BUSINESS OUTLOOK 2023

OFFSHORE ENERGIES UK

The comprehensive outlook for
the UK's offshore energy resources

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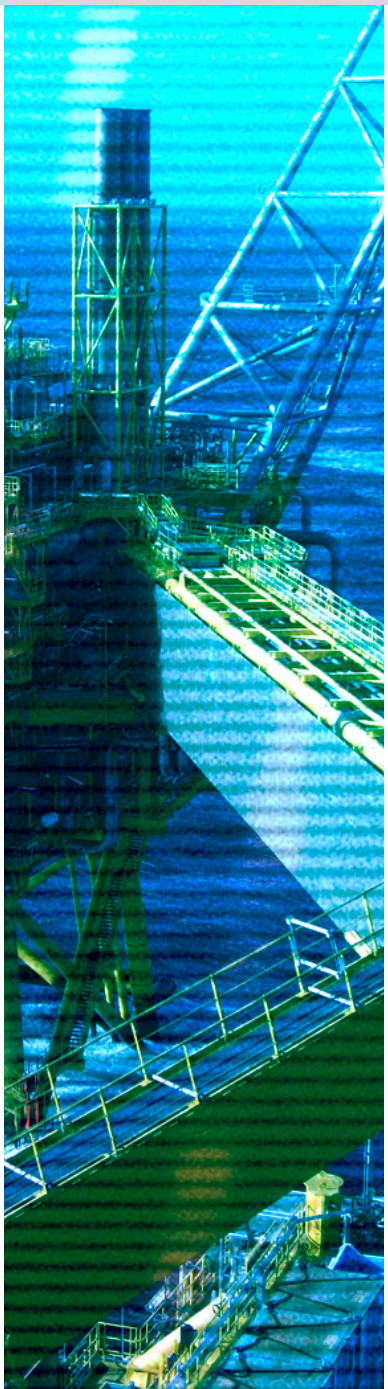
Working together, producing cleaner energies



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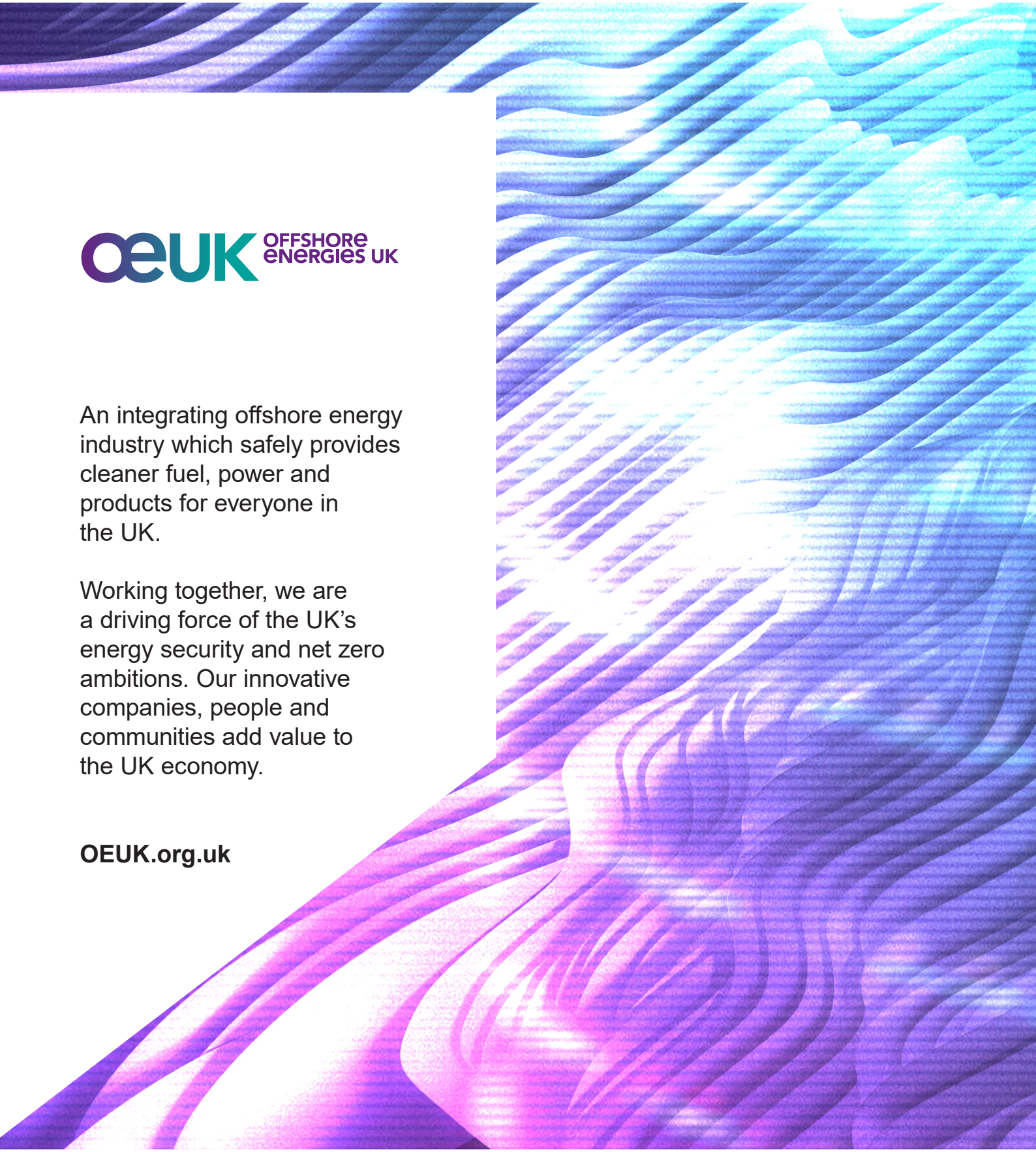
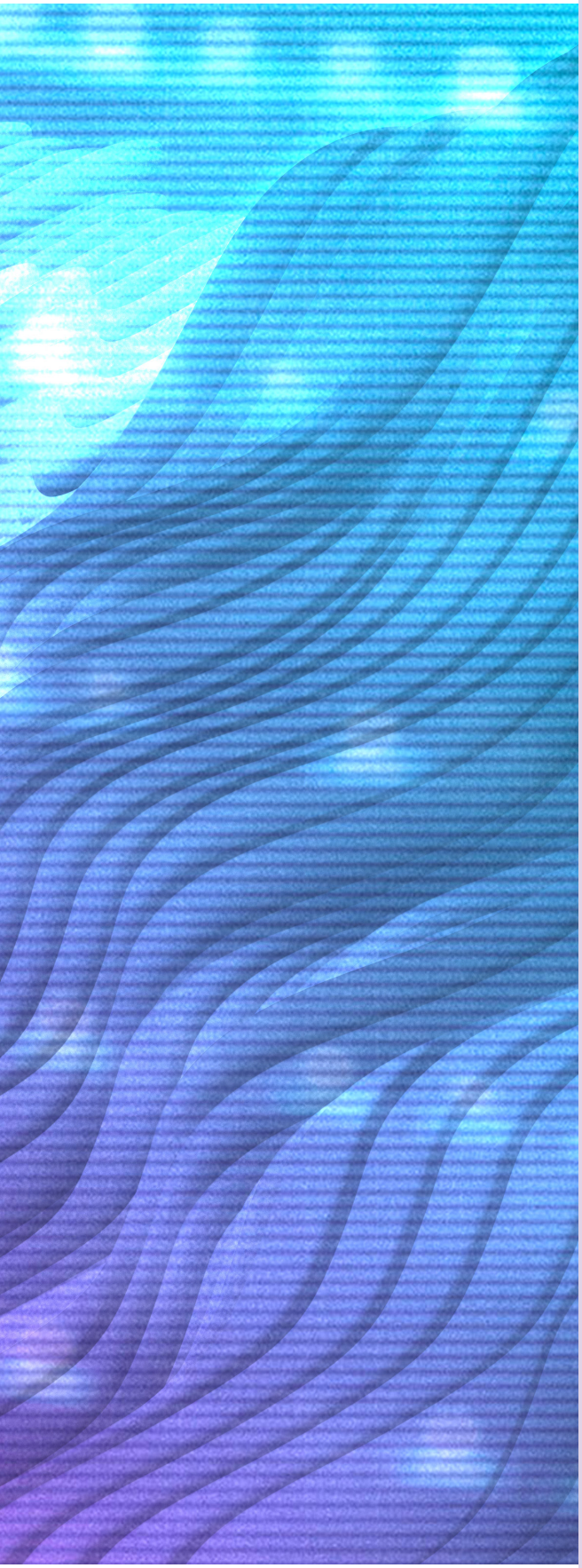


OFFSHORE ENERGIES UK

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.

OEUK.org.uk



BUSINESS OUTLOOK 2023

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Foreword

David Whitehouse
Chief Executive Officer
Offshore Energies UK

For over 50 years the UK's offshore energy sector has been providing the nation with secure supplies of energy. Our 2023 Business Outlook underlines the scale of opportunity for the UK in putting this industry at the heart of the race to net zero. In the rest of this decade alone the sector could spend £200bn in wind, hydrogen, carbon capture and storage (CCS), and oil and gas projects. This investment is critical to realising a lower-carbon energy system and demonstrates our resolute commitment to net zero.

Our sector is essential for the prosperity of our country and we take pride in our contribution. In the last year we added £28bn to the UK economy through oil and gas production and supply chain activities and provided 215,000 high value jobs throughout the UK.

There is every reason to believe our offshore energy sector will remain a bedrock of our economy and society for decades to come. We have the skills, infrastructure and geology. We have companies who are already in action and ready to invest more. But to make this happen, we need enduring and serious political support, which is reflective of the challenges we face. That support must recognise the reality that there is no simple choice between renewables on one hand and oil and gas on the other.

The size of the prize is substantial. We can continue to have secure energy that powers and heats our homes, transport and industry. We can have a vibrant, prosperous offshore energy sector which boosts the economy, supports hundreds of thousands of highly skilled jobs and cuts UK emissions. This approach will not only get us to net zero faster, but in a way where the UK economy becomes richer in resource and in talent, supporting governments and society with cleaner, more secure, more affordable home-produced energy.

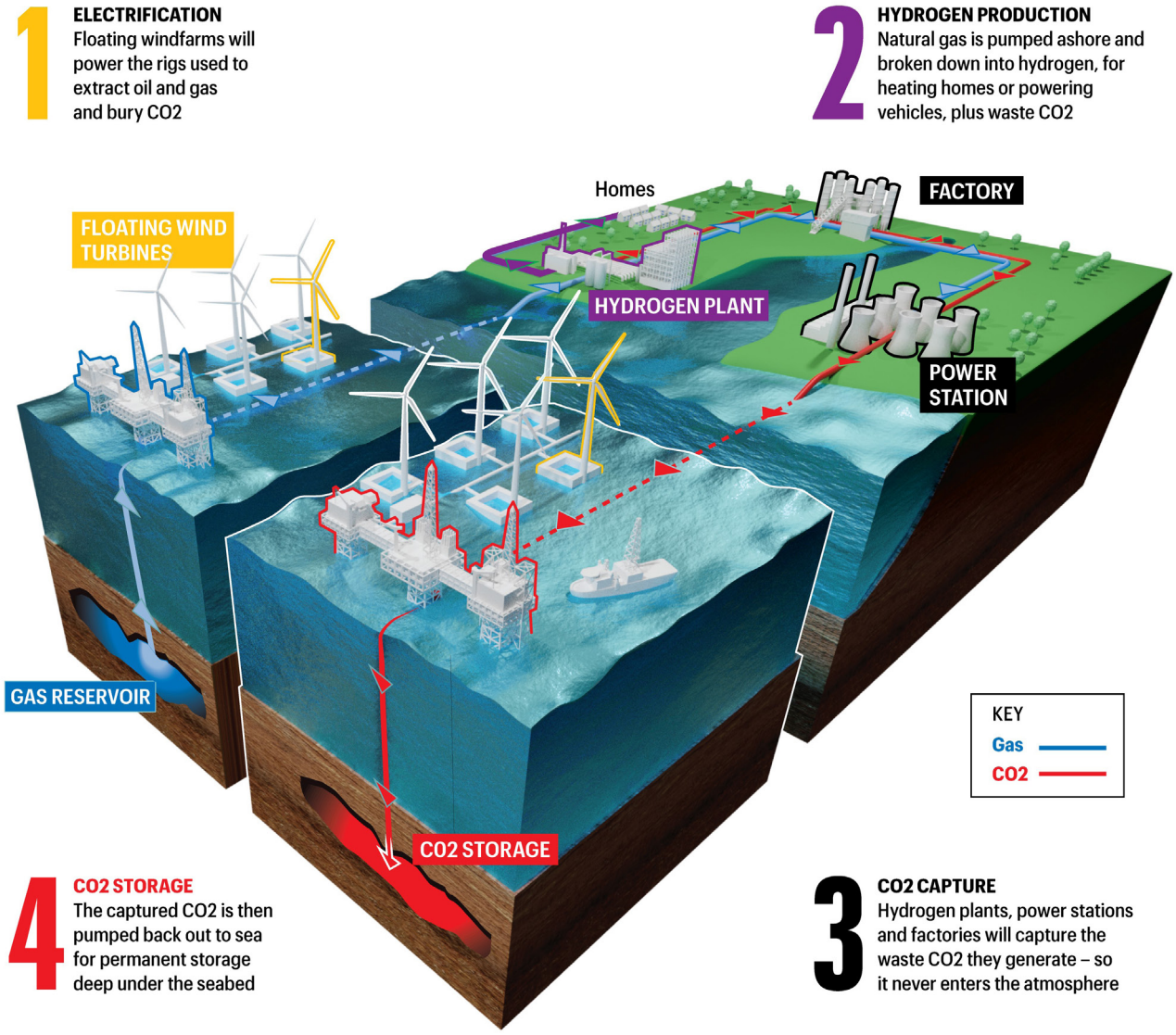
But this opportunity hangs in the balance. Our report finds that over 90% of the UK's offshore oil and gas operators are cutting back investment because of challenges like the windfall tax. It also describes how that reduction is impacting our energy security. Oil and gas projects from UK waters are now worse off, with about half a billion barrels of oil equivalent either being removed, or less likely to be produced, because of the challenges. That's roughly a year's supply from the North Sea.

By investing in domestic production, we reduce the need for costlier, less reliable and higher carbon imports while supporting the infrastructure we need to make cleaner, more affordable energy in the UK.

The more the UK relies on other countries for its energy, the greater the risk from global supply shocks. The report points out that last year's energy imports cost the UK £117bn – more than double the 2021 total of £54bn. If North Sea oil and gas production continues to decline farther and faster than demand, we should naturally expect these costs to increase.

The North Sea Transition Deal agreed between industry and the UK government two years ago has collaboration at its core. It is the basis for a long-term government and industry partnership that can transform the UK's energy systems.

While we have been in a time of a cost-of-living



crisis, our industry has contributed almost £11bn in production tax to support the country. However the Energy Profits levy, introduced last year, is driving investment out of the sector. The total tax rate for offshore oil and gas operators is now 75%: three times that of conventional UK business.

This report sets out the massive scale of the task of reaching net zero, while maintaining energy security and growing the economy – and finds the UK is behind schedule.

The UK is in a global race for energy and investment in net zero. The Office for Budget Responsibility has estimated that reaching net zero will cost the UK £1.4 trillion – but over 70% will have to come from the private sector.

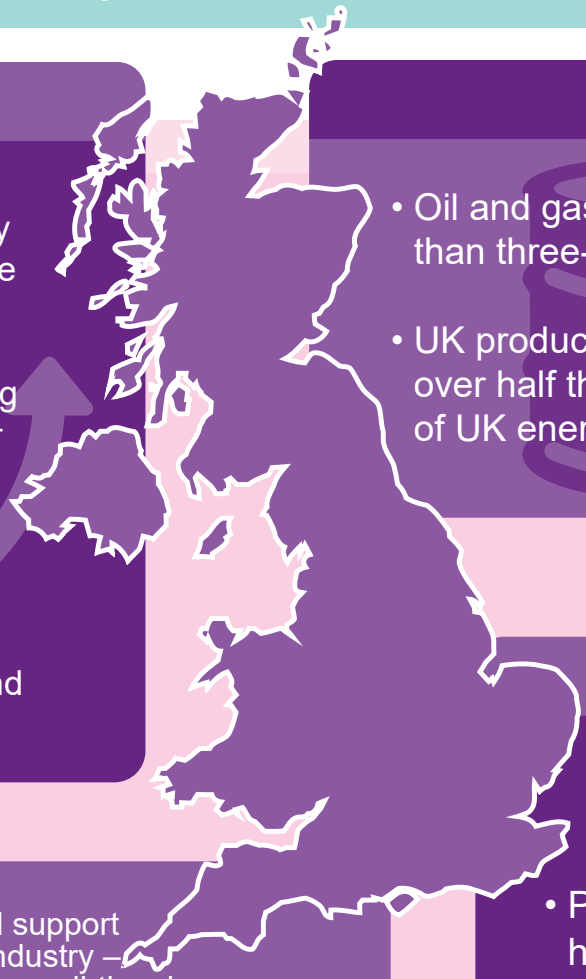
We have all the ingredients to win this race and achieve the economic and environmental benefits of net zero, stimulating economic growth and job opportunities in communities across the UK. But our governments need to work with us to carefully rebuild the confidence of the investors that are so crucial to this transformational endeavour. Our industry has the skills to create a future built on cleaner energy, and the resources to get us there. The prize for the UK is too big to miss.

