

ECONOMIC REPORT 2019

OGUK



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OGUK's vision is to ensure the UK Continental Shelf becomes the most attractive mature oil and gas province in the world with which to do business.

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1. Foreword

OGUK's *Economic Report 2019* reinforces the importance of the UK's oil and gas industry, a sector helping to meet today's energy needs and one that will be a key contributor to tomorrow's energy mix.

As our report shows, there is an increasing demand for energy in an expanding global economy. Global energy demand has increased by two-thirds since 1995 and most scenarios show this continuing to grow in the decades to come. Closer to home, the UK's energy landscape is changing at pace. The Committee on Climate Change recommended in May 2019 that the UK should aim to achieve net-zero greenhouse gas emissions by 2050, and 2045 in Scotland. The fact that these recommendations have been adopted at government level is welcomed and supported by OGUK.

This industry can play a major role in delivering the UK's net-zero future, given the recognition by the Committee on Climate Change of the importance of oil and gas as part of a diverse energy mix in 2050 and beyond. It can help deliver secure and affordable energy in a safe manner and contribute to the low-carbon solutions that will be required to realise the UK's ambitious climate change goals. Oil and gas companies are already in action, using their skills, expertise and resources and developing their energy portfolios in ways that will help move the UK towards net-zero.

A positive future for the industry is outlined in *Roadmap to 2035: a Blueprint for Net-Zero*. This roadmap represents the evolution of industry's Vision 2035 and has been developed following extensive engagement through the Our Vision, Our Future campaign. *Roadmap 2035* outlines what is already happening in our sector and what will be undertaken, to ensure a safe, sustainable oil and gas industry that contributes to a net-zero future.

The offshore oil and gas industry currently meets 45 per cent of the UK's overall energy needs and will continue to provide energy security for decades to come. Having an indigenous energy resource helps to ensure an energy supply we can control, regulate and access. It also brings with it a range of economic benefits. Production of domestic oil and gas directly accounts for around 1.2 per cent of the UK's GDP and will continue to contribute billions of pounds of taxes in the future, as well as securing hundreds of thousands of skilled jobs. It is an important contribution that is key to the well-being of the UK's economy and one that industry is proud to make.

Industry's performance continues to improve and, as a result, the UK sector is more competitive than it has been for many years. New investors are being attracted to the basin, with almost \$5.5 billion of assets changing hands so far this year. Fresh opportunities are being unlocked and drilling activity is increasing following record-low levels in recent years. Eighteen exploration and appraisal wells have been drilled so far in 2019, more than the whole of 2018, and the basin is on track to drill over 100 development wells for the first time since 2015.

In addition, production is higher than it has been since 2011 and production efficiency at its greatest level for a decade. The industry is also building its reputation for decommissioning excellence, which is part of the lifecycle of every asset. Experience in this area is growing and as a result of a sustained focus to improve efficiency, cost estimates continue to fall. Industry is now halfway towards the target of a 35 per cent reduction in total costs by 2022.

The international competitiveness of the sector will remain critical to achieving the potential of the UK's domestic resources and ongoing support from government and regulators is needed to maintain the progress made in recent years. Predictability, stability and clarity are all vital in the face of global challenges, and the tripartite arrangement, between government, industry and regulators can continue to serve the UK well in the future.

The strength of the supply chain is also key to the competitive proposition of the industry. Although the UK market is returning to growth, the sustainability of some companies remains fragile. Both operators and contractors need to work together, constructively, to ensure an appropriate balance of risk and that all companies realise value from their investments. OGUK has developed a new set of Supply Chain Principles with its members, uptake of which can help ensure the ongoing sustainability of the basin.

Industry's focus on its environmental performance, including its carbon footprint, is key to achieving a sustainable industry as we look to a net-zero future. In recent years progress has been made in managing emissions intensity from the production of oil and gas, but more can be done.

Offshore oil and gas production operations currently account for around 3 per cent of the UK's total greenhouse gas emissions, however the majority of emissions from the wider economy are from the use of oil and gas products. The UK's location and geology mean that it has a competitive advantage when it comes to large-scale emissions mitigation programmes such as Carbon Capture, Usage and Storage. The oil and gas industry also has the skills, capabilities and expertise to be a key partner in the development of this technology at scale, however it is important that governments ensure that the correct commercial and regulatory frameworks are in place to allow this. There are also other energy opportunities which oil and gas companies are already actively exploring, supporting and investing in, including hydrogen, wind, wave, solar and geothermal power.

We are an industry in action, providing secure and affordable energy, contributing billions of pounds to the UK economy and supporting hundreds of thousands of skilled jobs. We are playing an active role in the energy transition and the net-zero economy and with the right support, we are well placed to help realise the benefits it can bring to our economy and to our society.

We know that it will be a huge challenge, but it is one that we are ready to take on.



Deirdre Michie,
Chief Executive, OGUK

2. Report at a Glance

The oil and gas industry makes a key economic contribution to the UK

In 2018, it provided the equivalent of **45% of UK energy needs...**



...and 59% of oil and gas demand

Production of oil and gas contributed around **£24 billion to UK GDP** last year (1.2% of the UK total)

The industry is estimated to support around **270,000 jobs** across the UK in 2019

Oil and gas production in the **first six months** of 2019 totalled **315 million boe**, or an average of **1.74 million boepd**

Total production **this year** is likely be at the higher end of OGUK's forecast, at around **630–640 million boe** or **1.73–1.75 million boepd**

The basin is attracting new investment. Almost **\$5.5 billion of M&A activity** was seen in the first half of the year

Production is being boosted by **new projects** and **production efficiency**, which is now at **75% — its highest level for a decade**

Operating cost reductions are being sustained. Unit operating costs are expected to remain at around **\$15-16/boe** in 2019

Industry is demonstrating **decommissioning excellence** and is halfway to achieving the target of reducing costs **by 35%**

Drilling activity is increasing **8 exploration wells** and **10 appraisal wells** commenced drilling in the first seven months of the year — **more than those drilled during the whole of 2018**. The industry is also on track to drill **more than 100 development wells** for the first time since 2015



The UK oilfield services market is expected to **return to growth** in 2019 in line with increasing activity levels. However, many companies continue to see significant **pressure on margins**

Brent crude averaged **\$66/bbl** during the first half of 2019 — 7% lower than the 2018 full-year average of \$71/bbl

NBP gas prices averaged 40 p/th for the first half of 2019, **1/3 lower** than the 2018 average

NBP prices hit a low of **23 p/th** in June — the **lowest daily spot price since 2016** and the lowest monthly average price since 2004.