David Whitehouse

2 Offshore energy snapshot

Providing energy security and economic benefits

- Commodity markets have been extremely uncertain and volatile
- Prices have been high but are declining and showing greater stability
- This needs to be recognised in the fiscal regime, with a mechanism to unwind windfall taxes



- Oil and gas still provide more than three-quarters of UK energy
- UK production is enough to meet over half these needs – the heart of UK energy security

- But a lack of political support is undermining the industry – new investment is at an all-time low
- Windfall taxes have eroded investor confidence
- Supply chain resources are leaving the UK for more attractive regions
- The industry's potential is slipping away as a direct result of these challenges – urgent intervention is needed
- Companies need to be given the confidence to invest, or imports will soar
- The UK's energy security, jobs, economy, and emissions are being put at risk

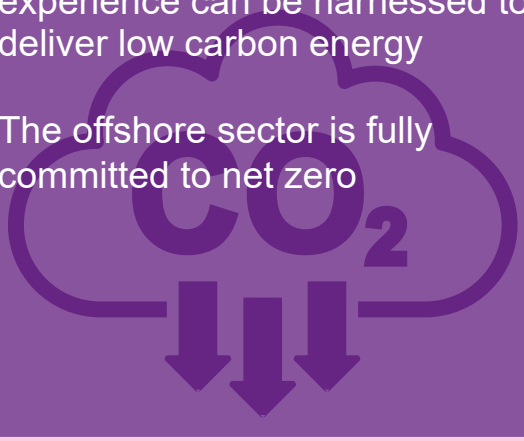
20%

- Production emissions have fallen **20%** since 2018
- The industry supports **215,000** jobs and **£28bn** in economic value
- There is still huge potential, continuing to meet at least half our oil and gas needs

215,000

Delivering net zero emissions

- The UK economy is not currently on track to meet its emissions commitments
- Government action is needed to support people and businesses to invest to cut emissions
- The oil and gas industry's experience can be harnessed to deliver low carbon energy
- The offshore sector is fully committed to net zero



- A strong oil and gas sector will help the transition happen more effectively
- Most of its skills can be applied to carbon capture and offshore wind projects
- Companies are already delivering new projects and there are more to come

- But government and regulators need to help speed this up
- Providing faster access to grid connections and approval processes for offshore wind
- Putting commercial frameworks in place for hydrogen production
- Picking up the pace on support for CCS projects

3 Energy markets

Gas market

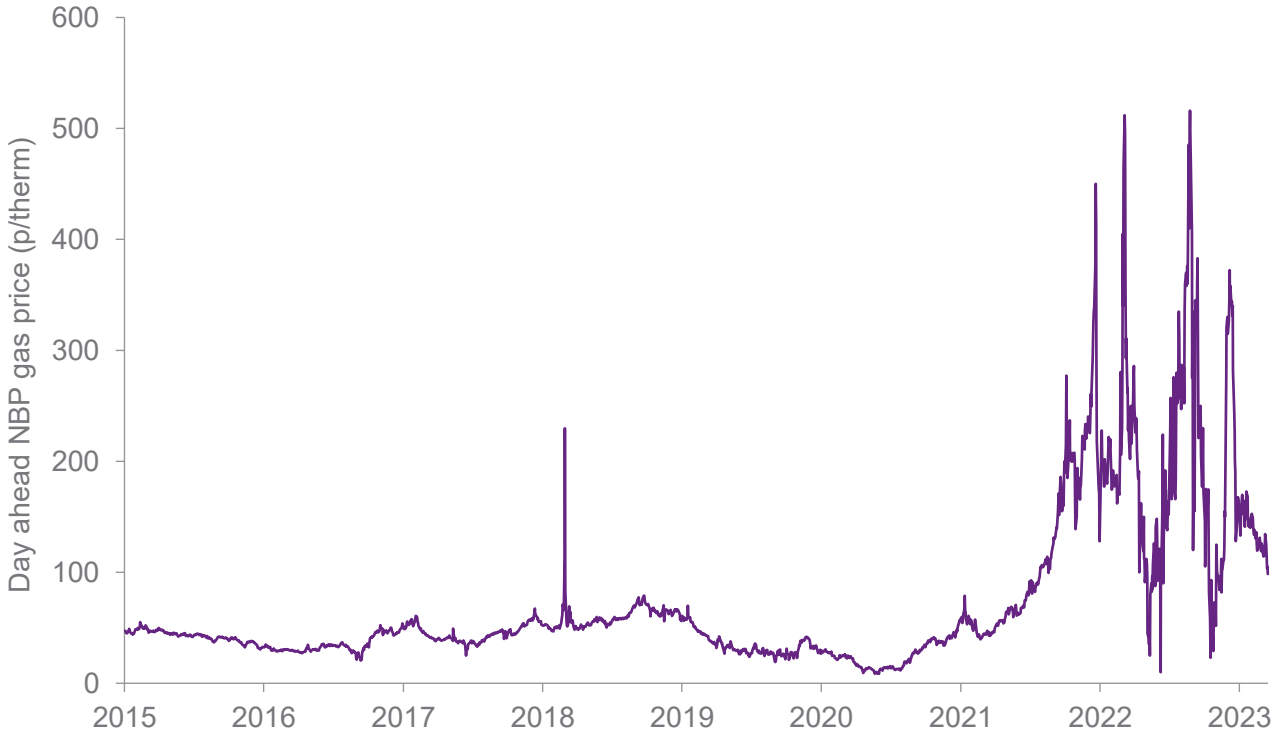
The record high gas prices and extreme volatility in 2022 were primarily caused by the Russian invasion of Ukraine and the subsequent drive from European countries to diversify away from Russian gas supplies. However, prices had been starting to rise in 2021. These events compounded the low investment in production that was seen during the pandemic and meant there was little in the way of available supplies for Europe to turn to, driving up prices globally. Consumers in the UK have felt this hard as gas is used to heat 85% of homes and is also used to provide over 40% of the UK power mix. At peak times it is much more, and it generally sets the wholesale market power price owing to the present market design.

The UK's gas price marker, the National Balancing Point (NBP), averaged 204 pence per therm (p/th) last year for day-ahead delivery, which was 76% higher than in 2021 (116 p/th), and more than eight times higher than in 2020 (25 p/th). The volatility is shown by swings in price from over 500 p/th and down to 10p/th last year.

These trends are the opposite of the previous decade, which was characterised by a better supply-demand balance and lower and more stable prices. The prior record UK gas price was during a single extreme weather event (Beast from the east) in March 2018, when prices briefly spiked at almost 300 p/th. This high was exceeded on 106 separate days last year.

Towards the end of 2022, and in early

Figure 1a
After a long period of stability, NBP gas prices have been extremely volatile...



Sources: ICIS, OEUK

Figure 1b
...especially in the last two years

Sources: ICIS, OEUK

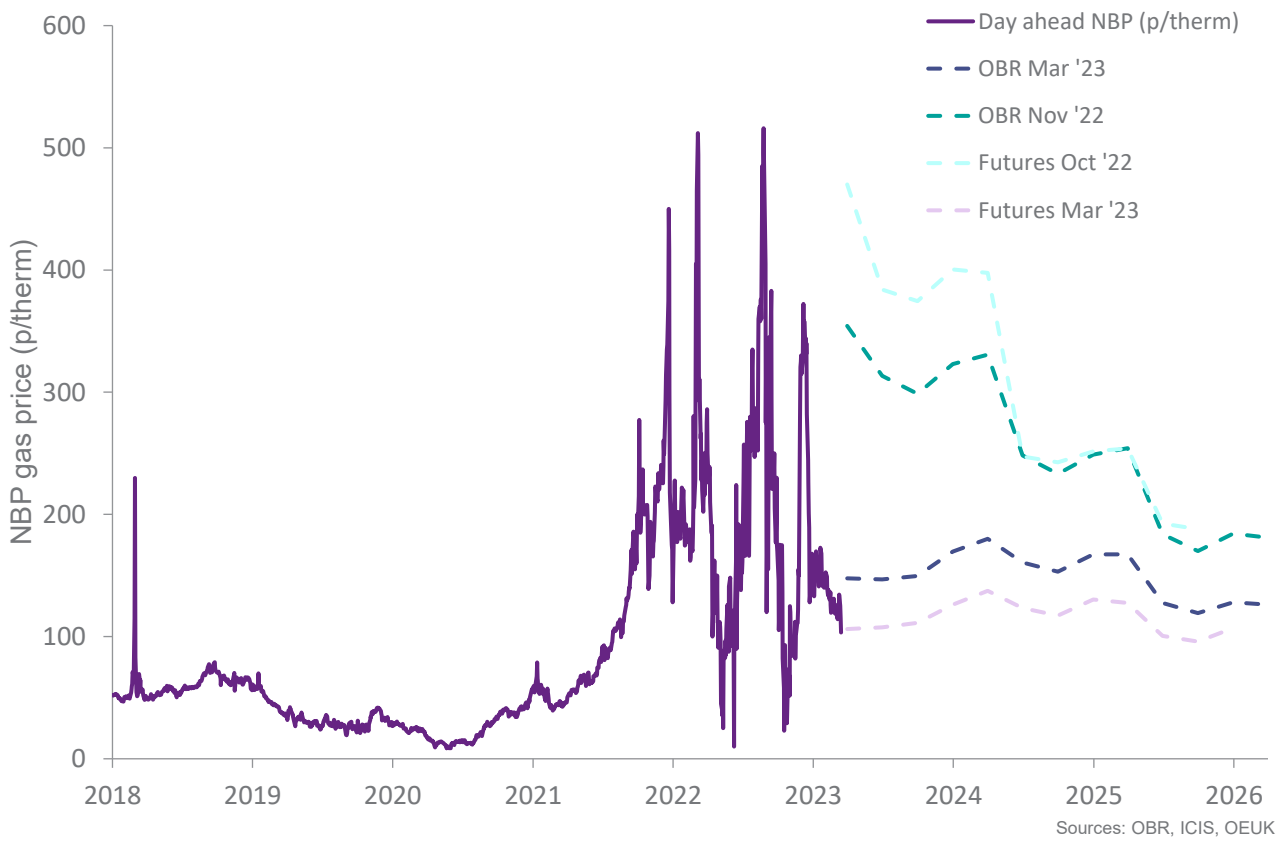
2023, NBP day-ahead prices have generally seen greater stability but they have been declining. They settled at around 160 p/th in January and 135 p/th in February. By mid-March they were just over 100 p/th. Forward contracts are now also trading much lower than they were during 2022 and they are more stable. In late August 2022, contracts for summer and winter 2023 delivery were trading at around 700 p/th, and almost 500 p/th into 2024. In mid-March 2023 these same contracts are priced at less than 140 p/th – even lower than they were 12 months ago, before Russia's invasion.

The trend is also significantly lower than the expectations that were outlined by the Office for Budget Responsibility (OBR) in its November Economic & Fiscal Outlook[1] (over 350 p/th for Q1 2023), with the OBR outlook remaining higher than the prevailing forwards prices throughout the period. This is an important point as the OBR outlook is used to set fiscal expectations and guide policy decisions, such as windfall taxes. The OBR significantly lowered its price expectations at the time of the government's Spring Budget. They are however still higher than forwards contracts.

Prices are still historically high, but these trends reflect the greater certainty that supply and demand will balance at lower prices across Europe in the months and

[1] Economic and fiscal outlook - November 2022 - Office for Budget Responsibility (obr.uk)

Figure 2
NBP future prices have reduced over time



years to come. There is also less worry about storage inventory. This is partly owing to less industrial use and switching to alternative, higher carbon, fuel – so there has been a cost in terms of lower economic output and higher emissions.

Lower prices have also been helped by reduced Chinese LNG demand owing to prevailing Covid-19 restrictions. This does bring some relief to consumers and will also limit the anticipated cost of the UK government's energy support schemes, but Europe cannot assume that this unexpected relief will last.

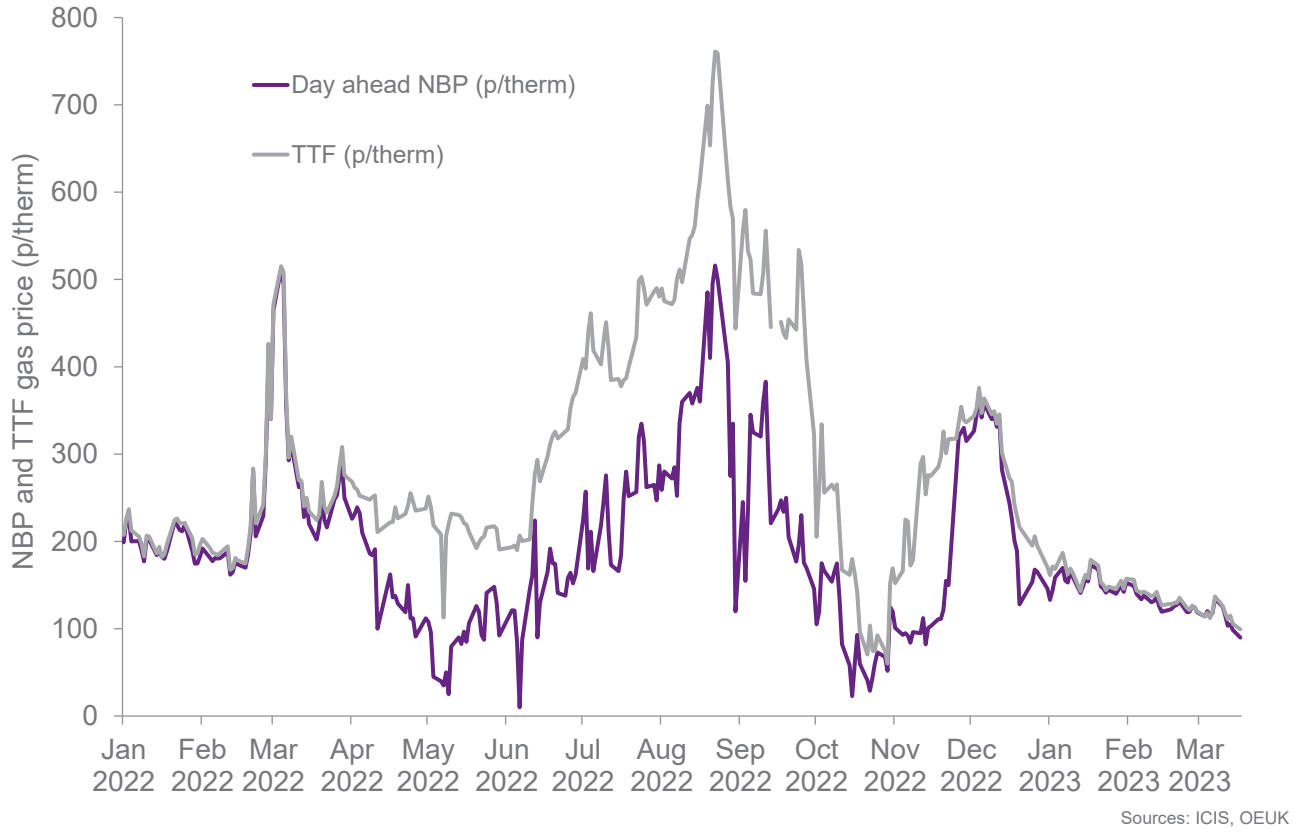
This is in fact part of the warning against complacency from the International Energy Agency (IEA)[2]. Keeping demand down, while not harming industrial output and economic growth, will be difficult.

Outlooks by Shell[3] and IOGP[4] show the increasing importance of LNG in supplying Europe. But there are indications that global LNG production may struggle to match demand in the coming years. IEA notes that LNG supply is only likely to rise around 4% this year. It does say also that the demand outlook is uncertain and highly dependent on China's economic performance. There is the possibility of a 35% increase in its LNG demand.

Given this massive uncertainty it is vital that the UK, and other European countries, continue to prioritise and encourage investment in domestic resources to ensure security of supplies. Expanding capacity at the Rough storage facility would also help act as a strategic buffer against market shocks.

[2] Background note on the natural gas supply-demand balance of the European Union in 2023 – Analysis - IEA
[3] https://www.shell.com/energy-and-innovation/natural-gas/liquefied-natural-gas-lng/lng-outlook-2023/_jcr_content/root/main/section_599628081_co/promo_copy_copy/links/item0.stream/1676487838925/410880176bce66136f-c24a70866f941295eb70e7/lng-outlook-2023.pdf
[4] New study identifies Europe's supply options to replace Russian gas before 2030 | IOGP

Figure 3
UK gas prices were consistently lower than those in NW Europe throughout 2022



Sources: ICIS, OEUK

It is also vital that the volatility in price and cyclical nature of the sector are reflected in government policy decisions, with a mechanism included in the Energy Profits Levy to ensure that only true windfall profits are captured by the increased tax rate, so that the tax is removed as prices fall. This price should be based on a transparent market rate, with the higher tax only coming into effect when prices exceed it.

This is a crucial step towards giving industry certainty that this is a temporary measure and restoring the confidence that companies have in developing new projects here. OEUK was disappointed that the opportunity to include this in the UK governments Spring Budget was missed.

The strength of the UK's gas supplies, and availability of its infrastructure (including LNG import capacity), means the UK was able to transfer an increased volume of gas to Europe last year. The same amount of gas was piped from the UK to Europe as in the previous four years combined (just over 19bn m^3), a reverse of previous trends where the UK has generally imported more gas from Europe.

Europe would have struggled to meet demand without these increased supplies. The UK also sent 4bn m^3 to Ireland, twice the amount five years ago. The UK now meets around 75% of Irish gas needs, with their dependence on imports projected to grow to 90% by 2030.

These dynamics have helped keep UK prices lower than the European counterparts – without domestic supplies this trend would be very different.

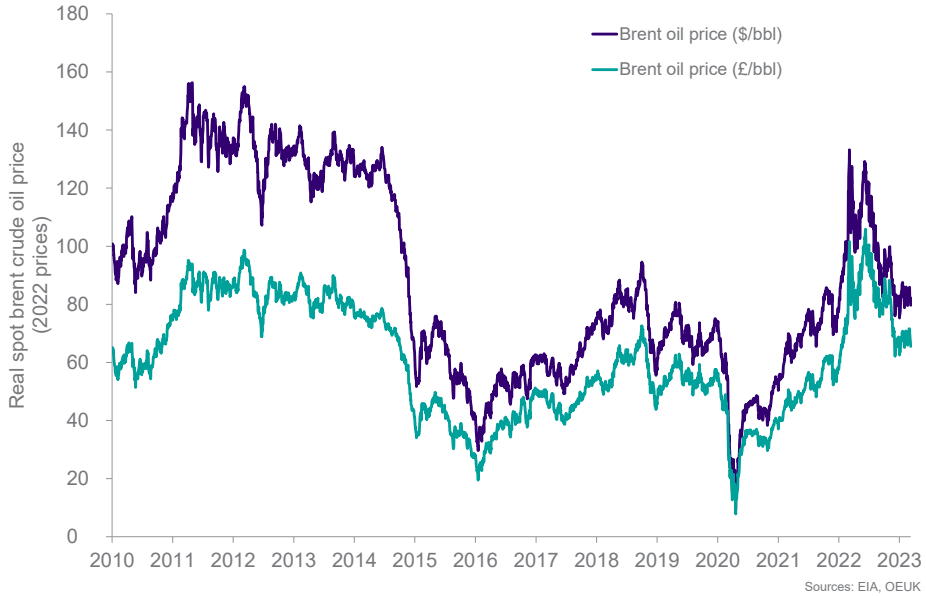
Oil market

The Brent oil price averaged $101/barrel (b) last year, which was a 42% increase on 2021 ($71/b). However, when considered in sterling terms, it was a 60% increase (£82/b compared with £51.5/b). This is an important consideration in light of the UK's cost of living challenges. It shows how much the weakness of the UK economy is driving up the price of dollar-denominated commodities.