The oil and gas industry is aligned with the UK's commitment to become a **NET-ZERO ECONOMY BY 2050**

It is estimated that achieving net-zero could require around **£1 trillion of investment** across the UK economy — providing **significant opportunities** for oil and gas companies to apply their experience, expertise and technology

ROADMAP 2035

outlines the near-term priorities for the industry to create a **sustainable future**

- **Supporting** net-zero
- **Helping** meet UK needs
- **Developing** people and skills
- **Driving** technology and innovation
- **Growing** the economy and exports

The Committee on Climate Change estimates that in 2050, UK oil and gas demand will still be around **65 mtoe**, at least 30% of which will be met by production from the UK

The **carbon intensity** of the UKCS has **fallen by 16%**

since 2013 to 21,000 tonnes CO₂/million boe.

Oil and gas companies can have an **important role** in helping to achieve net-zero. In the decades to come, the industry can:

- **Maintain energy security**
- **Reduce emissions** from oil and gas production
- **Support the mitigation of emissions** from the wider economy
- **Advance the development of low-carbon energy sources through investment and diversification**

The industry needs to deliver production with an **emissions intensity of 4,000 tonnes CO₂e/million boe by 2050**

CCUS

The CCC estimates that **175 million tonnes of CO₂/year** will need to be captured and stored in the UK by 2050

The UK oil and gas industry is in a **unique position** to lead in the development of CCUS

Oil and gas companies are **already supporting** CCUS schemes at 18 sites around the world

10,000 CCUS projects are required around the world by 2070, with the global industry forecast to be worth around £100 billion per year by 2050

HYDROGEN

Hydrogen can have an important role in decarbonising sectors such as heating, transport and heavy industry

The roll-out of hydrogen across Europe has the potential to reduce emissions by **800 million tonnes of CO₂e/year** by 2050 (**19% of current emissions**)

The **existing gas infrastructure** network can be used to support a roll-out of hydrogen

3. The UK Oil and Gas Industry as a Key Economic Asset

In Summary

As a major industrial sector, the UK oil and gas industry brings widespread benefits across the length and breadth of the UK. The industry’s contribution to the economy is made up of a combination of factors which reflect the total value added by the sector, with significant positive contributions from both exploration and production (E&P) operations and the associated supply chain activity.

Oil and gas met three-quarters of the UK’s primary energy needs in 2018. The industry is a critical component of the UK’s energy security, providing vital insurance in an ever-changing and uncertain geopolitical environment. Last year, production from the UKCS was enough to meet 45 per cent of primary energy demand and 59 per cent of oil and gas demand.

In addition, the industry contributes considerable sums to the UK Exchequer from production, corporation and payroll taxes, and contributes more widely to the economy by adding to GDP, gross value added (GVA) and balance of trade. In terms of employment, estimates suggest that in 2019 the industry supports just under 270,000 jobs across the country — the majority of which are in the UK’s world-leading supply chain.

The UK oil and gas industry is more competitive than it has been for many years and continues to evolve in response to the challenges it faces. It remains well placed to continue to make a significant contribution in the decades to come, supporting economic growth whilst helping to advance the UK towards a net-zero future through its technology, skills and capabilities.

UKCS production is equal to 45% of UK energy needs

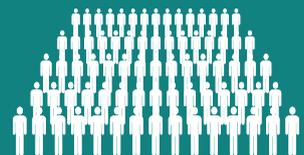


Crucial to maintaining energy security

Oil and gas production contributed over £24 billion to UK GDP in 2018



The oil and gas industry supports around

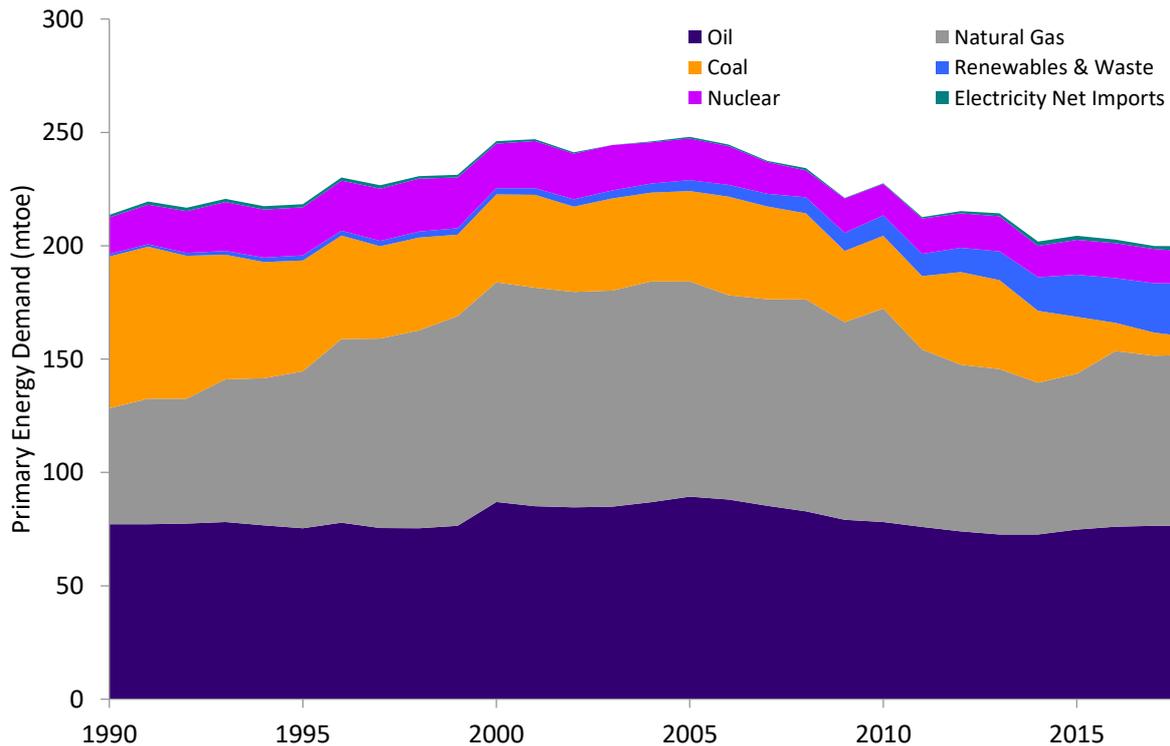


270,000 jobs across the UK

3.1 Delivering UK Energy Security

The UK energy mix has evolved significantly over time, as outlined in Figure 1 below. The overall proportion of UK primary energy demand met by oil and gas has increased since the early 1990s, from around 60 per cent to 75 per cent in 2018. As the use of coal has decreased over time, gas has formed an increasingly important role as the main swing producer within the UK system to help meet peaks in electricity demand.

Figure 1: UK Primary Energy Demand

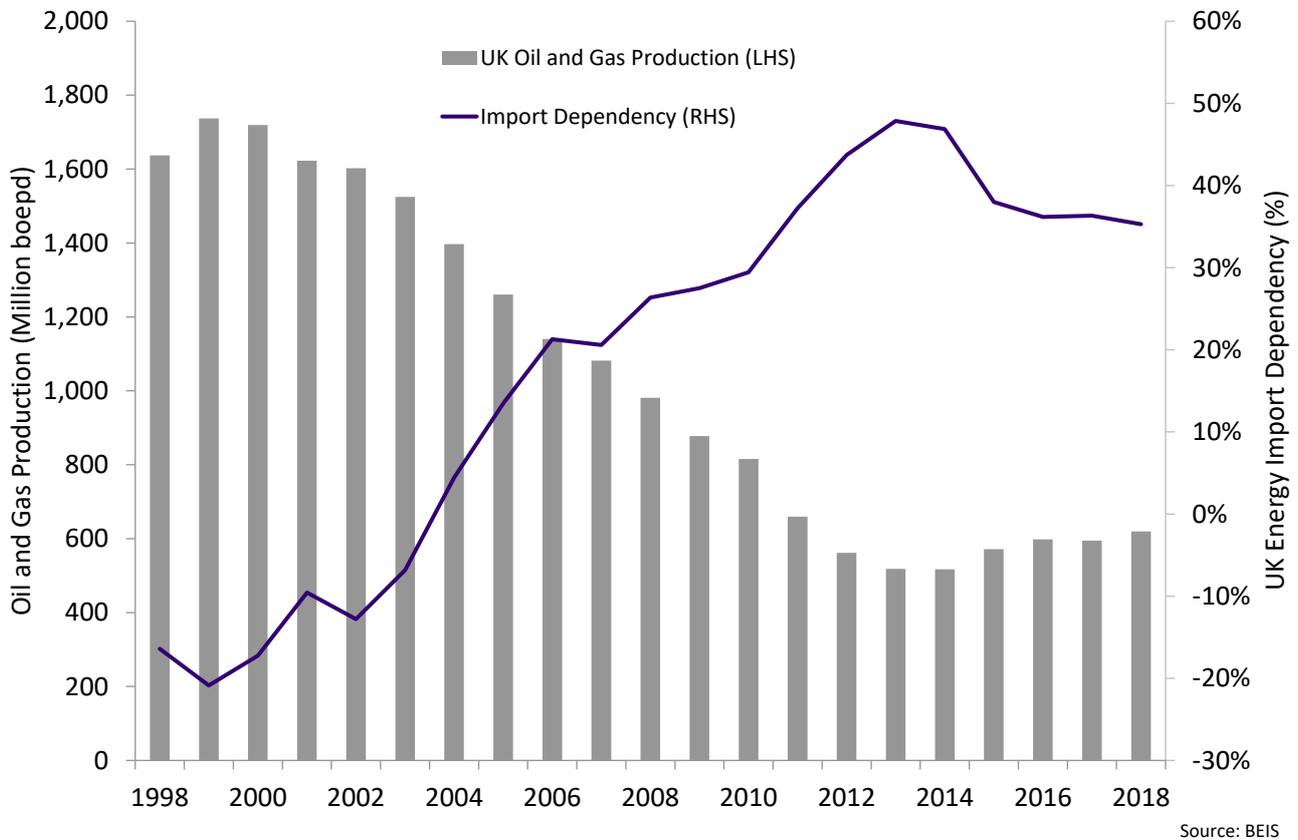


Source: BEIS, DUKES

In 2018, the UK produced enough energy from a range of domestic sources to meet around 65 per cent of its primary energy demand, with the remaining 35 per cent imported from other countries. Domestic oil and gas production was equal to 45 per cent of primary energy needs last year. This was sufficient to meet 51 per cent of the country's gas demand and 67 per cent of oil demand (although significant quantities are also exported).

Of the UK's gas imports, the majority (72 per cent) were from Norway, 13 per cent via the Netherlands and Belgium and 15 per cent from liquefied natural gas (LNG) shipments, the bulk of which originated from Qatar. In terms of oil imports in 2018, 39 per cent were from Norway, 29 per cent from OPEC countries and 17 per cent from the US. The remaining imports were from a range of other nations including Canada, Azerbaijan, Egypt and Russia.

Figure 2: UK Energy Import Dependency and Oil and Gas Production



There is a clear correlation between the rate of domestic oil and gas production and the energy import dependency of the UK. When domestic oil and gas production levels peaked at around 4.7 million barrels of oil equivalent per day (boepd) in 1999–00, the UK was exporting 20 per cent more energy than it consumed, the majority of which was oil and gas. In line with the fall in UKCS output, the UK became a net importer of energy in 2004 and reached a level of 48 per cent energy import dependency in 2013. Following the 20 per cent increase in UKCS production between 2014–18, energy import dependency has since declined to 35 per cent.