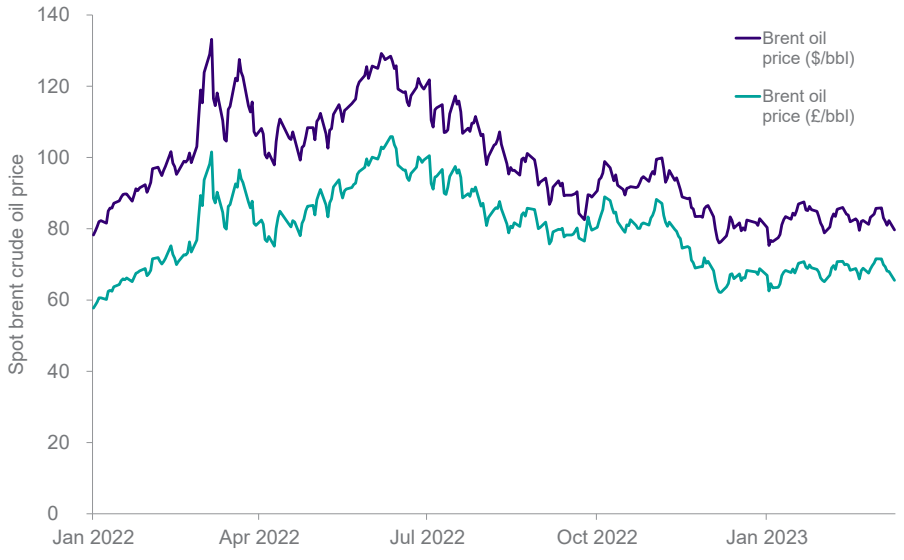
It is also important to reinforce that these prices are not unprecedented in real terms. Crude oil prices averaged over $130/b (£80/b) between 2011-13, when adjusted for inflation, so dollar prices over the last year were less than a decade ago and were similarly lower in sterling.

Prices have though been trending downward since peaking in the middle of 2022, and since December they have been relatively stable at around $80/b. This price is mainly owing to output cuts in Opec+ countries, including Russia. At the time of writing in mid-March,

Figure 4
The Brent price has been high, but not at unprecedented levels

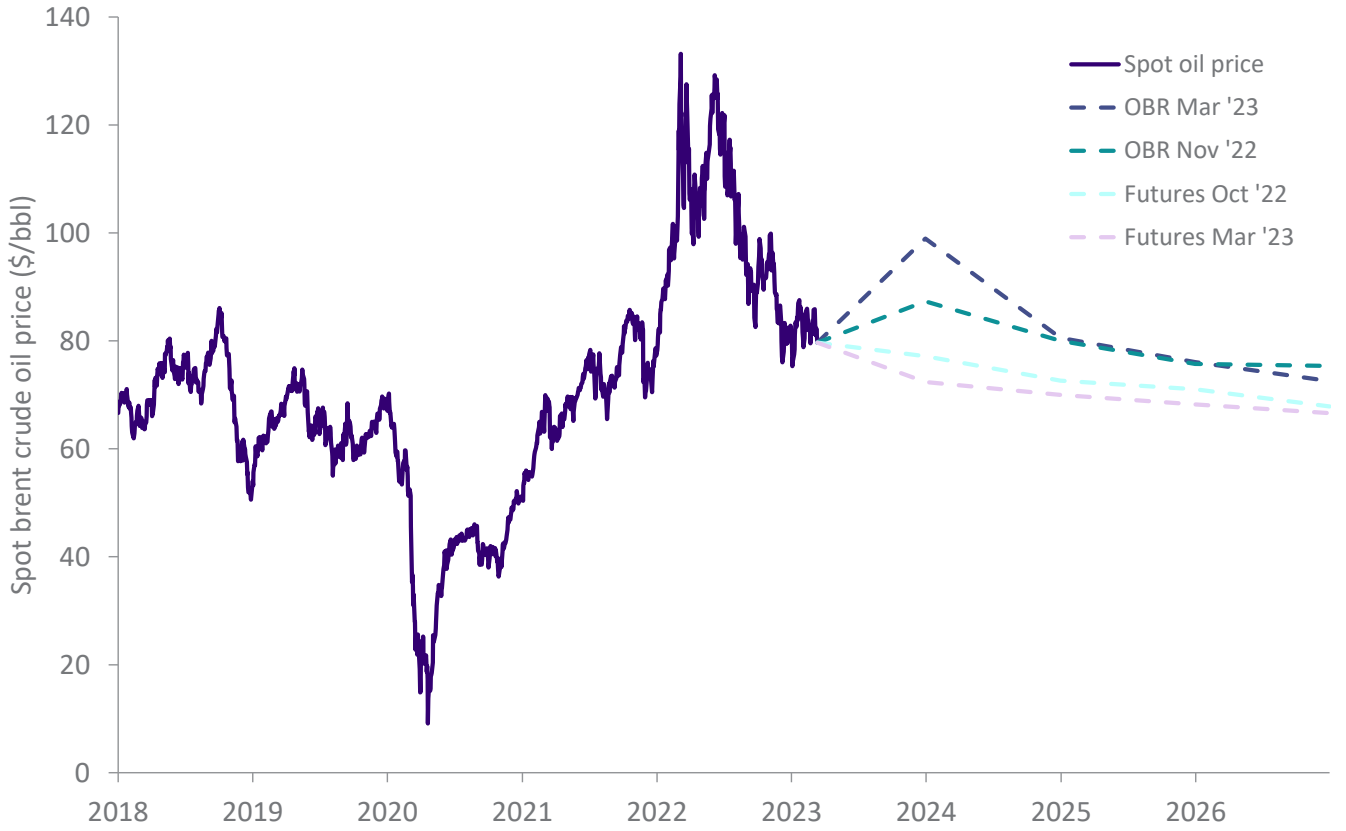


Sources: EIA, OEUK



Sources: EIA, OEUK

Figure 5
Brent futures prices have reduced



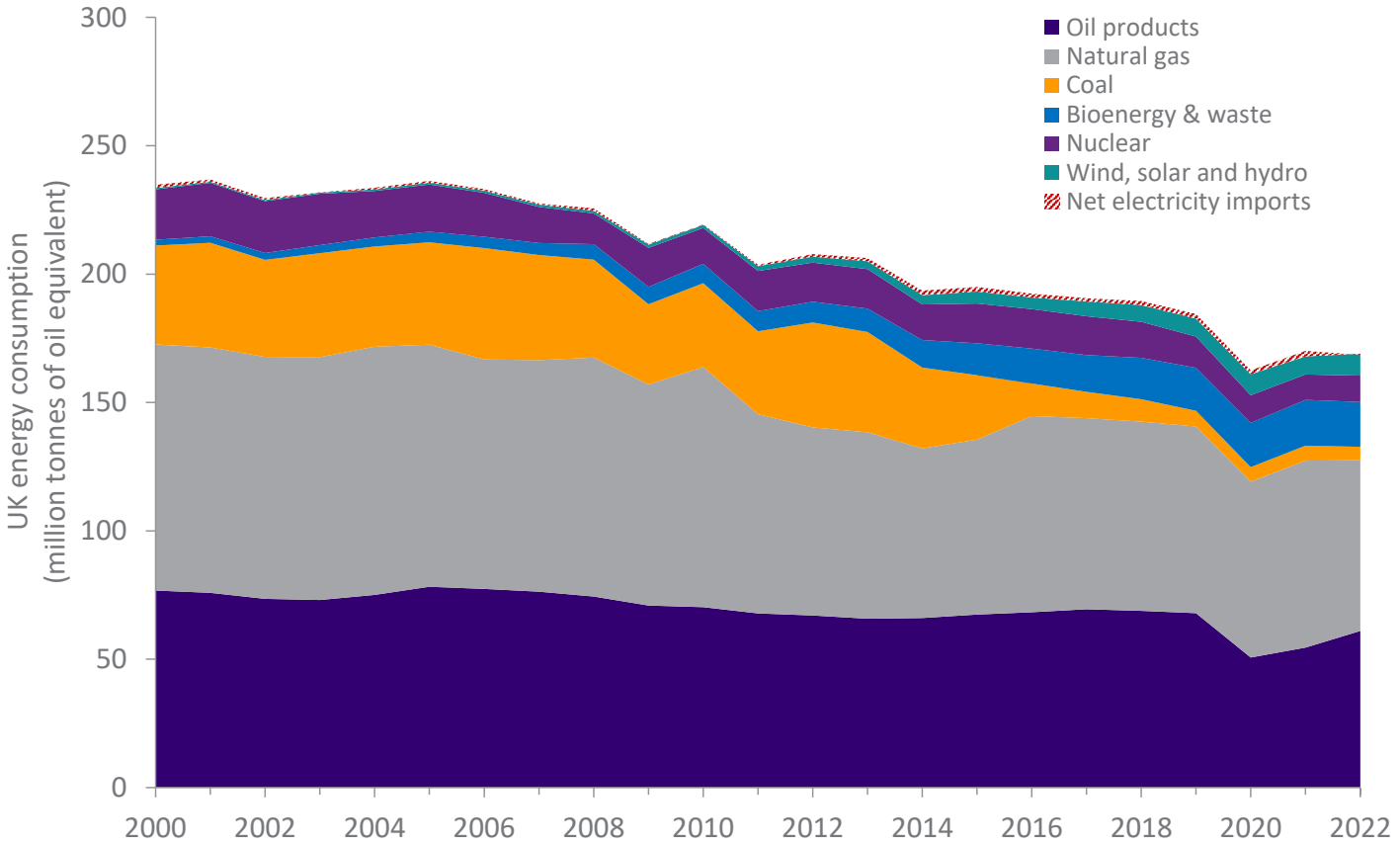
Sources: OBR, ICE, EIA, OEUK

downside risk was worsening in relation to fears of an escalating banking crisis that would hit economic growth. Brent prices have fallen as low as $70/b in response to this and also to continuing inventory builds – the lowest price since late 2021.

Brent futures prices are for now more stable this year than last, trending from around $70/b throughout 2023 to $68/b by end 2026. As outlined in Figure 5, the current futures trend is considerably lower than the forward curve at peak levels last year. It is also around 10% lower than the OBR price outlook throughout the period. Again, this highlights the cyclical nature of the basin and reinforces the need for a mechanism to ensure that the Energy Profits Levy applies only to profits made when prices exceed a certain level.

4 Meeting the UK's energy needs

Figure 6
Oil and gas continue to meet over three-quarters of UK energy consumption



Sources: DESNZ, OEUK

Last year the UK used broadly the same amount of energy as it did in 2021 (1% reduction). But gas was down 9% and oil was up 12%.

Gas demand fell as people and industries responded to higher prices. Domestic heating demand was down also because the winter was milder. There was also less working from home compared with the prior few years. Despite more people travelling, oil demand was still a tenth less than it was in 2019, the year before the pandemic.

Oil and gas continue to provide 76% of UK energy (just over 39% gas and 36% oil), up slightly on 2021 (75%) and little changed for over a decade. Despite reductions in overall energy use and the growth of renewable energies (*see Section 5*), the UK's reliance on oil and gas has barely fallen in recent years.

Energy demand – heading for net zero?

UK emissions fell 43% between 2000-21, largely driven by reductions from energy supply, which have fallen by almost two-thirds – meaning that this has directly driven half of the UK absolute reductions. Reductions in oil and gas production emissions are part of this, being down 20% since 2018.

But further cuts will be harder: there is a real need to make inroads into emissions from demand, as well as those from supply.

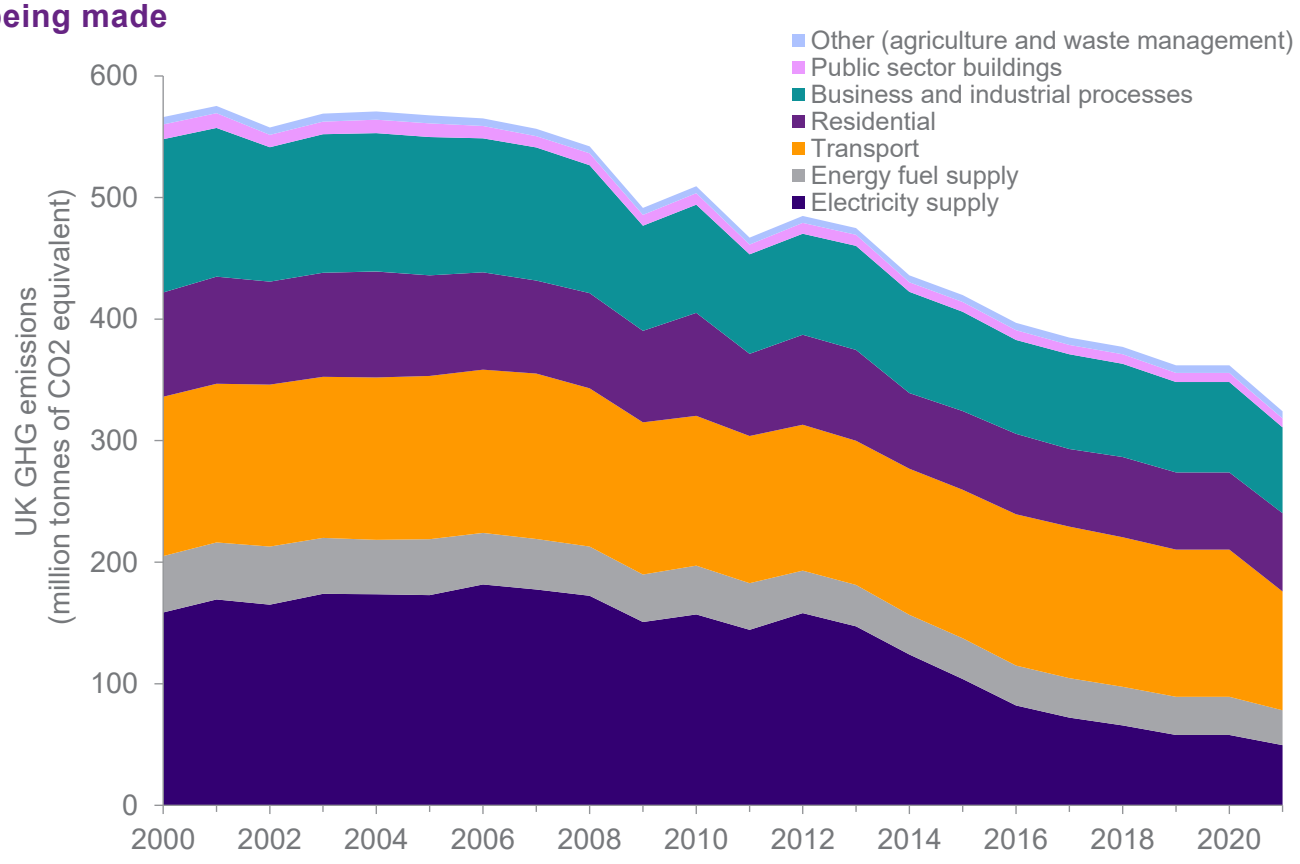
Emissions reductions from energy supply do not cover energy produced outside the UK. It imports more than a third of its energy needs but the carbon footprint from these supplies, gas in particular, is often considerably higher than domestic production.

The recent Skidmore report, *Review of Net Zero*, outlined how the UK's ambitions and targets were the right ones, but stressed that progress needed to be stepped up across several areas and more needs to be done to encourage private-sector investment. It says net-zero emissions is "the economic opportunity of the century" and that failure to deliver that goal presents a significant risk to the economy as well as to the environment.[5]

The Climate Change Committee's (CCC) Balanced Pathway scenario, first outlined in 2019, outlines a possible path for the energy sector towards net zero. However, evidence is beginning to emerge that the UK is not on track to meet its aims, with Skidmore noting the need for a "step change in the government's approach to delivering net zero". The CCC scenario sets a path for a faster reduction in the UK's oil and gas dependency than today's trend indicates and they also state that the UK is going to miss its next Carbon Budget for the first time (2023-2027).[6,7]

This trend is being driven by emissions associated with fuel consumption, not production in the UK. The scale-up of

Figure 7
Reductions in emissions from energy production have been key to overall UK fall in emissions. Consumption is by far the largest driver, with relatively little progress being made



Sources: DESNZ, OEUK

[5] Latest available data at this level of granularity at time of publication
[6] Net Zero Review: UK could do more to reap economic benefits of green growth - GOV.UK (www.gov.uk)
[7] Advice on reducing the UK's emissions - Climate Change Committee (theccc.org.uk)

electrification across the economy and decarbonising generation will help reduce emissions. But oil and gas are not always easily replaceable, especially in some industrial applications. The UK also needs to step up the pace on efforts to transform fuels used for transport (especially heavy goods transport) and heating, which combined make up around 40% of UK emissions.

The government's latest Energy Reference Scenario[8] shows that overall oil and gas demand is likely to remain relatively steady throughout the 2020's, and only be around 20% lower in 2030 compared with 2019. Within this mix, oil and gas demand is expected to fall more slowly until 2026, so their share of the energy mix would actually increase. Although higher prices impact this now, the trend could still reverse. UK policy development needs to move faster to bring about real, sustainable change in the energy system, as Skidmore's report says.

DNV also forecasts in its recent *UK Energy Transition Outlook*[9] that the UK will miss a net zero outcome by 2050. It shows that overall oil and gas use in the UK is still likely to be 35% of the energy mix at that point, compared with 22% in the CCC Balanced Pathway. CCS and blending or replacing natural gas with hydrogen will be important abatement methods.

Electricity supply

Gas brings scale and flexibility to the UK's power system, enabling the almost complete removal of coal (which creates far higher emissions). Coal has gone from meeting 20% of the UK's energy, and 38% of its electricity, just 10 years ago to effectively nothing now. This has been the critical driver in the fall in overall energy supply emissions, with those from power stations falling by almost 70% since 2000.

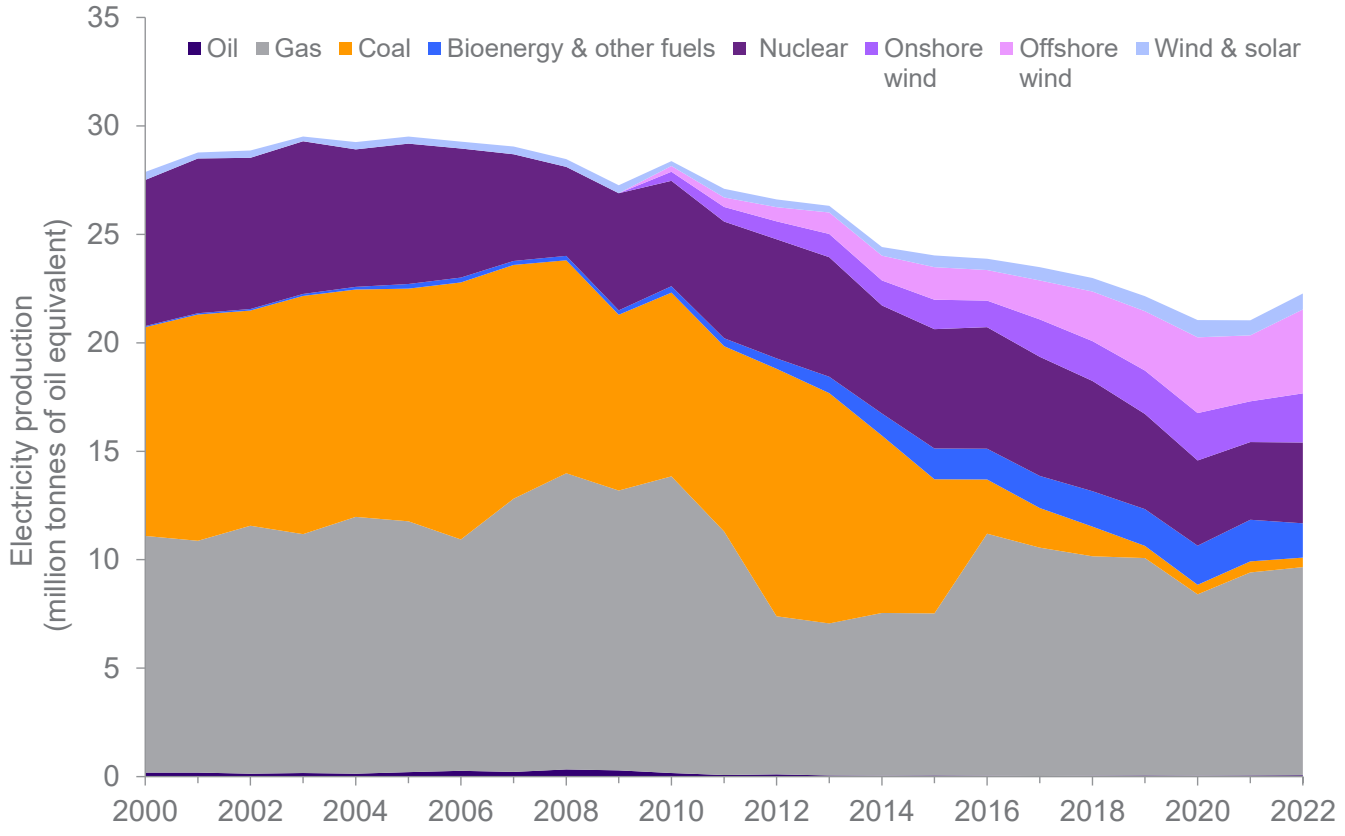
It should be noted though that concerns over gas supplies have led to some coal stations being thrown a lifeline as the government has asked them to keep operational. The plan is to close the last one by October 2024.

While renewable power generation capacity has grown significantly over the last decade, including the development of world's second largest offshore wind capacity (almost 14 GW), gas-fired power stations provided 43% of electricity supply last year, and at some periods this has been as much as two-thirds. The CCC therefore says that by 2035, gas-fired power generation will still be essential, given the current pace of change in the system, transmission bottlenecks and the inability to rely on wind to meet power demand peaks.[10]

On electricity demand, the UK has seen a downward trend in the last decade. It is now

[8] Current programmes will not deliver Net Zero - Climate Change Committee (theccc.org.uk)
[9] Energy and emissions projections: 2021 to 2040 - GOV.UK (www.gov.uk). This scenario incorporates currently implemented policies and those which were at an advanced stage of planning (and with secured finance) in 2022
[10] Download our UK Energy Transition Outlook 2022 - DNV

Figure 8
Gas provides the majority of UK electricity generation, despite the large growth in renewable sources



Sources: DESNZ, OEUK

around 17% lower than it was in 2010. Lower industrial demand is the main cause, which is down 24% and indicative of the continued deindustrialisation of the UK economy, as manufactured goods are increasingly imported from other countries. The falling trend needs to reverse with its share of energy consumption needed to more than double to over 40% by 2050, in the CCC Balanced Pathway scenario.

Household heating

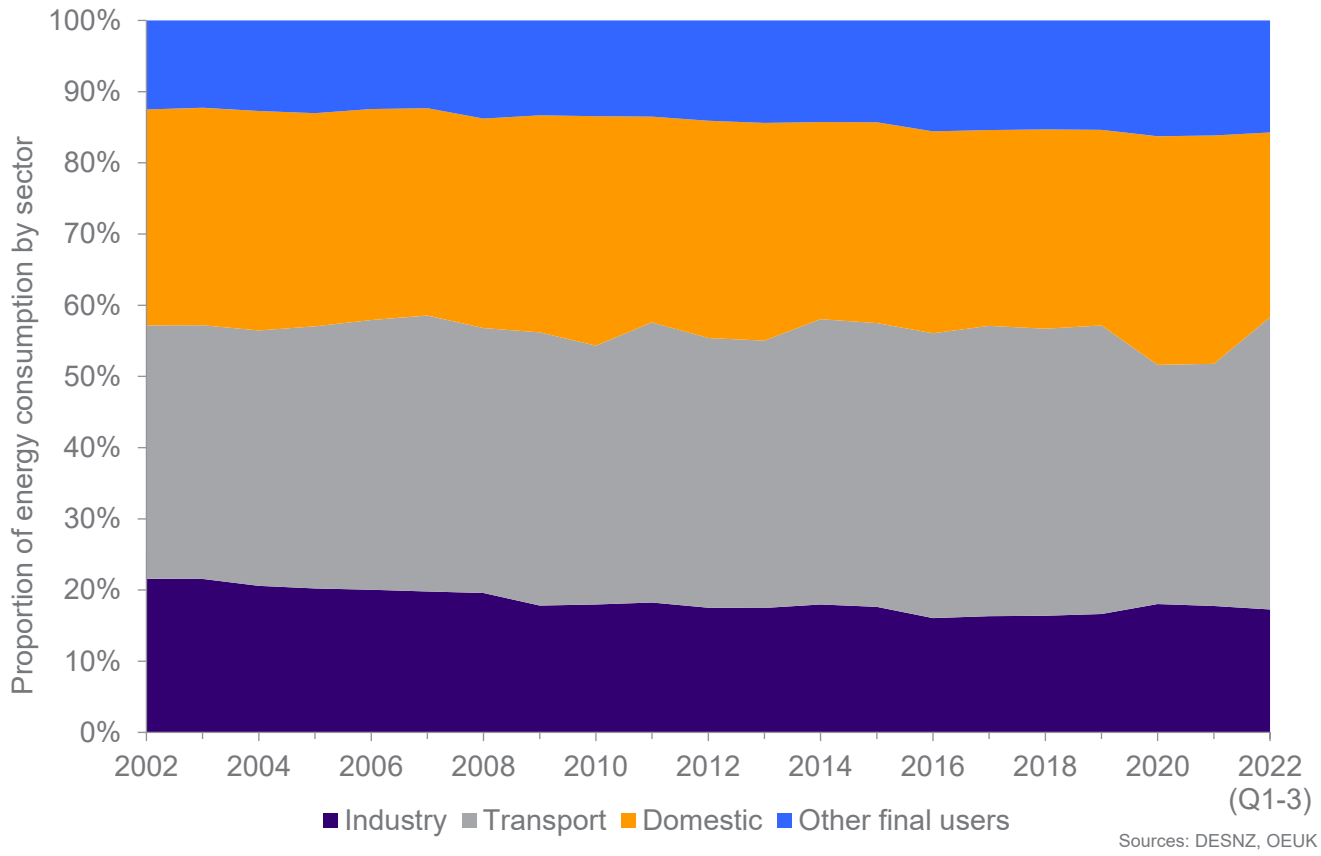
Household heating is the UK's second largest use of energy and the largest component of gas consumption. It also accounts for the largest proportion of household emissions, which make up 16% of the UK's total. Reducing this dependency on gas will lower emissions. About 85% of homes are heated by gas and National Grid expects the number to continue to rise slowly until 2025. Even the most ambitious scenarios from National Grid[11] see gas being the largest domestic heating source until at least 2032.

A broad range of solutions will be needed to gradually reduce this gas dependency. The CCC has found that 8mn homes should have heat pumps installed by 2035, and 11.9mn home-efficiency support packages will be needed over and above the prioritisation of fuel poor homes[12] (with some estimates expecting half of UK households to face the threat of fuel poverty this year).[13]

Within some more ambitious scenarios outlined by National Grid, the UK will need

[11] A reliable, secure and decarbonised power system by 2035 is possible – but not at this pace of delivery - Climate Change Committee (theccc.org.uk)
[12] Future Energy Scenarios 2022 | National Grid ESO
[13] Development of trajectories for residential heat decarbonisation to inform the Sixth Carbon Budget (Element Energy) - Climate Change Committee (theccc.org.uk)

Figure 9
Transport and heating are the UK largest energy consumers, and are both dominated by oil and gas



Sources: DESNZ, OEUK

to have 26mn heat pumps (including hybrid systems) installed by 2050.[14]

The UK installed around 42,000 home heat pumps in 2021 and has the lowest installation rate in Europe,[15] with householders collectively installing gas boilers 120 times faster than low carbon systems.[16] For context the UK government has set a target of installing 600,000/year by 2028, while National Grid says that 900,000/year may be needed.

However not all homes will be suitable for this technology, meaning that it is important to also progress alternative options, such as blending gas in the pipeline with hydrogen.[17]

Transport emissions

Transport is the UK's largest use of energy (accounting for around a third), and by far the largest driver of oil demand (75%). It also accounts for around a quarter of the UK's emissions, with cars making up the biggest proportion of this (52%).[18] The government has set a target to end the sales of new combustion engine vehicles by 2030, and hybrid vehicles by 2035. Scaling up electric vehicles (EVs) in recent years has been slow, but last year they accounted for 13% of new vehicle sales – ahead of the CCC Balanced Pathway scenario, and even in line with some

[14] Future Energy Scenarios 2022 | National Grid ESO
[15] Savills Blog | Heat pumps: why is the UK falling short?
[16] UK heating plan still means 120 gas boilers installed for every low-carbon system - Energy Post
[17] National Housing Federation - NHF response to BEIS consultation on review of net zero policies
[18] Transport and environment statistics 2022 - GOV.UK (www.gov.uk)

of its more ambitious outlooks. Overall though a significant scale up in sales is needed, with the CCC finding that over 23mn EVs will need to be on the UK roads by 2032, and all vehicles electric by 2050 (potentially 49mn cars).[19] This compares to 1.8mn in mid-2022. But the expansion of charging infrastructure, in particular on-street points is lagging. The CCC estimates that the number of public charging points will need to increase to 325,000 by 2032, up from 28,000 in 2020 to encourage more drivers to buy EVs.[20] The Society of Motor Manufacturers and Traders (SMMT) has also highlighted the crucial role of the supply chain in enabling this, calling for a government-led strategy to enable the UK to compete against the US and EU for supply chain investment.[21]

Both hydrogen and carbon capture and storage (CCS) will be crucial in reducing UK emissions while also creating domestic industrial and economic growth. The use of hydrogen will be important in particularly hard-to-abate industrial sectors. It can also be used in transport (especially for heavy goods vehicles), and it can be used safely in home boilers when blended with natural gas. CCS will be a key enabler of the scale up of hydrogen production, and will also be critical in reducing industrial emissions where there is a lack of low-carbon fuel options.

The UK government and regulators need to step up pace in putting the conditions in place to give companies the confidence to invest in these projects (*see section 5*), such as a business model for hydrogen.

[19] The-UKs-transition-to-electric-vehicles.pdf
[20] The-UKs-transition-to-electric-vehicles.pdf (theccc.org.uk)
[21] SMMT-Race-to-Zero-report.pdf

Providing UK energy security

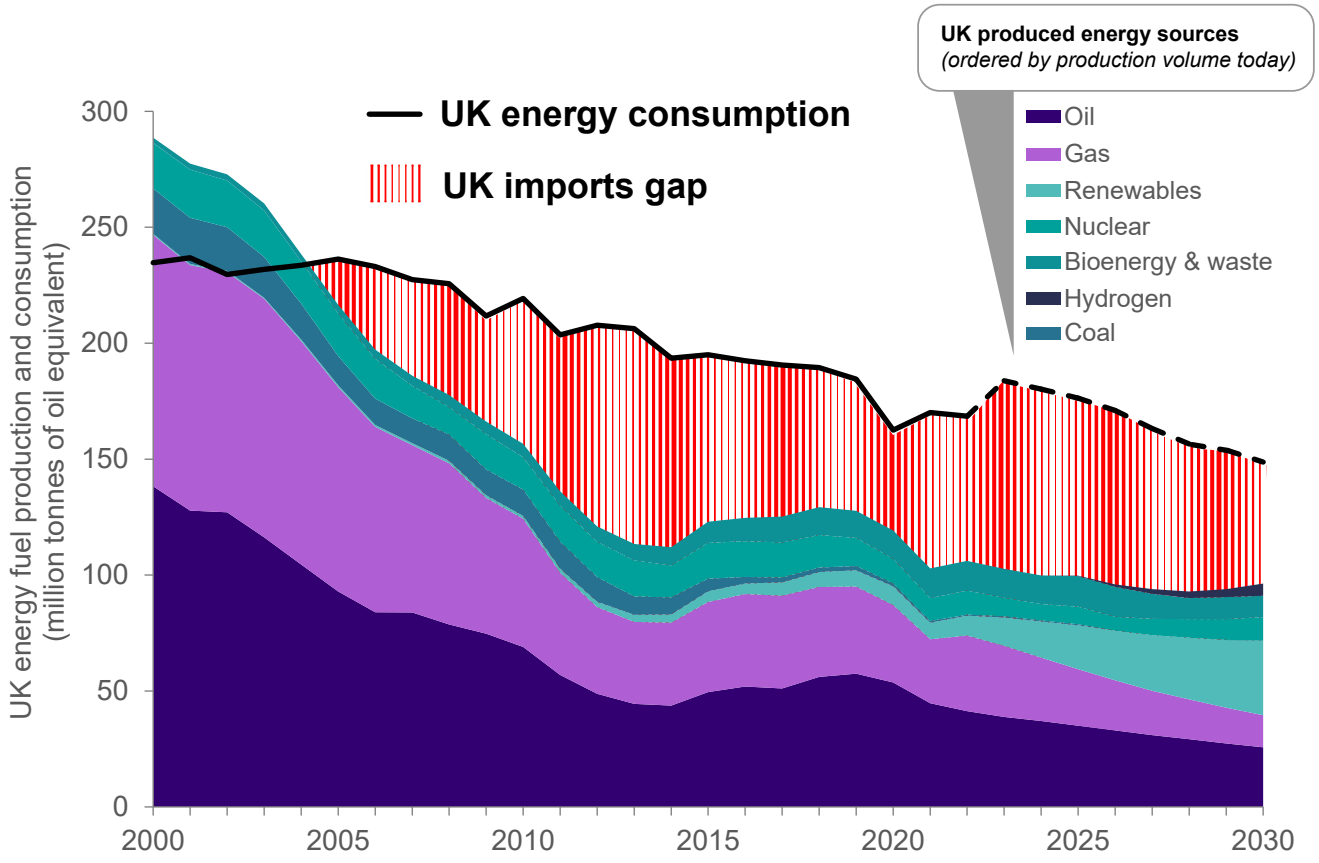
The UK has been a net importer of energy since 2004, meaning that the country uses more energy than is supplied from domestic resources and relies on other countries to meet its energy needs.

Most of the UK's own energy production is oil and gas (71%), followed by primary electricity generation (17%). But this is only sufficient to meet 65% of our energy consumption.

Being so reliant on other countries for our energy leaves the UK exposed to disruptions to supply and volatility in international markets. Last year for instance the overall cost of fuel imports doubled to £117bn.