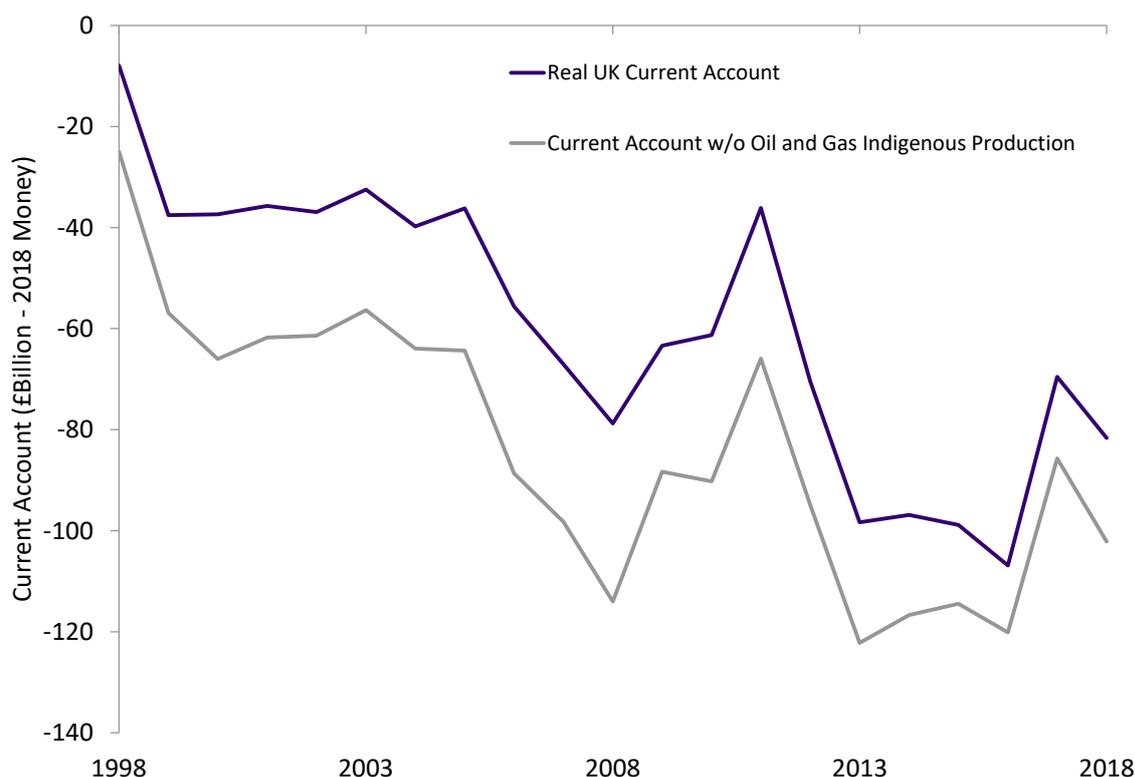
The UK government’s current energy reference scenario (outlined prior to the adoption of the 2050 net-zero greenhouse gas [GHG] emissions target) estimates that oil and gas will continue to provide around two-thirds of UK energy needs through to 2035. The recent recommendations from the Committee on Climate Change (CCC), made in the report *Net Zero – The UK’s contribution to stopping global warming*,¹ outline that in a net-zero economy there will continue to be demand for oil and gas and the need for domestic production — albeit at a lower rate. The CCC forecasts that the UK will still need to consume around 65 million tonnes of oil equivalent (mtoe) per year by 2050, or roughly 450 million boe (just under half of current demand). Given the benefits that indigenous production brings, it is important that as much of this demand as possible is met from UK sources.

¹ www.theccc.org.uk/publication/net-zero-the-uks-contribution-to-stopping-global-warming/

3.2 Contribution to UK Current Account

As well as helping to provide energy security, the oil and gas industry boosts the UK’s international trade balance both by reducing reliance on imports and through the exports of goods and services from the domestic oil and gas supply chain.

Figure 3: UK Current Account and Contribution of Oil and Gas Extraction



Source: GOV

The UK economy’s current account — the difference between the value of goods and services imported and exported from the country, effectively the UK international trade balance — has been negative for more than two decades (i.e. more goods and services are imported than exported). The deficit in 2018 stood at £82 billion, but would have been significantly larger (£102 billion) without the impact of domestic hydrocarbon production. This means that without its indigenous oil and gas resources, the UK would have had to pay £20 billion for additional net imports of oil and gas to supply its energy demand in 2018 alone.

There is also an additional impact in terms of the export of goods and services from UK supply chain companies. The most recent estimates, covering 2017, showed that the value of exports from the wider oil and gas supply chain amounted to £10.6 billion.² The industry has ambitions to increase exports from the sector to £20 billion over time as part of *Roadmap 2035* (see section 5.1).

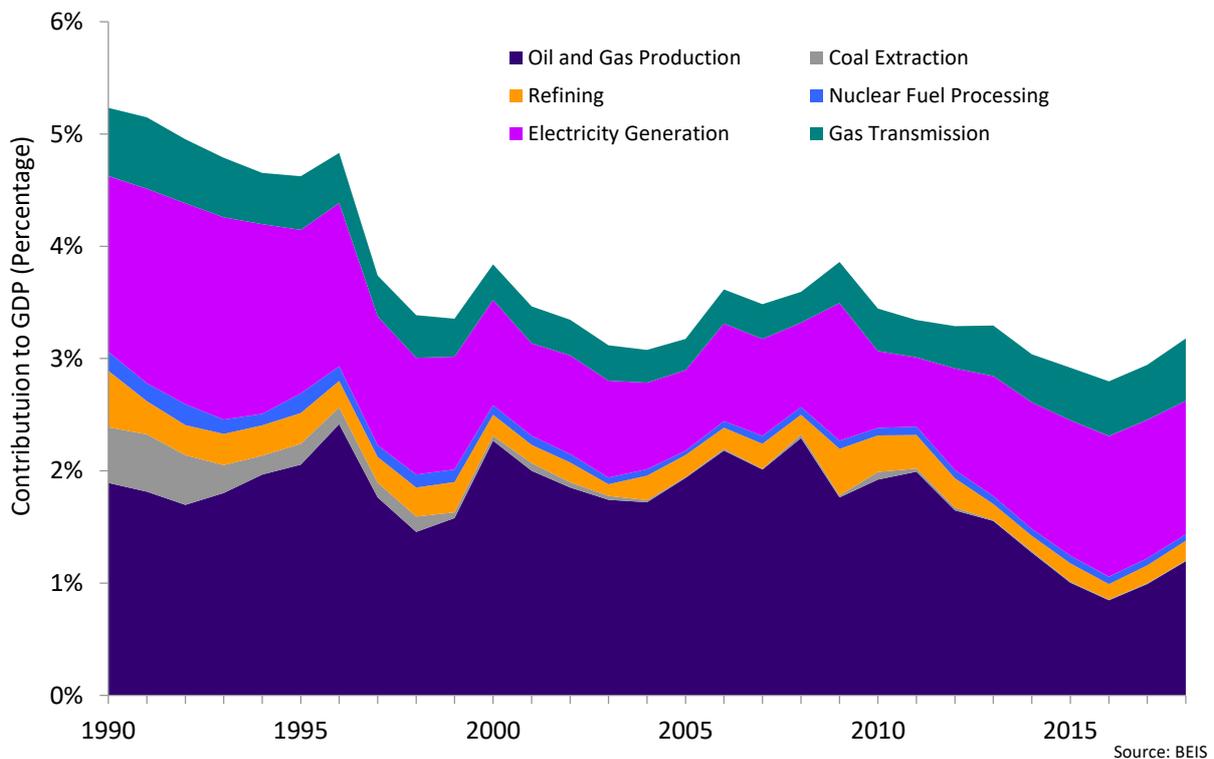
² EY OFS Report www.ey.com/uk/en/industries/oil---gas/ey-review-of-the-uk-oilfield-services-industry-january-2019