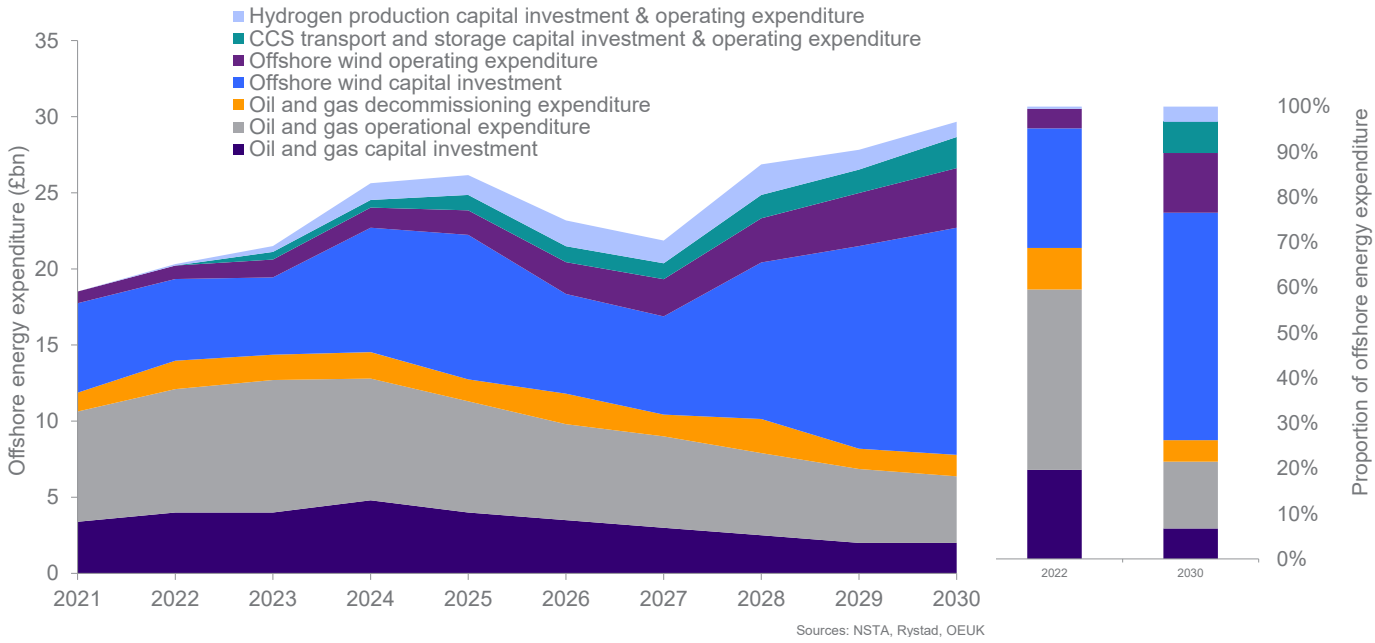
The UK has some of the largest, and most diverse, energy production potential in the world. Meeting our future energy needs in the most secure, affordable and sustainable way possible will require making the most of this diversity. OEUK estimates that about £200bn could still be spent on developing, operating and decommissioning UK offshore oil and gas, wind, carbon transport and storage[22] and hydrogen production infrastructure throughout the remainder of the decade. For context this level of expenditure is about 10 times greater than the cost of the 'Crossrail' Elizabeth Line and eight times more than Hinkley Point C.

Figure 10
UK energy production has fallen over time, with the UK being a net importer since 2004. The majority of energy production, and imports, continues to be oil and gas



[22] The process of carbon capture is not included in this and would represent an additional opportunity.

Figure 11
Around £200bn could be spent in offshore energy projects this decade



The projects comprising this profile would meet the government's Energy Security Strategy[23] ambitions and would help to kick-start the transformation of the energy system. But developing them is becoming more difficult. All parts of the energy system in the UK are struggling to attract the investment needed because it is not as competitive and attractive as it could be. Windfall taxes, uncertain political support, slow regulatory decision making, high inflation and supply chain and workforce capacity pressures are all holding progress back. It is important that government and stakeholders work closely with industry to address these challenges and show that the country wants to work with investors to develop the country's future energy and low carbon infrastructure.

A long-term approach to policy making will promote the necessary investment conditions. Much greater progress will be needed to accelerate towards net zero in the coming decades, while also closing the energy import gap. Companies need long-term certainty, or they will spend their money in other countries where stability is greater.

[23] British energy security strategy - GOV.UK (www.gov.uk)

Oil & gas supplies

The UK produced just under 500mn barrels of oil equivalent (boe) (or 1.36mn boe/d) from its offshore oil and gas resources in 2022, which was the same amount as the year before. This was made up of almost 34bn m³ of gas and 41mn tonnes of oil and associated liquids (288mn barrels) – enough to meet 44% of the UK's gas consumption and 67% of oil and related products.[24]

Gas production increased by 17% last year, which was a 5bn m³ rise – equivalent to the annual heating needs of 4.4mn homes. But this rise only offset the drop in the year before. Overall gas production has seen a fall of around 7% over the last five years and it would have been much steeper without investments in new fields. Twelve new gas and condensate fields have started up over that period, and they account for 30% of the UK's gas output.

That means the UK would have had to scramble to meet a wider import gap as LNG would have been the marginal import source.

However, LNG is likely to be in short supply this year. It also has over twice the carbon intensity of domestic gas by the time it has reached the UK and been regasified.

But for its own gas production, the UK would also have been a much weaker partner for continental Europe: it would have been unable to provide flexibility through its LNG import and pipeline export capacity. This really reinforces the importance of continued investment into new UK production.

Oil production fell by 7% last year, and is now 26% lower than in 2018, representing a decline of almost 300,000 b/d. Drawing a steady flow of investment into new production is as crucial for oil output as it is for gas. New fields that have started producing in the last five years only account for around 8% of total oil output – not enough to offset decline rates in older fields.

The amount of oil and gas produced throughout the middle of this decade will depend on how much is invested in new fields and on the upgrades and extensions of existing assets approved in the next 12 months. As outlined in Figure 13, under no realistic circumstances is domestic oil and gas production expected to exceed demand.

New projects, like Penguins, Seagull and Southwark, will start up this year, but on too small a scale to maintain overall output. After these, there are very few projects that now sit somewhere between the approval and the start-up periods. Without urgent new approvals Tolmount East and Jackdaw will be the only consented new UK projects in development. Even they will not start producing until 2024 and 2025, respectively.

This could lead to overall production falling by as much as 15%/year by the turn of the decade, meaning that output in 10 years will be around 80% less than now. New investment and exploration will be required to meet the North Sea Transition Authority (NSTA)'s long-range production forecast, and even on this trend production will fall by over half in the next decade. That is an average decline rate of 8%/yr – slightly higher for gas (10%/yr) and lower for oil (6%/yr).

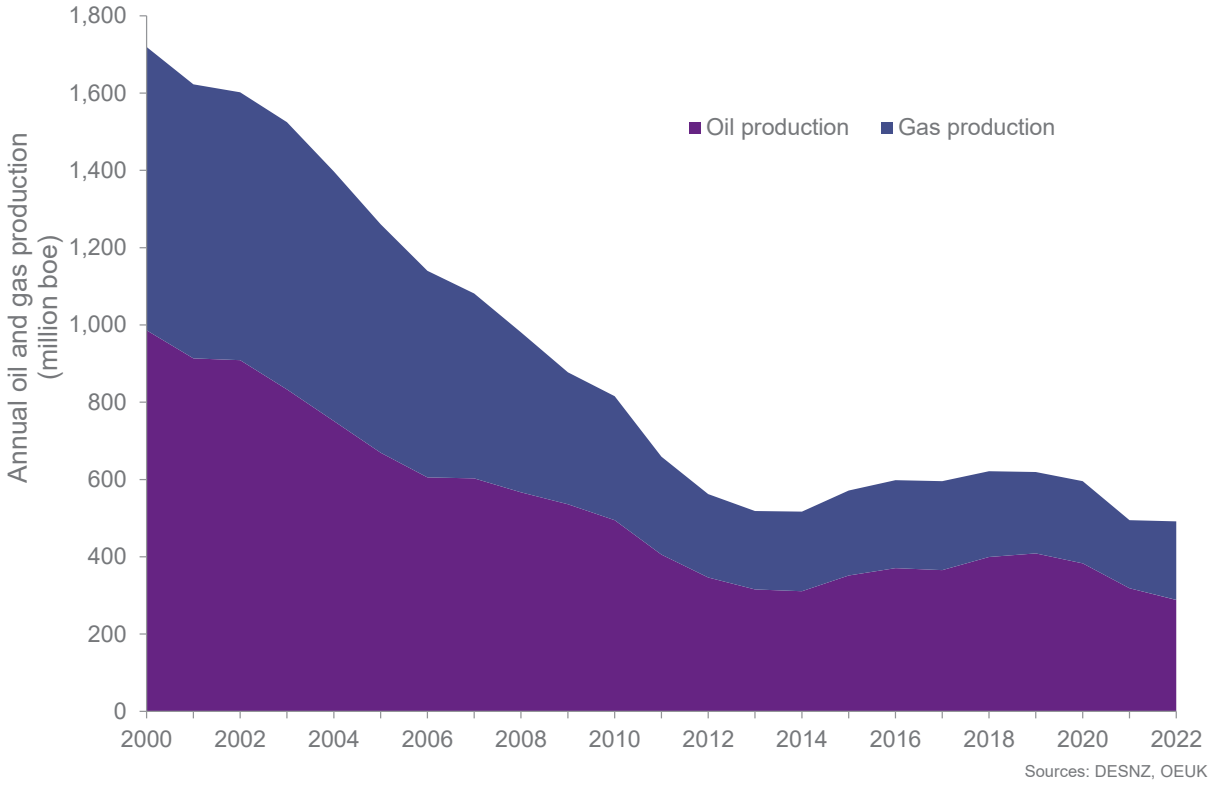
It is important to consider these production trends against the long-range consumption estimates. Under the government's Energy Reference Scenario the oil and gas import gap will continue to grow – reaching 85% in 10 years if there is no new investment. Even with sufficient new investment to meet the NSTA's production forecast, the import gap would grow to over 70%.

In a more ambitious consumption scenario aligned with net zero, the CCC Balanced Pathway, the UK will still import 80% of net demand in 10 years without new investment, and 60% in line with the NSTA production forecast.

In both these scenarios the import gap will be greater for gas than for oil.

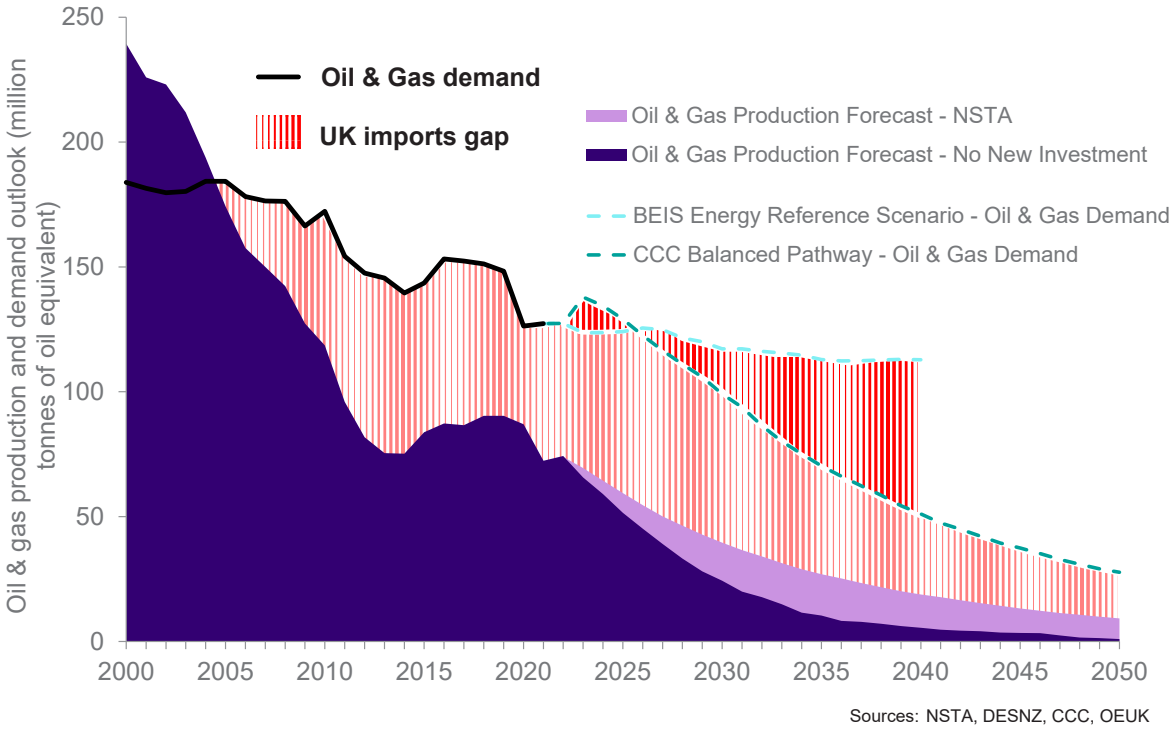
[24] Due to the nature of international markets and associated supply routes, much of the UK's oil production is sold internationally, however it can then go on to be reimported as crude oil and other refined products. The UK continues to be a net importer and produces less than it consumes.

Figure 12
The UK's oil and gas production has fallen over time, but still meets 44% of gas needs and 67% of oil products



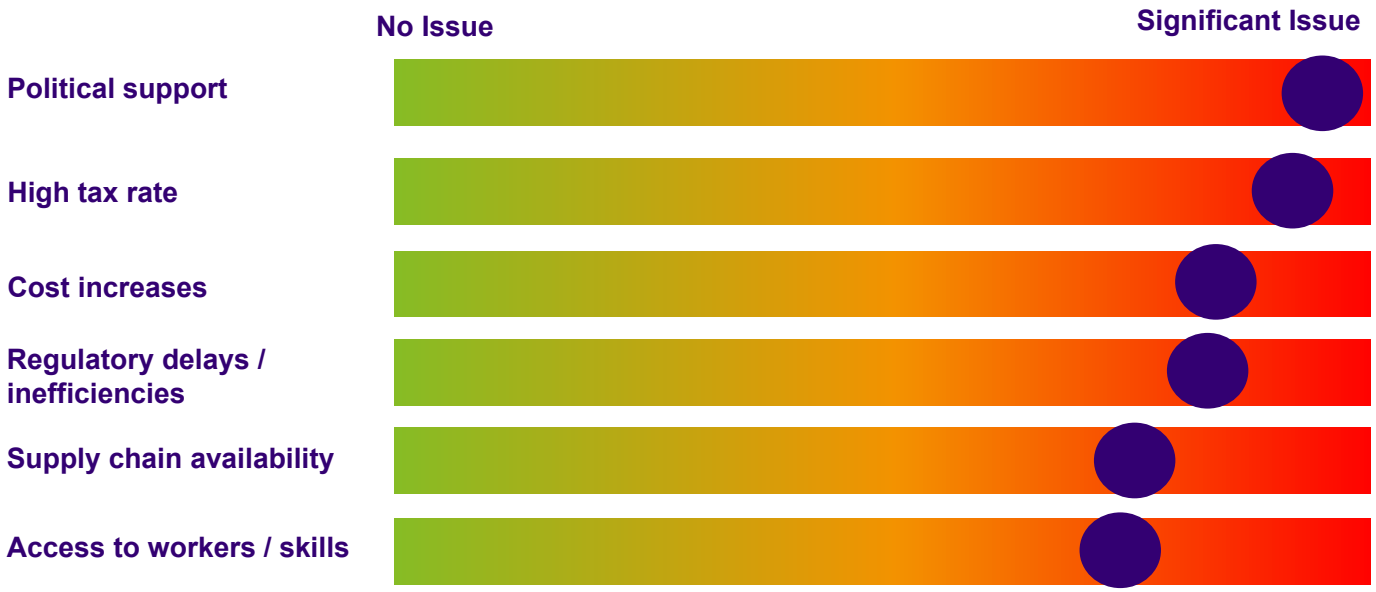
Sources: DESNZ, OEUK

Figure 13
The UK will remain a net importer of oil and gas, but how much of each will depend on investments in new production and action to cut demand



Sources: NSTA, DESNZ, CCC, OEUK

Key investment challenges



Challenges in the business environment have knocked investor sentiment
The UK is struggling to compete against other regions & opportunities

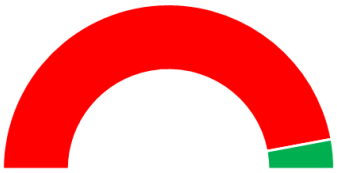
How competitive do you view the UK for investment?

- 1. Not competitive or attractive
- 2
- 3
- 4
- 5. Highly competitive and attractive

Business sentiment compared to start of 2022?

- Significantly worse
- Worse
- About the same
- Higher
- Significantly higher

Over 90% of companies will see a negative impact on production and investment in the next 5 years



- Yes
- No

Financial risk

- Access to commercial lending/ increasing cost of capital continues to constrict projects.
- This is creating challenges for both oil and gas projects as we see an increased focus on ESG and investors' expectations on where capital should be deployed (race to increase green finance).
- First of a kind net-zero technology investments.

Cost/operational risk

- In a high inflationary environment, projects are less cost-effective.
- Tax and finance cost increases limit available capital to invest.
- Lack of certainty is increasing supply chain flight – which risks creating a bottleneck leading to higher costs in a tighter supply market.

Reputational/political risk

- Aggressive regulation – EPL and EGL have damaged the attractiveness of the UK energy industry.
- Risk of political change until the next general election.
- Other governments are actively encouraging investment into energy and emissions reductions projects, such as EU and US.

We need certainty to invest and an attractive regime to do this:

To support the scale of investment needed in the UK to deliver the energy transition whilst maintaining energy security it is important that policy is used as a lever for long-term investment. This will require further regulatory reform and integration across government departments to deliver objectives in offshore wind, CCS and hydrogen, while also supporting oil and gas investment.

This means ensuring the UK regime is competitive on an international scale including compared to policies introduced in Japan, EU, China, and US over the last two years.

UK oil & gas resource and investment outlook

Although the UKCS has been producing oil and gas for over 50 years there are still significant new opportunities remaining, with the NSTA estimating that there could still be 10-15bn boe of potential. But despite the strong oil and gas prices, challenges in the investment climate are holding progress back. Investment rates were already relatively low towards the end of the last decade, with many of the remaining projects facing substantial technical and economic complexities. This has been compounded by the pandemic and most recently the EPL and political instability. All these factors combine to put real pressure on oil and gas company business plans.

OEUK has visibility of almost 6bn boe in company business plans, similar overall to the beginning of last year, when volumes since produced are considered (*see Figure 14*). However, there has been some significant movement in the specifics of this, meaning that the overall outlook is poorer than it otherwise could have been.

Although some new projects have been able to progress, including some from the 32nd Licence Round, there have been some significant downgrades of other projects. Even those that have moved forward still face real hurdles when it comes to sanctioning.

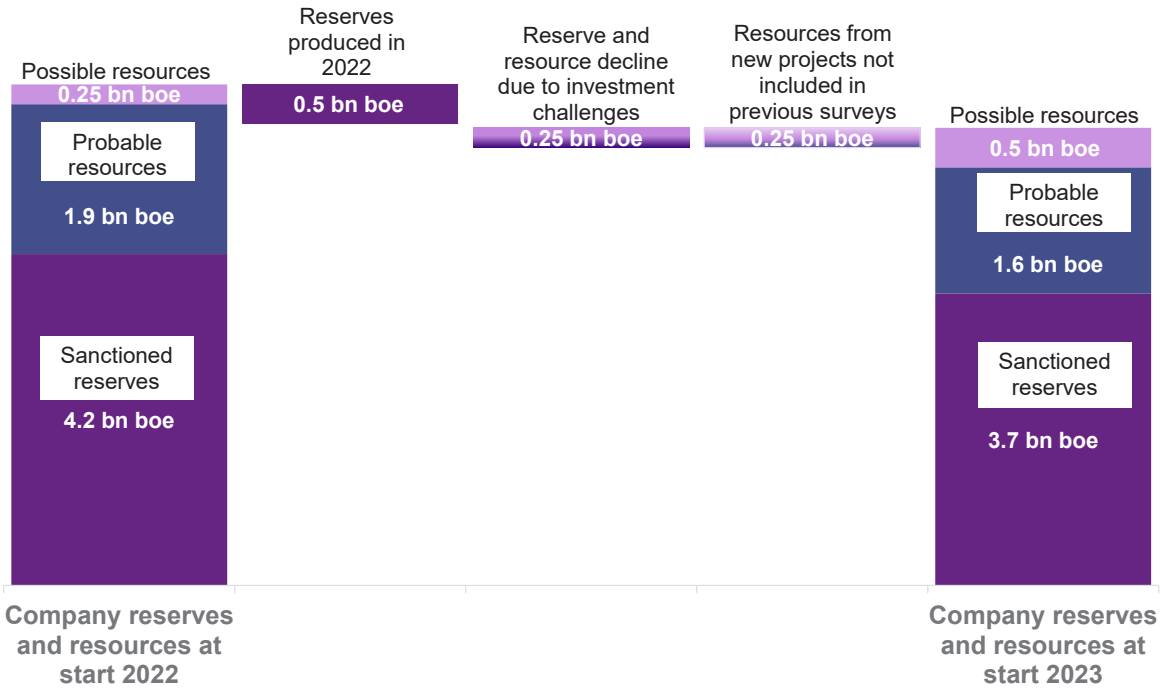
Overall OEUK estimates that around 250mn boe have been removed from company plans, whereas another 250mn boe have been downgraded from 'probable' projects (meaning a greater than 50% chance of progression) to 'possible' (a less than 50% chance). This means that 500mn boe of potential have slipped, equivalent to one year of UKCS output, owing to levels of investment risk.

This will impact on the UK's future energy security and economic prosperity.

Developing these reserves and resources could cost almost £35bn, with almost 90% of this spent this decade.

This is more than in last year's *Business Outlook*, but the higher expenditure is not associated with increased output. Around

Figure 14
The UK's oil and gas reserves and resources have been downgraded



Sources: NSTA, OEUK

£1bn is included that relates to some potential platform electrification projects. These will be crucial enablers in achieving the emissions reduction commitments made as part of the North Sea Transition Deal. That said, electrification remains challenging. The regulatory framework and difficulties in securing grid access are among the key issues.

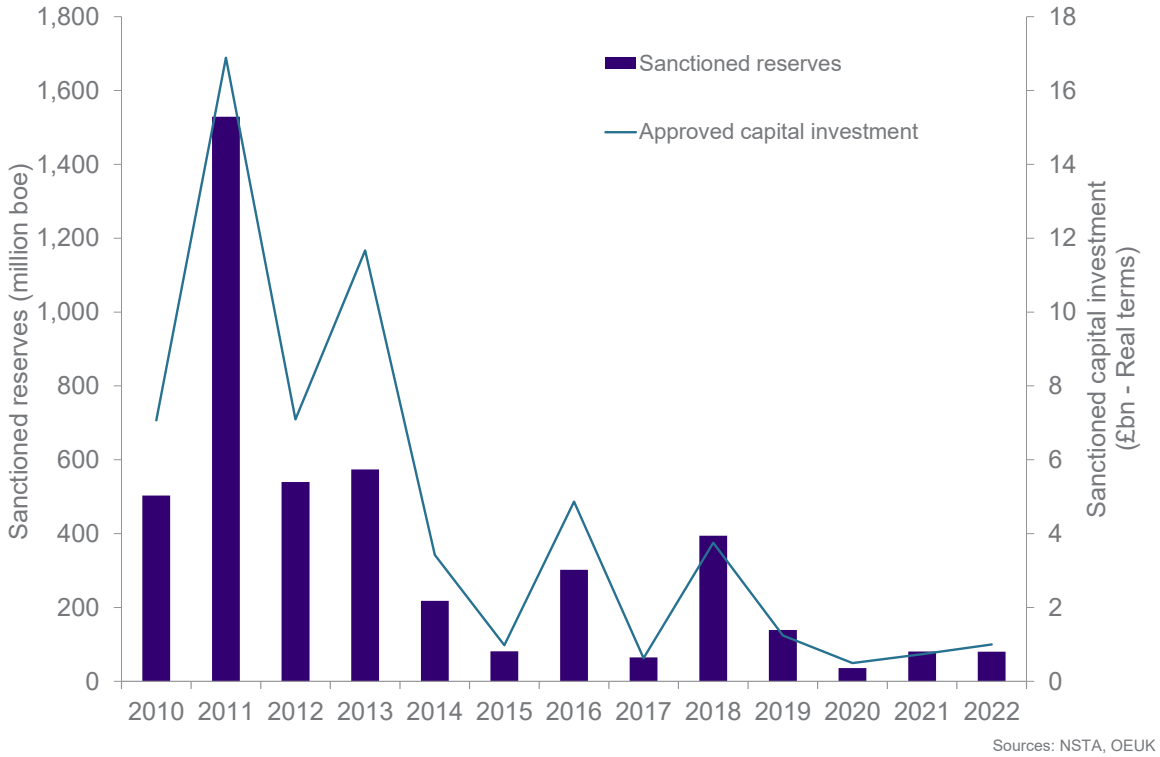
Most of the increased capital though is related to cost inflation. The average development costs of unsanctioned resources have grown by around 20% since the start of 2022, from just over £9/boe to around £11/boe. The cost of materials like steel, limited supply chain resource availability, the higher cost of capital and foreign exchange effects are all harming the UKCS as a place to do business.

Similar pressures are also being seen on operating costs which are expected to increase to almost £19/boe this year. This marks a 15% increase on 2022 (£16.50/boe) and a greater than 50% increase since 2019 (£12.20/boe). Big rises in the cost of gas for offshore power generation (especially in assets which are fuel-gas deficient), higher carbon costs, and logistics costs (owing to marine diesel prices) all have a big impact on this, especially in later life assets which tend to be less efficient and now have significantly lower production levels than the infrastructure was built for. Because of their age, it is not economic to tackle many of these costs (such as emissions reductions), but it is possible that as economy wide inflation eases, so will some of the cost challenges.

Only three new fields gained development approval last year (Jackdaw, Abigail and Tommeliten A which is mainly in Norwegian waters, but extends slightly across the UK boundary; and the eastern extension to the existing Tolmount field). These projects contain just over 80mn boe of reserves (equivalent to around 2 months of output at current rates) for around £1bn in capital investment.

This is similar to the last three years, but is significantly lower than the average rate

Figure 15
Investment in the development of new fields has been low and is falling



Sources: NSTA, OEUK

across the previous decade of almost 450 mn boe/year. The lack of new approvals means that brownfield projects will make up the majority of UK capital investment in the short term. This has the potential to then reverse depending on the rate of new approvals.

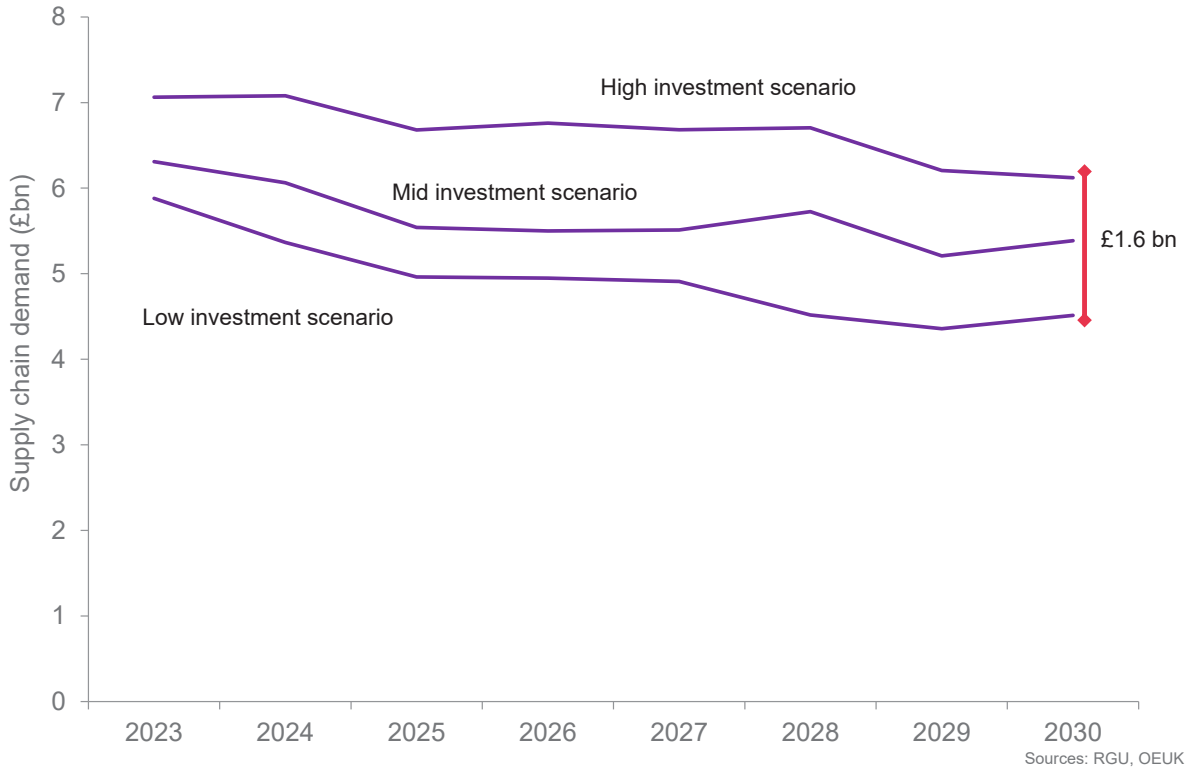
There are 10 projects undergoing final regulatory scrutiny by two regulators, OPRED and NSTA. In total these projects could contain 650mn boe of new reserves and consume up to £8bn of development capital, and there are others moving towards these stages. On average these fields were discovered 33 years ago, which goes to show just how complex and challenging they were even before issues such as windfall taxes emerged. It is unlikely that all will have a positive final investment decision (FID) and OEUK is concerned that the UK is not keeping pace with the development activity in other countries.

For example, Norway saw a record number of FIDs last year, stimulated by fiscal regime incentives. These will unlock 2.5bn boe and over $40bn of investment. Insight from WoodMackenzie shows that there are 50 new projects in development in Norway – for context, this is the same number of new fields approved in the UK over the last 10 years. Activity is also ramping up quickly in regions such as the Middle East. Saudi Arabia alone approved almost $50bn-worth of new capital expenditure last year.

The lack of new approvals continues to hit drilling activity, which is now only around one-quarter of the rate of well decommissioning. Only 55 new wells (46 development, 5 exploration and 4 appraisal) started drilling in 2022 – the lowest rate since 1970 and 60% lower than in 2019.

But there have been some exciting exploration finds, such as Pensacola in the southern North Sea, and some other promising plays will be explored this year. There is optimism around the level of interest in the 33rd Licence Round, and it is important that new rounds continue to be offered. Although older discoveries are progressing, there have been recent discoveries that have gone to first oil or gas in under two years.

Figure 16
The rate of oil and gas activity is crucial to the outlook for the supply chain



Over the last decade the average interval has been five years.

But a significant short-term uptick in activity is unlikely to materialise from the licence round, as the EPL challenges the economics of short-cycle projects, and many potential opportunities will require farm-in investment. WoodMackenzie data shows that half the largest pre-development opportunities on the UKCS have single company ownership. In many cases the current owners won't have the financial capability to progress them on their own. Potential new investors are being put off by the high tax rates imposed on UK producers and negative political statements, and existing UKCS companies have less confidence to buy into new projects. Development drilling rates will be determined by the rate of new field approvals and their scale, along with the confidence companies have in approving infill drilling.

Some companies are struggling to finance their projects, as borrowing capacity has been roughly halved following the introduction of the EPL. More widely we see less availability of reserve-based lending (RBL) facilities. This is a real issue as OEUK estimates that in the region of 450mn boe of unsanctioned potential this decade will require RBL finance facilities. Similarly, with higher risk and other challenges, significant increases in cost of capital are being seen. In many cases regulatory timelines are also stretching. While robust and transparent scrutiny is important, it also needs to be proportionate and appropriate.

Securing the new project investment needed to maintain oil and gas production in line with the NSTA production forecast could generate an additional £9bn for the UK supply chain by 2030 relative to a no-new-investment scenario, and some £17bn of a difference in a full investment case.[25]

Supporting a higher level of activity would help build a compelling investment proposition for supply chain companies to maintain and grow their UK presence, with capacity built with the future needs of offshore wind, carbon transport and storage and hydrogen production in mind.

[25] Including capital, operating and decommissioning expenditure and assuming increases in local content in line with the North Sea Transition Deal.

5 Advancing the energy transition

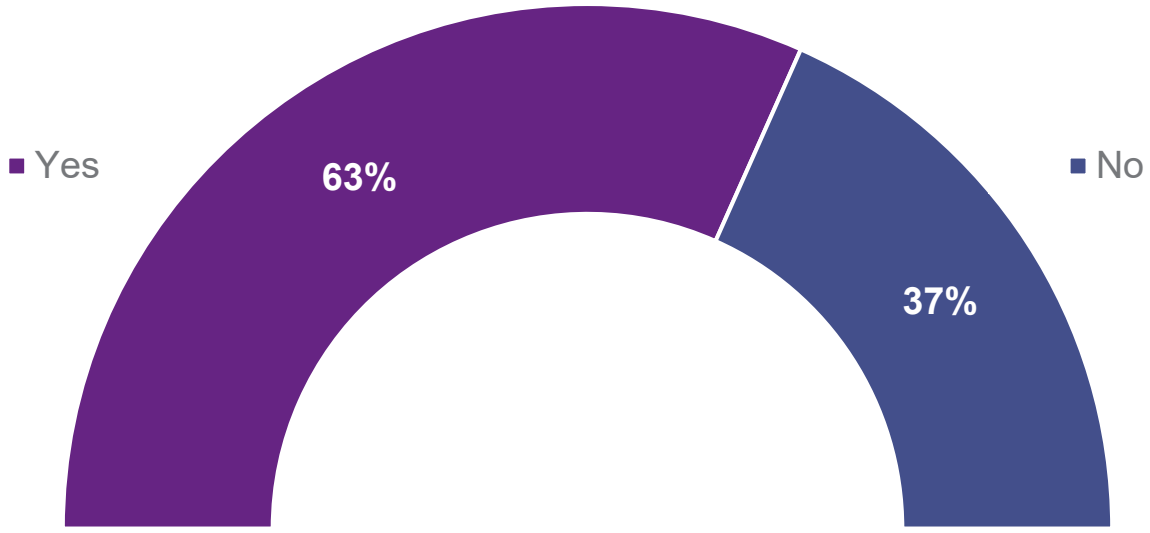
Harnessing the UK's energy supply chain

Building greater project visibility

As outlined in Section 4, OEUK has sight of potential project expenditure totalling £200bn in oil and gas, offshore wind, carbon transport and storage and hydrogen production through to 2030. This adds up to a huge opportunity for the energy supply chain. By rights, the UK should be at the front of the queue for companies who want to invest in new capabilities and capacity. However, today's environment means that the delivery of the full pipeline of projects is questionable. Hence, supply chain companies are often reluctant to take positions for the future.

Helping to create greater certainty of project spend is important. A recent survey of OEUK supply chain members showed that two companies in every three are finding it difficult to attract and retain investment in UK resources.

Figure 17
Supply chain sentiment - Is a lack of certainty on future UK energy projects impacting on your ability to attract and retain investment and resources in the UK?



OEUK is working with Robert Gordon University (RGU) to develop a 'Supply Chain Roadmap' which provides a framework for the transformation of the oil and gas supply chain to an all-energy one. It will help give supply chain companies the confidence to invest in the UK capabilities and resources needed to build future UK energy projects, and then go on to realise an increased share of the global market. This would help make the country a world leader in low-carbon energy capabilities. This also provides powerful insight to policy-makers into what happens when they fail to create attractive investment conditions.

Figure 18
Supply Chain Roadmap framework

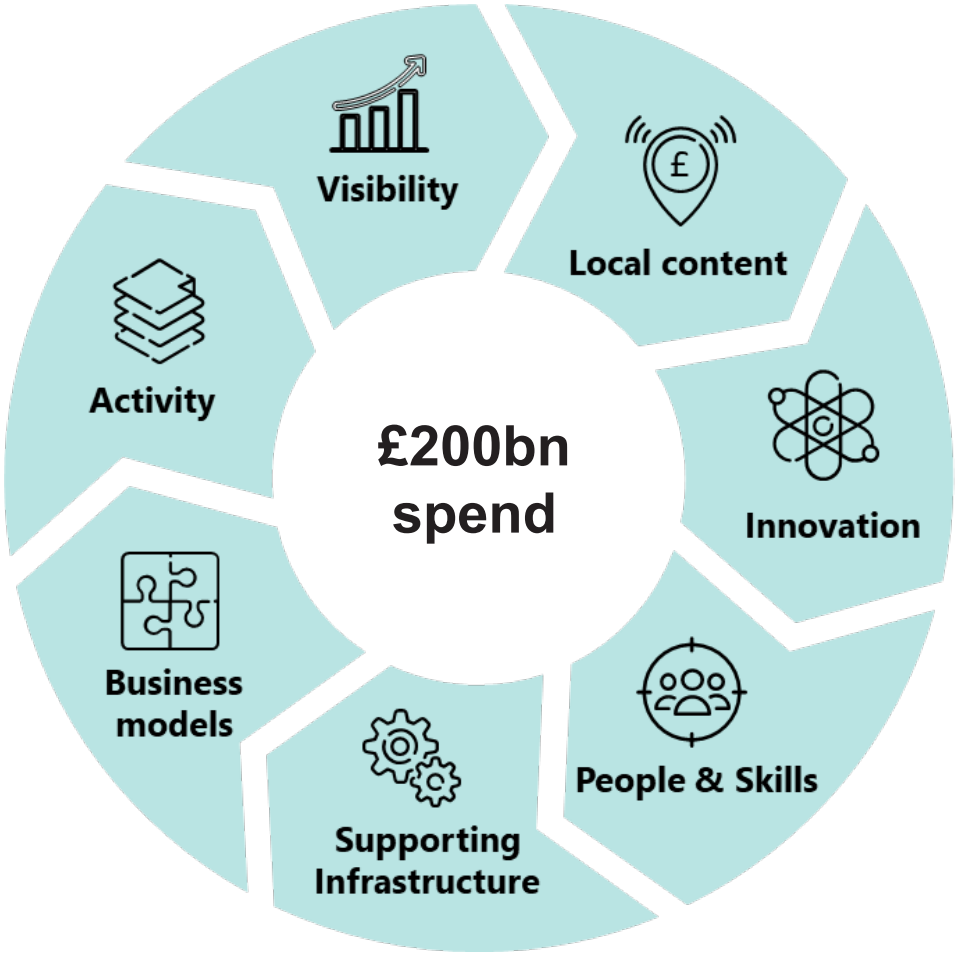


Figure 19
Potential UK offshore energy development scenarios

UK offshore energy 2022			Target by 2030		
Energy sector			Scenario 1	Scenario 2	Scenario 3
Offshore wind - fixed	12	GW	45	39	30	GW
Offshore wind - floating	< 1	GW	5	1	< 1	GW
Carbon processing, transport and storage	< 1	$MtCO_2$	30	20	15	$MtCO_2$
Hydrogen	< 1	GW	10	5	2.5	GW
Oil and gas	1.3	mboe/d	0.9	0.7	0.5	mboe/d

The first stage of the roadmap is to shine a spotlight on near-term UK energy project spend, to help companies plan effectively, and to quantify the additional value that could be gained by encouraging energy project investment and boosting the ability of the UK supply chain to win as much of this business as possible.