3.3 Contribution to Gross Domestic Product and Gross Value Added

The energy industry makes an important contribution to UK GDP (the total value of economic activity within a country), with figures for 2018 outlining that the energy sector made up 3.2 per cent of the UK total (a contribution of £64 billion). Of this, the production of oil and gas accounted for over one-third of the energy sector’s total contribution and 1.2 per cent of overall UK GDP (equal to around £24 billion).

The trend seen in Figure 4 reflects the reduced output from the UK oil and gas industry over time, as well as the changing nature of the UK economy, in line with a larger shift towards the provision of services. Service industries now account for around 80 per cent of UK GDP, compared with 64 per cent in 1990, whilst in that time total manufacturing has fallen from just under 25 per cent of GDP to around 10 per cent. At the same time, the energy intensity of the UK economy has reduced. Total energy demand today is around 7 per cent lower than in 1990 (down from just under 214 mtoe to 200 mtoe per year), while UK GDP has grown by more than 75 per cent in real terms over the same period.

Figure 4: Contribution of Energy Industry to UK Gross Domestic Product



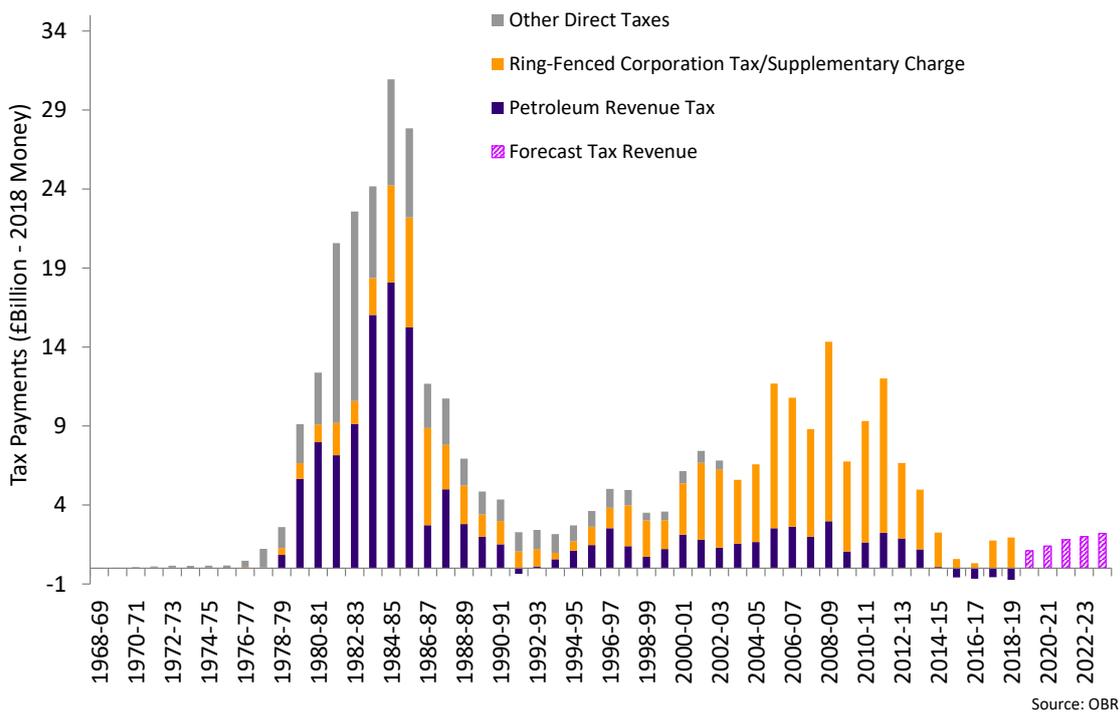
The gross value added (GVA) of the UK economy – defined as the value of sales minus the production costs, and a similar metric to GDP – is also boosted by the oil and gas industry. In 2018, the extraction of oil and gas was the fifth-largest industry within the production, manufacturing and construction sector (representing £20.5 billion, or 5 per cent of the sector), behind specialist construction, building construction, civil engineering and electricity generation, transmission and generation.

However, this is an underestimate of the true contribution of the wider oil and gas industry, as supply chain companies contribute a further 0.13 per cent to the UK total (£2.4 billion). With the inclusion of the GVA of supply chain companies, the industry’s total contribution would overtake that of electricity generation and transmission, and is almost 38 per cent greater than other major industries such as motor vehicle production.

3.4 Fiscal Contribution

As well as the wider contribution to the economy, the industry is a significant source of revenue for the UK Exchequer. More than £350 billion (in 2018 money) has been paid in direct production taxes over the last 50 years, with more still to come. Although the UKCS is a mature basin, it still contributed £1.2 billion in each of the financial years 2017–18 and 2018–19, and the Office for Budget Responsibility (OBR) forecasts that net production tax payments by industry will amount to more than £8.5 billion over the next five years.