To do this, OEUK and RGU have modelled the potential project pipeline of oil and gas, offshore wind and carbon transport and storage projects in the remainder of the decade.[26] A range of scenarios has been developed based on the pace of realised investment and gains in local content. Scenario 1 is aligned with the ambitions of the UK Energy Security Strategy. It represents a full investment case. Scenarios 2 and 3 outline a slower pace of new project development and associated spend. The outcome of these scenarios is lower than the targets in the government's Energy Security Strategy.

The different scenarios, coupled with different local content outcomes, give an indication of the level of potential demand on the UK supply chain in the coming years. In a high investment scenario the demand could increase by 50% by 2030 (*see Figure 20, below*).[27] The balance between capital and operational expenditure is likely to shift throughout the decade, with the proportion of capital increasing from around 40% now to 50% in the coming years, mostly driven by growth in offshore wind. However a lower development scenario would result in a relatively flat supply chain demand outlook, which will dampen UK jobs creation, yield a lower gross value-added (GVA) contribution and reduce its ability to develop world leading capabilities further.

This insight shows that driving a more competitive business environment, for investments into both new energy projects and supply chain capabilities, could increase the cumulative opportunity for UK supply chain companies by over £30bn over the next seven years, compared to a lower case.

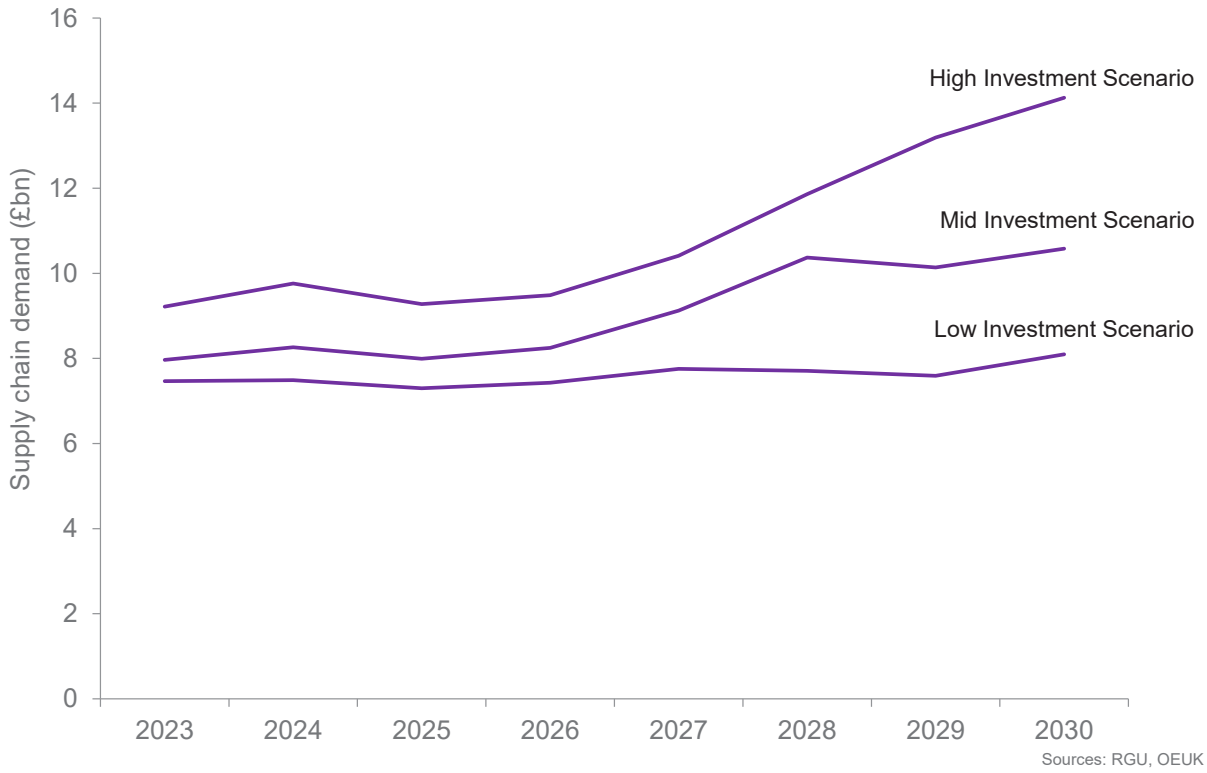
Companies across the energy supply chain will be making strategic investment decisions in the next year or two which will affect what will be available to support anticipated demand levels in the second half of the decade. To maximise UK jobs and GVA contribution, it is vital that supply chain companies have the confidence to base their business in the UK.

However, some companies are already actively prioritising international business, with crucial resources like drilling rigs and

[26] The analysis does not currently cover hydrogen projects due to data limitations, however this is being added to phase 2 of the project.

[27] Assuming that the local content targets in the North Sea Transition Deal and Offshore Wind Sector Deal are achieved.

Figure 20
Offshore energy supply chain demand profiles, by scenario



Sources: RGU, OEUK

vessels being moved to other regions where activity is increasing. Some countries and regions, such as the US and EU, are actively putting incentives in place to encourage supply chain companies to invest and base their businesses. If the UK is not competitive there will be a negative impact on meeting future energy and emissions targets, and the country will suffer as it has to import the goods and services needed for new projects, with the loss of econmic value and jobs potential.

This threatens the ability of the UK to further develop local content, which would mean the UK needs to import supply chain resources and the ability to support tens of thousands of new jobs (directly, indirectly and induced in wider communities) would be lost – all undermining the UK and Scottish governments' commitments to a just transition. There is a clear prize to be gained. This analysis outlines that reaching the local content targets in the North Sea Transition Deal and the Offshore Wind Sector Deal by 2030 could create an aditional £10bn of cumulative value this decade.

To secure this, it is important that the below recommendations are realised:

- Ensure new energy activity more than backfills oil and gas activity
- Line of sight on opportunities and de-risking of investments (pace, certainty and regulation)
- Help address the competitiveness of the UKCS and level the playing field against other countries
- Address strategic, high capability and capacity gaps
- Support early, anticipatory, investment in the supply chain
- Maximise local value, not just local content

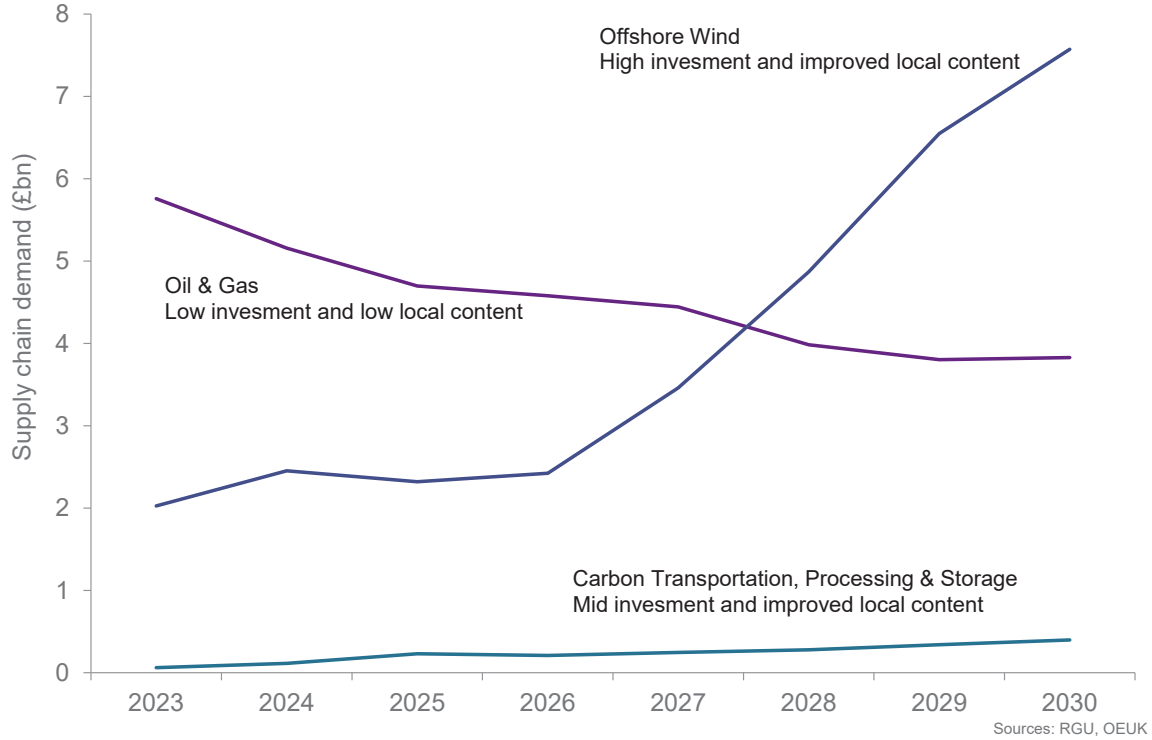
Identifying priority areas

The country's offshore oil and gas experience provides it with a huge advantage when it comes to the expansion of the low carbon energy and emissions reduction solutions. Many of the same companies that provide secure oil and gas supplies are also delivering the future offshore wind, CCS and low-carbon hydrogen projects. However the current investment challenges are undermining the future of the UK's energy supply chain, and put a managed transition at threat.

Even in a high scenario for the development of offshore wind and carbon transport and storage, oil and gas spend will be the greatest area of supply chain demand until at least 2027, as these projects take time to ramp up. Delays to investment timelines would further delay the point at which the balance tips towards new energy projects, and it is possible that demand from these new areas will not exceed oil and gas this decade. To successfully build a competitive UK all energy supply chain we must build on existing capability, and ensure that new energy activity more than backfills oil and gas activity. Failure to do this risks supply chain flight, and a capability gap that may never be filled.

It is important to consider that some areas of the supply chain will be more impacted by these trends than others, and some of these form critical links in the energy transition chain. For example, a low oil and gas investment case could see drilling demand fall by a further 30% by the middle of the decade, which would see a loss of rigs from the basin. This creates a strategic gap in the UK's ability not only to drill new, and decommission old, oil and gas wells, but also drill future carbon storage wells.

Figure 21
Potential UK supply chain demand from oil and gas, offshore wind and carbon transport and storage projects

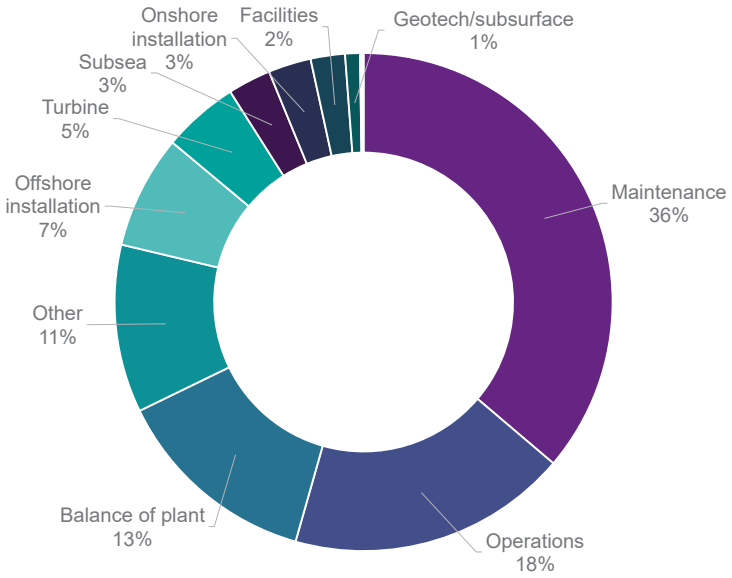


Sources: RGU, OEUK

Overall this analysis shows that over three-quarters of the UK's existing oil and gas supply chain has direct cross-over with the needs of offshore wind and around 90% with carbon transport and storage projects. There is also the potential for around 70% of offshore project demand to be reliant on just 12 supply chain subsectors. This analysis helps to identify areas of the supply chain which need to be maintained, repurposed and grown to capture as much value as possible in the UK, however it is important to note that other areas of the supply chain will also play crucial roles in building and servicing future projects.

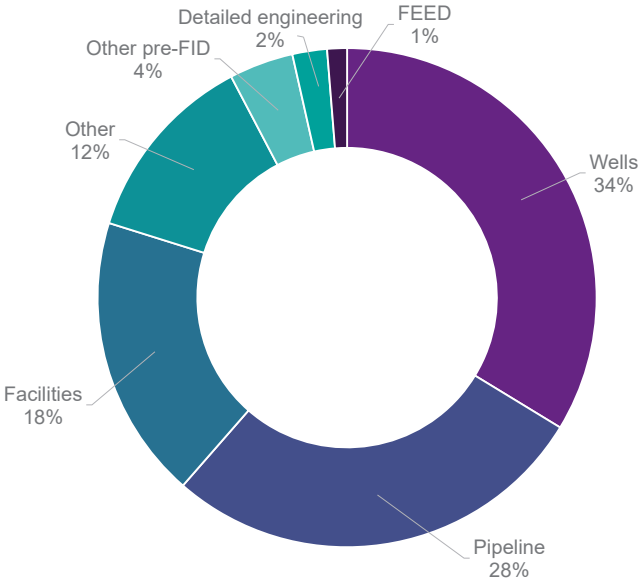
Figure 22
2030 energy project supply chain sector demand (assuming sector deal local content)

Offshore wind



Sources: RGU, OEUK

Carbon Transport & Storage



Sources: RGU, OEUK

Expanding the UK's offshore wind capacity

As well as helping to provide clean power to the grid, the off-grid expansion of offshore wind can help the future development of other UK energy resources. This includes the electrification of oil and gas infrastructure, which will be key to achieving the oil and gas sector's North Sea Transition Deal emissions reduction commitments (to lower production emissions by 50% by 2030, 90% by 2040 and to be net zero by 2050). It will also have a crucial role to play in supporting the production of green hydrogen.

The Innovation and Targeted Oil and Gas (INTOG) licensing round was announced to directly support the progression of oil and gas platform electrification and support project developers to test offshore wind innovations and develop new technologies at smaller initial scales. The awards of the INTOG round were announced as this report was going to press.

INTOG can also act as an important opportunity from the supply-chain perspective. There will be a lot more offshore wind capacity towards the end of the decade and into the next, driven by licences awarded through ScotWind, Crown Estate Leasing Round 4 and in the Celtic Sea. But the projects associated with INTOG are likely to be nearer term which will help to build supply chain capacity and accelerate the development of new technologies.