Figure 5: UK Oil and Gas Industry Direct Fiscal Contribution



The continued stability and predictability of the fiscal regime are core components of the competitiveness and attractiveness of the UK as an investment proposition in this global industry. HM Treasury’s continued support through its *Driving investment: a plan to reform the oil and gas fiscal regime*³ has been fundamental to restoring and building investor confidence. Recognising the increasing maturity of the basin, the changes to the fiscal regime will help ensure the UK oil and gas industry remains a vital economic asset in the years to come. This is an industry with a long investment cycle, and it is crucial that this stability continues throughout governmental and political change. Industry is committed to the tripartite arrangement with government and regulators and would like to see this constructive work continue to further improve the UK’s competitive advantage.

Fiscal stability is also important to the investment plans of supply chain companies operating in the UK. A more attractive landscape for E&P companies enables supply chain companies to invest in new capacity, resources and research and development (R&D) with greater certainty, due to higher confidence that they will secure the required return on their investment. Building this capacity will also help to ensure a sustainable cost base for all areas of industry is maintained.

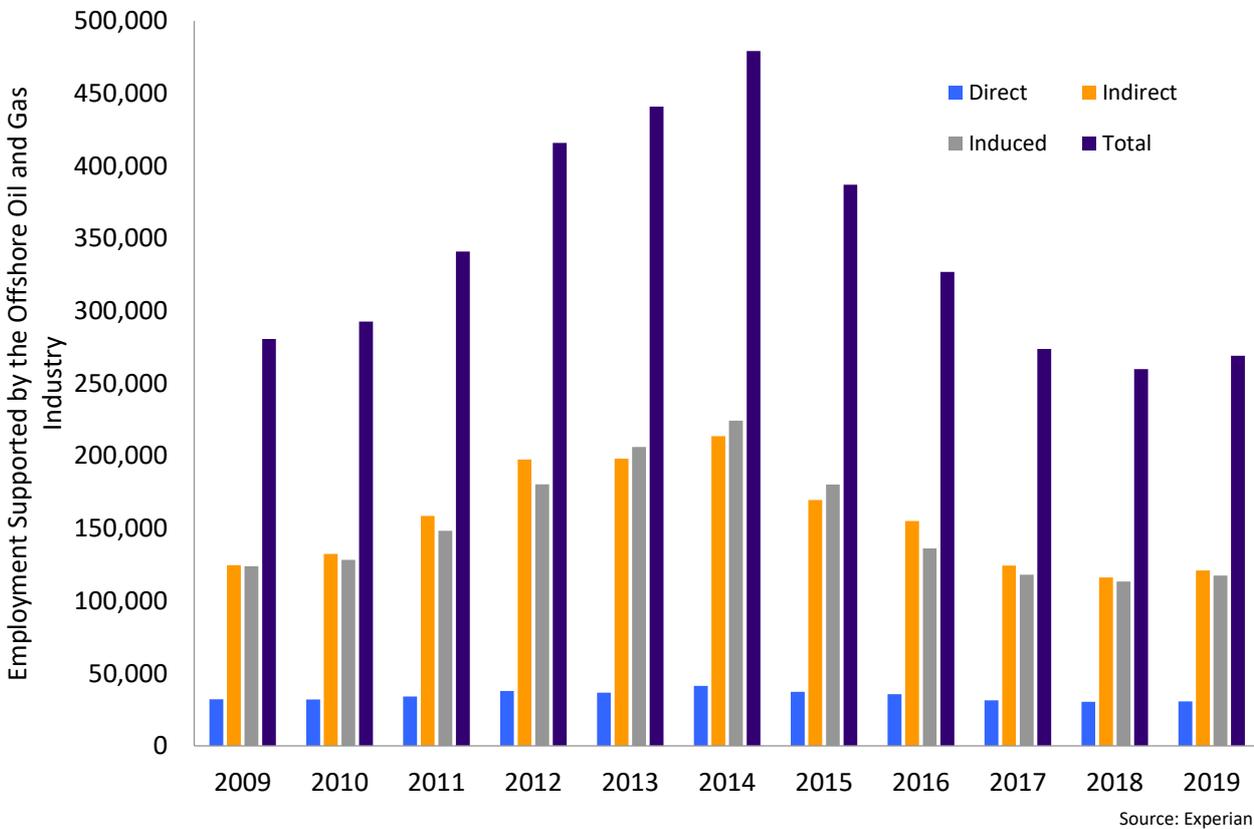
³ https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/382785/PU1721_Driving_investment_-_a_plan_to_reform_the_oil_and_gas_fiscal_regime.pdf

3.5 Employment and Productivity

On top of its direct economic contribution, the industry remains a significant source of skilled employment throughout the length and breadth of the country.

The level of supported employment is related to levels of investment and expenditure. In 2018, the industry is estimated to have supported around 259,900 jobs with an anticipated increase to around 269,100 in 2019 — based on a forecast range between 253,800 and 284,400 — the first year-on-year increase in employment since 2014.⁴ This reflects an anticipated increase in investment levels, following the reductions seen in recent years, and represents a more sustainable environment compared with levels seen between 2012–15.

Figure 6: Employment Supported by the UK Oil and Gas Industry



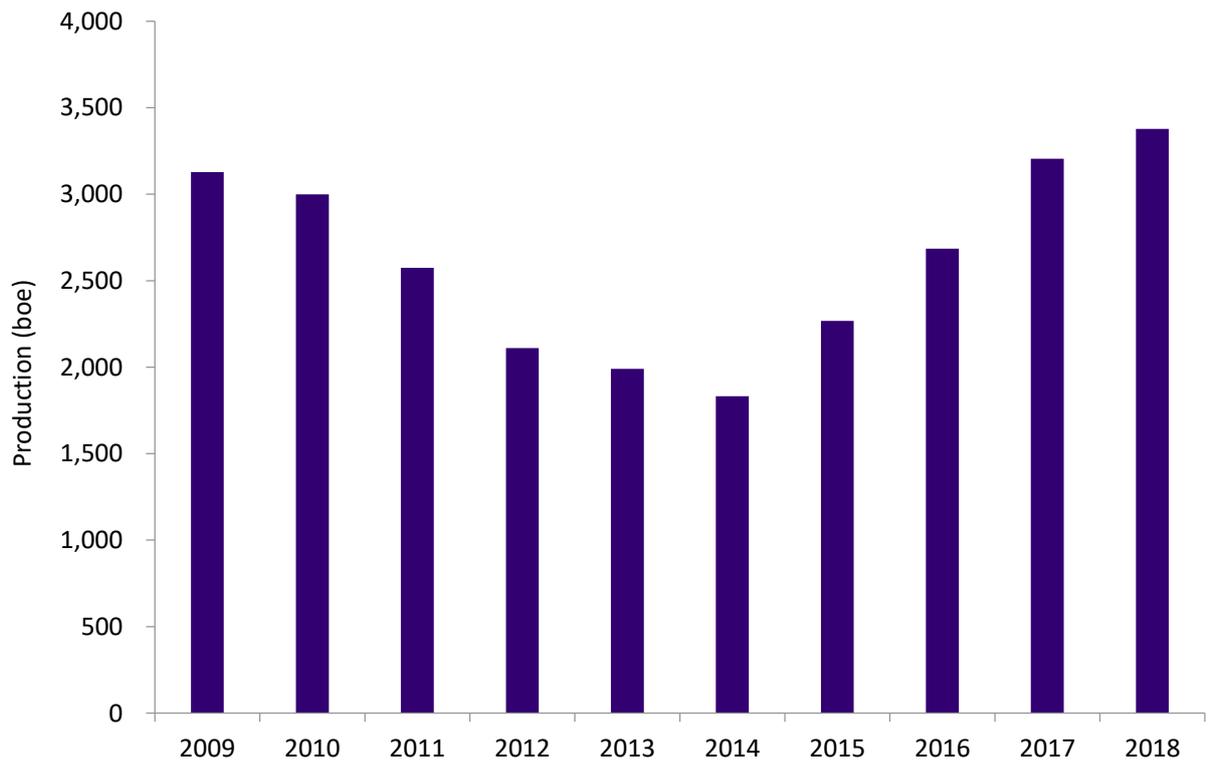
The largest proportion of supported employment in 2019 is within the wider industry supply chain (121,000 via indirect employment), with around 30,600 people directly employed, i.e. those who work for companies directly involved in the extraction of oil and gas and associated services. Induced employment, equivalent to around 117,500 jobs, covers those who are supported as a result of the wider economic activity stimulated by oil and gas expenditure.

The reduction in total supported employment between 2014–18 was driven by the industry downturn, during which companies implemented various measures to improve efficiency and reduce expenditure and investment to help ensure the economic viability of their operations.

⁴ OGUK Workforce Report 2019 www.oilandgasuk.co.uk/product/workforce-report/

During this period, production from the basin has increased by 20 per cent (see section 4.2), driven by a combination of new project start-ups and continued improvements in production efficiency. When combined with the reduction in supported employment, the number of barrels produced per direct and indirect worker has increased by 84 per cent since 2014, to almost 3,400 boe in 2018. This demonstrates the improved productivity of the industry at a time when the wider UK productivity performance has been stagnant for more than a decade.

Figure 7: Barrels Produced per Direct and Indirect Workers



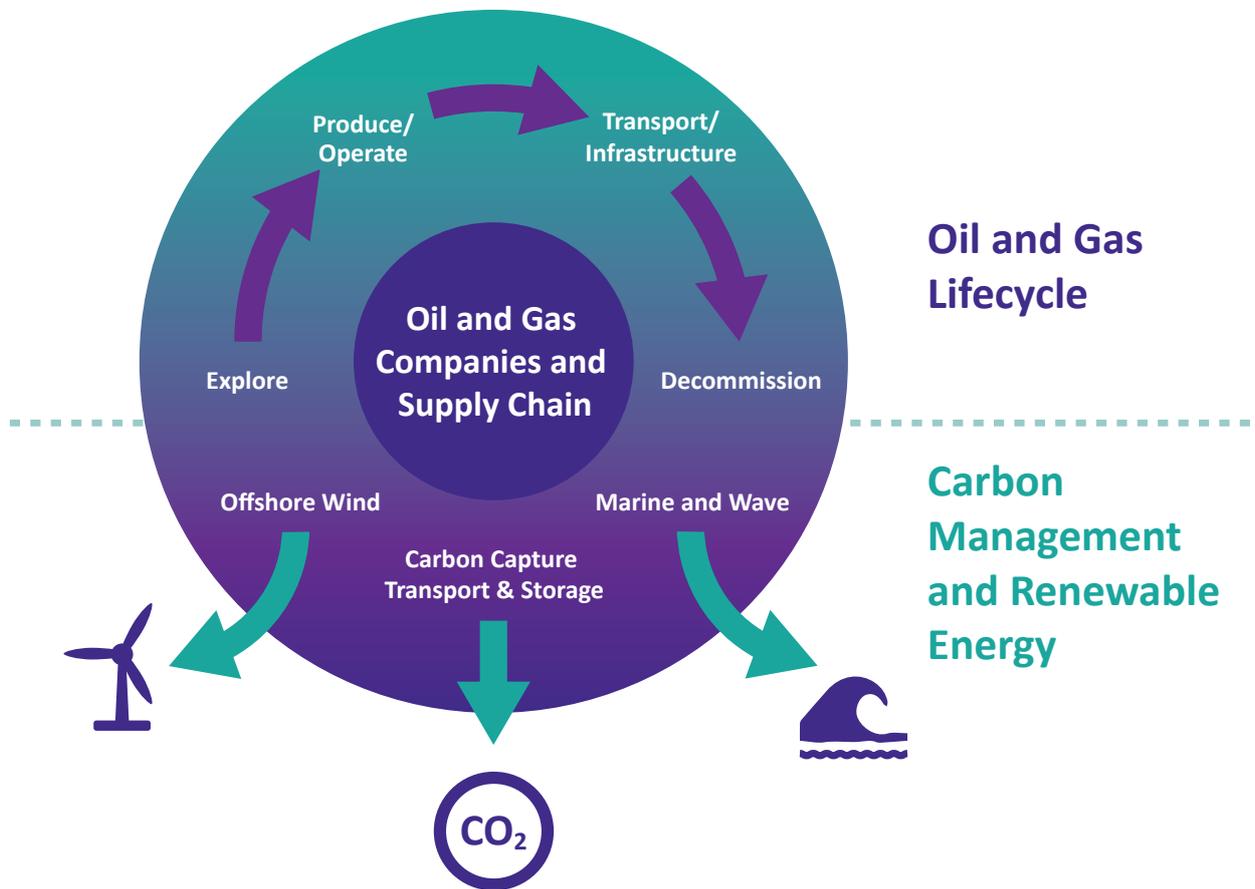
Source: OGUK, Experian

3.6 Supply Chain Landscape

Alongside E&P activity, the UK oil and gas supply chain makes a significant contribution to the UK economy — contributing to GDP, boosting the current account through export activity and supporting the majority of jobs within the sector. The supply chain has world-leading capabilities across all aspects of oil and gas operations, supports international basins through exports and increasingly supplies other industries and aspects of the energy sector as companies diversify their businesses and investments.