The UK already has the world's second largest installed capacity, at almost 14 GW, running up some £55bn in the cost of developing 40 operational offshore wind projects. They have around 2,700 turbines. RenewableUK says a further 86 GW of projects are in the pipeline[28] spanning 90 projects. This is the world's second largest project pipeline (behind China) and represents a huge opportunity for the UK's energy system and supply chain. It is crucial that as many of these project opportunities as possible are progressed through to operations: the CCC says over 100 GW of capacity will be required by 2050.[29]

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[28] UK offshore wind pipeline reaches nearly 100 gigawatts - while global pipeline hits over 1,100GW - RenewableUK
[29] Sixth Carbon Budget - Climate Change Committee (theccc.org.uk)

Figure 23
The UK could see significant growth in offshore wind capacity this decade, but many of the potential projects are at an early development stage

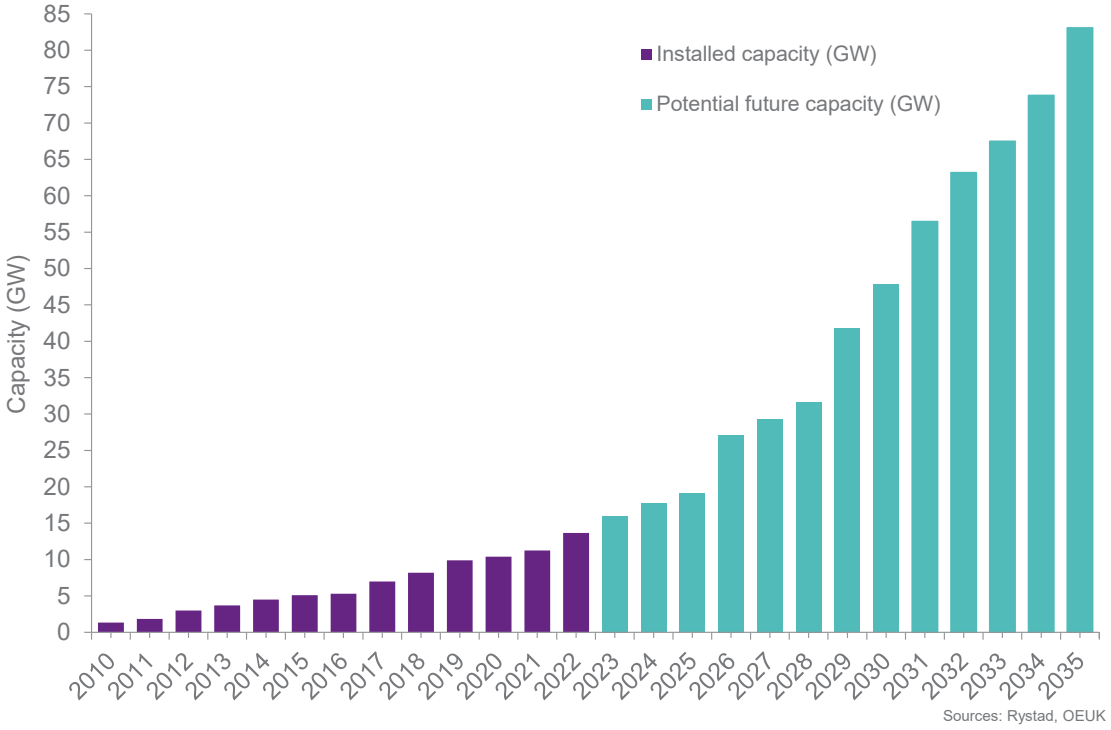


Figure 24
Projected offshore wind capacity additions by project status & capital investment

UK offshore wind status

3 new projects started up in 2022, with **3.2GW** of capacity

£6bn of capital investment in 2022 – twice what it was 3 years ago

41 offshore substations

4 GW of new capacity consented last year

8 export cables laid, totalling **3,000 km**

Over **3,500 km** of array cable

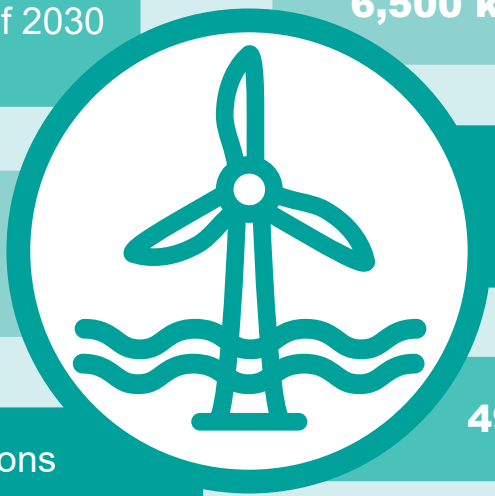
Almost **2,700** turbines installed

Achieving 50 GW by 2030

2,800 more turbines - meaning a turbine manufactured and installed every day through to the end of 2030

86 export cables totalling **6,500 km**

A further **40** new wind farms could be developed



7,300 km array cabling laid

49 offshore substations

Fixed or floating foundations for each new turbine

The government has set an interim target of building capacity to 50 GW by 2030 and in theory there is sufficient scale in the projects to achieve this timeline. Progress is being made, but it will need to step up pace.

Achieving this target could see further project activity totalling up to £75bn of capital investment this decade. But there is a series of complex challenges that could hold this back. Like the EPL, the Electricity Generator Levy that was introduced in November 2022 has significantly damaged investor confidence in the UK market.

Most of the projects this decade are not yet consented, especially towards the end of the period. Overall, it is taking about a decade to consent and build some projects, which is far too long.[30]

Grid access delays threaten project investment and could put the UK's climate ambitions in doubt. Significant investment is required to develop the necessary scale of grid connections, particularly in Scotland, to allow these projects to supply power to onshore consumers. National Grid plans to invest £54bn upgrading the infrastructure required to carry this power to areas of greater demand south of the border but some power generators will have to wait until the mid-2030s to connect their projects.

Supply chain constraints also threaten the rate of progress, with the capacity not in place to meet anticipated demand, especially towards the end of the decade. Maintaining and repurposing much of the UK's existing oil and gas supply chain will be crucial to meeting the needs of the wind projects. But near-term oil and gas project activity is too low to ensure these capabilities remain long enough to be used for wind projects later in the decade.

Companies with a traditional oil and gas heritage have already played an important role in the development of the UK's offshore wind capacity, bringing scale and important technological innovations. For example, Equinor operates Hywind Scotland (which was the world's first floating wind farm) and the Dudgeon and Sheringham Shoal wind farms off the east coast of England. It is also a lead developer in the Dogger Bank project – which will be the world's largest when complete. In addition, TotalEnergies is the majority owner of the Seagreen project, which has the world's deepest fixed turbine foundations and is Scotland's largest offshore wind farm. These projects are also being supported by supply chain companies who are branching out from oil and gas.

They include, but are not limited to:

- Subsea7 completed the engineering, procurement, construction, and installation (EPCI) of the foundations and inter array cables for Seagreen[31]
- Petrofac designed, supplied, and installed the onshore and offshore substations for the Seagreen project[32]
- Companies such as Aker[33] and Technip FMC[34] have entered separate strategic partnerships for the development of floating installations
- Worley is responsible for inspection and maintenance work on over 70% of the UK's offshore wind turbines[35]
- Wood is conducting the pre-front-end engineering design work for the Western Star floating project in Ireland[36]

The ongoing diversification of oil and gas companies is accelerating and will be crucial in building future capacity. Companies expanding from oil and gas have plans to support the development of over 8 GW of UK capacity, and up to £20bn in capital

[30] UK risks wasting huge wind power opportunity, energy boss warns | Financial Times (ft.com)
[31] Subsea 7 awarded renewables contract offshore Scotland
[32] Petrofac appointed for Seagreen wind farm substations | NEWS | MEDIA | PETROFAC | Petrofac
[33] About us – Aker Offshore Wind
[34] Offshore floating renewables - TechnipFMC plc
[35] Inspecting and maintaining the Siemens London Array offshore wind farm – Worley
[36] Wood awarded early design for floating offshore wind project in Ireland | Wood (woodplc.com)

investment, by 2030. In total OEUK members, including companies solely focused on wind projects, have plans which support 13 GW and £30bn respectively. Together, these could cumulatively power over 14mn homes in 2030. These figures will continue to grow into the 2030's as projects awarded in recent ScotWind and English Round 4 licence schemes, and the upcoming Celtic Sea round, move forward.

UK licensing round activity

ScotWind

OEUK member led projects have committed £38bn for UK supply chain organisations, which is almost 50% of the anticipated ScotWind supply chain opportunity. OEUK member led projects are targeting at least 55% UK local content, on average.

Crown Estate, Round 4

Six new projects announced in the Crown Estate's Offshore Wind Leasing Round 4 could start up by the end of the decade. Cumulatively the Crown Estate has now awarded over 40 GW of seabed rights to offshore wind project developers which have the potential to make a major contribution to delivering affordable and sustainable electricity for the UK.

Celtic Sea

The Celtic Sea programme is intended to award 4 GW of floating capacity by 2035. With the right investment and business policy conditions, this area has the potential to accommodate a further 20 GW by 2045. Project developers will also be required to submit strategic plans for how they will develop and collaboratively engage with supply chain organisations.

Developing a low carbon hydrogen and carbon transport & storage industry

The development of large-scale, low-carbon hydrogen and CCS capacity will be critical in achieving the UK's net zero ambitions. By 2030 the UK is aiming to have the infrastructure in place to store 20-30mn tonnes/yr of carbon and to have at least 10 GW of low-carbon hydrogen production capacity (with at least half of this being 'green'), and at least 2 GW by 2025. Although these targets represent good initial first steps, the UK will need to go much further in the future if it is to achieve the required levels of emission reduction.

The CCC estimates that the UK will need to capture and store up to 175mn tonnes/yr of CO_2 by 2050 and DESNZ[37] outlines the need to have the capacity to produce up to 460 TWh/yr of hydrogen (potentially meeting up to 35% of UK energy).[38] This rate of increase will be a huge challenge. OEUK is actively working with its members and policy makers to ensure the business conditions are in place to progress projects at pace.

CCS

As well as being key for industrial emissions reduction, CCS is needed for 'blue' hydrogen which is widely seen as a stepping-stone towards the large-scale use of 'green' hydrogen (from electrolysis).

[37] Net zero and the different official measures of the UK's greenhouse gas emissions - Office for National Statistics
[38] UK hydrogen strategy (accessible HTML version) - GOV.UK (www.gov.uk)

The UK government has committed to supporting four transport and storage cluster projects to become operational by 2030. So far, two offshore transport and storage projects – HyNet in the northwest of England and Net Zero Teesside in the northeast of England – have been awarded 'track 1' status by the government, meaning that they are being fast tracked and supported through to initial operations by the middle of the decade. These two projects are moving towards investment commitments. However, it is possible that regulatory and government timelines relating to the announcement of 'phase 2' projects could delay these commitments into 2024. This could have a knock-on impact on the chances of CCS in late 2025 or early 2026. Phase 2 projects will be the power plus CCS, industrial CCS and blue hydrogen projects that receive initial support for the capture of carbon. Urgent progression of this is needed to give certainty to carbon transport and storage projects on the timelines for the flow of captured carbon into their systems.

The UK has committed to a second carbon transport and storage project track which will support another two projects. Although the timeline for this support has not yet been confirmed, there are several other projects, such as V Net Zero in the southern North Sea and Acorn in northeast Scotland which are progressing towards this. Other projects will also emerge in the coming months as the outcome of the NSTA's first carbon storage license round is expected to be announced. Overall, there have been 26 licence applications from 19 companies, spanning the 13 areas on offer.

It is important that the awards of new licences, and subsequent government support, move forward as quickly as possible to ensure that the project investment that will be required for the UK's targets is secured. A roadmap towards the continued scale up of CCS post-2030 is also urgently required to give those who do not secure track 2 status the confidence to continue to progress them. For context, up to 100 storage sites are expected to be required by 2050, whereas the current government schemes only support four. The government has given some welcome reassurance on this by announcing ongoing support to the tune of £20bn over the next two decades.

The cluster projects represent important new opportunities for the UK's energy supply chain, especially considering that existing oil and gas capabilities translate well across to the requirements for carbon transport and storage.

OEUK policy recommendations to speed up the deployment of CCS:

- Legislate a regulatory framework and support to attract private investment through the energy bill as soon as possible.
- Announce the awards of the NSTA licence round as soon as possible
- Announce the outcome of the Phase 2 process as quickly as possible
- Commit to a timeline for the support of Track 2 projects
- Commit to a roadmap for the scale up of storage post-2030

Hydrogen and industrial carbon capture

Hydrogen will be critical in reducing emissions from heavy industry, as well as in power, transport, and potentially heat. There are over 70 projects planned across the UK of which many OEUK members are playing a critical role in.

These projects are a range of sizes and using a range of technologies including electrolytic and methane reformation amongst others with hydrogen hubs emerging in almost every area of the UK. Coupled with industrial carbon capture (ICC), this will support the deep decarbonisation of industries that often have no viable alternatives, such as chemicals, refining, cement, and residual waste management processes.

The UK government has ambitions to deliver up to 10 GW of low-carbon hydrogen capacity (subject to affordability and value for money) and to capture and store 20-30mn tonnes/yr of CO_2, which includes 6mn tonnes/yr of industrial emissions by 2030. OEUK members are at the heart of delivering these targets which are also expected to support over 12,000 jobs in the hydrogen value chain alone.

To support the scaling of hydrogen and industrial carbon capture and reduce market risk, DESNZ has developed a hydrogen business model to help reduce the cost difference between hydrogen production and counterfactual carbon fuels. Similarly, the introduction of the ICC model will help to incentivise the deployment of carbon capture technology for industries which are hard to decarbonise.

Ensuring that we see this policy delivered at pace will be critical to give investors and developers certainty to progress opportunities while ensuring we can utilise existing supply chains.

OEUK policy recommendations to speed up the deployment of low carbon hydrogen production capacity:

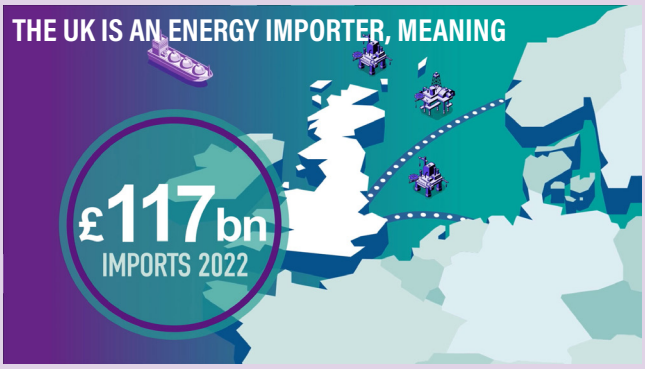
- Finalise energy bill to legislate for, and finance, hydrogen opportunities.
- Ensure legal changes are made to allow gas network companies to blend hydrogen into the gas grid.
- Support the use of existing energy supply chains.
- Ensure that low carbon hydrogen is supported through UK taxonomy to encourage the crowding in of private investment.

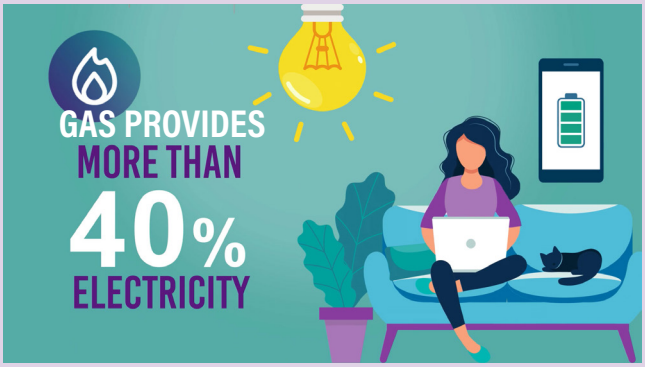
Some common energy conversion factors

Base unit	to	Bn m³	Bn ft³	PJ	Mn Toe	Mn T LNG	Trillion Btu	Mn Boe	GWh
Bn m³*	>	1	35.315	36	0.86	0.735	34.121	5.883	10,001.8
Bn ft³*	>	0.028	1	1.019	0.024	0.021	0.966	0.167	279.12
PJ	>	0.028	0.981	1	0.024	0.021	0.952	0.164	279.12
Mn Toe	>	1.163	41.071	41.868	1	0.855	39.683	6.842	11,630
Mn T LNG	>	1.36	48.028	48.747	1.169	1	46.405	8.001	13,595.47
Trillion Btu	>	0.029	1.035	1.05	0.025	0.022	1	0.172	290.75
Mn Boe.	>	0.17	6.003	6.093	0.146	0.125	5.8	1	1,697.98
GWh	>	0.0001000	0.0035827	0.0035827	0.0000860	0.0000736	0.0034394	0.0005889	1

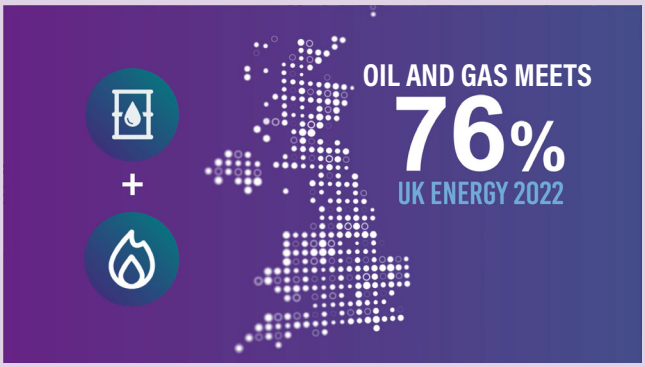
* At standard pipeline pressure & temperature


THE UK HAS
BENEFITTED FROM
5
DECADES OF
NORTH SEA ENERGY


THE UK IS AN ENERGY IMPORTER, MEANING
£117bn
IMPORTS 2022


GAS PROVIDES
MORE THAN
40%
ELECTRICITY


OIL AND GAS PRODUCTION SUPPORTS
OVER 200,000 JOBS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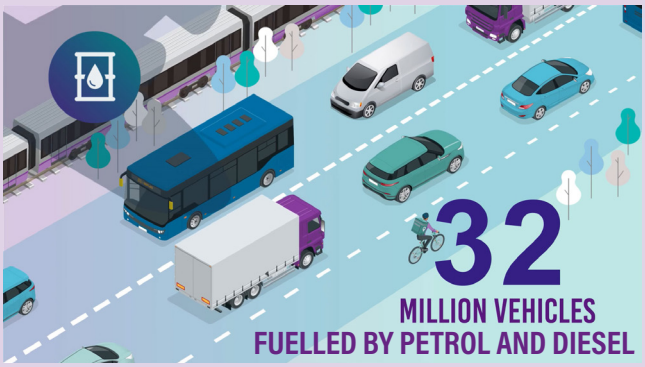
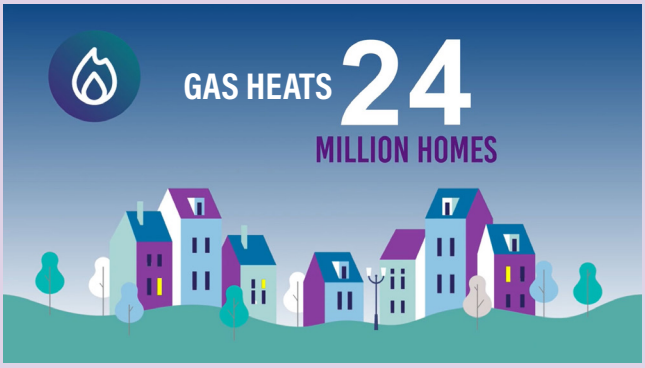
OIL AND GAS MEETS
76%
UK ENERGY 2022


32
MILLION VEHICLES
FUELLED BY PETROL AND DIESEL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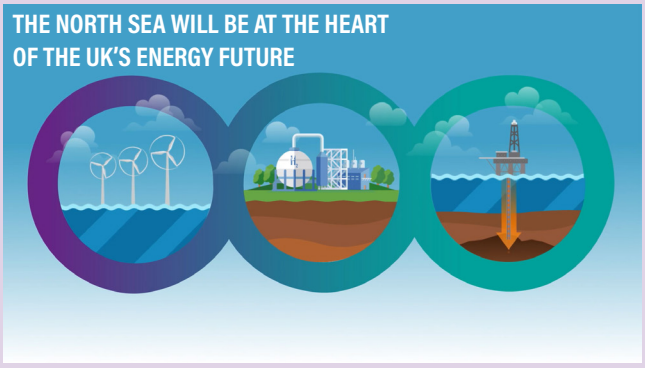
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