Growing this opportunity for the UK supply chain and supporting the transition to a net-zero economy are key ambitions of industry's *Roadmap 2035* (see section 5.1). The supply chain can continue to be a global leader in oil and gas services, whilst embracing the opportunities presented by the energy transition. This will ensure that the industry's supply chain continues to contribute to the UK economy in the decades to come.

Figure 8: UK Oil and Gas Supply Chain Landscape



4. Business Environment and Industry Performance

In Summary

Global markets continue to show significant volatility. The Brent crude spot price experienced a 38 per cent swing in the first half of 2019 and the monthly average National Balancing Point (NBP) gas price fell by more than 50 per cent between January and June, reaching the lowest monthly average since 2004. These trends continue to drive E&P company strategies with robust cost control being required and only the most attractive investment opportunities gaining approval within competitive global portfolios.

To ensure that the UK economy continues to benefit from indigenous production, it is essential that the industry responds effectively to the energy transition and in line with *Roadmap 2035*. To achieve this, the industry — along with government and regulators — must remain focused on maximising economic recovery (MER) and maintaining the correct framework to attract and retain investment in the search for new resources and their subsequent development. Whilst pursuing MER, the industry will continue its focus on reducing its carbon intensity from production activities, consistent with achieving a net-zero economy in 2050.

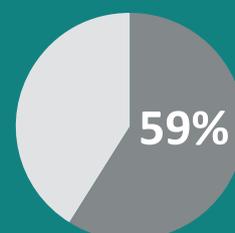
Good progress is being made in a number of areas: the recent growth in production has continued, drilling activity is increasing and the basin continues to attract new investors. However, there are persisting challenges, particularly around the enduring sustainability of the supply chain, which also needs to view the UK as a good place to invest. Innovative contracting models, partnerships and collaboration across industry can ensure that new opportunities are progressed while achieving value for all parties.

By getting the balance of risk and reward right, the oil and gas industry will continue to make a vital contribution to the UK economy in the decades to come, whilst also helping to advance the transition to a net-zero economy.

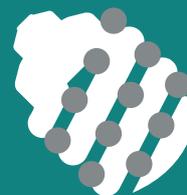
UK industry must remain internationally competitive to unlock new opportunities



UKCS production continues to grow, now meeting 59% of oil and gas demand



Drilling activity is increasing – more E&A wells have been drilled so far in 2019 than in the whole of 2018



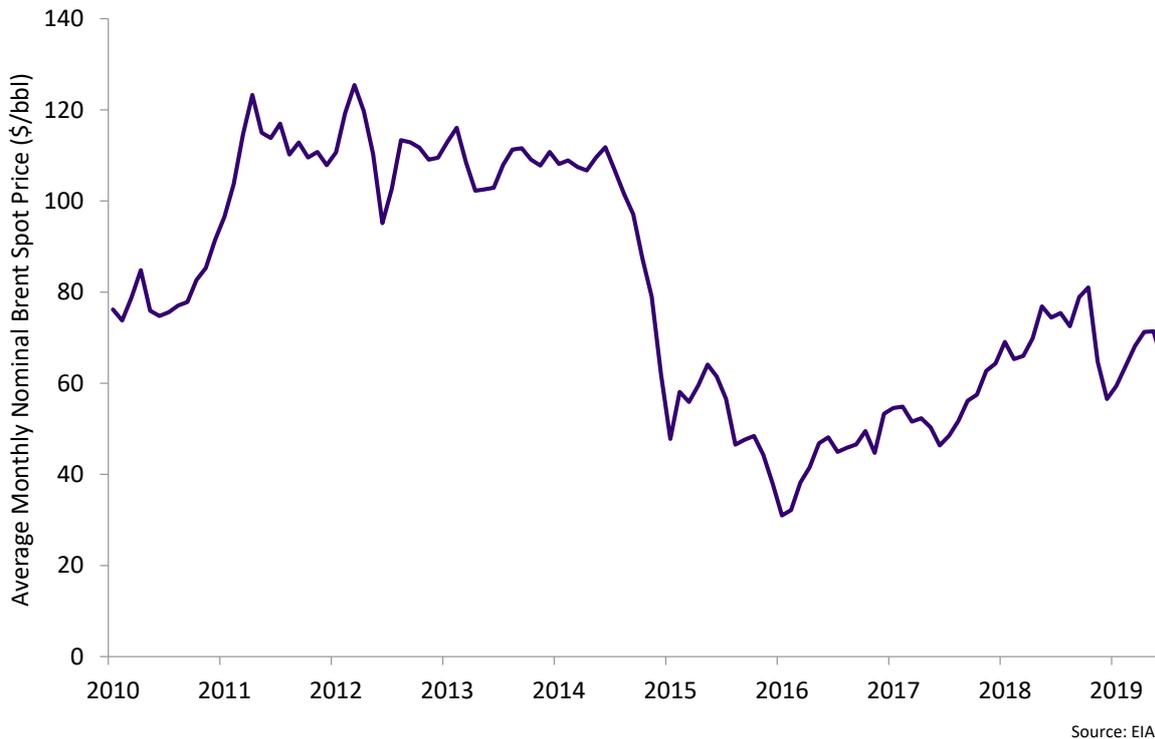
4.1 Business Environment

Oil Market

During the first half of 2019, Brent crude averaged \$66 per barrel (bbl), in comparison with an average of \$71/bbl in 2018, and significant volatility has persisted in the market — evidenced by a 38 per cent swing in prices. This is felt to an even greater extent in the UK given the ongoing volatility of the GBP/USD exchange rate, which saw a swing of 10 per cent in the first seven months of 2019. To manage this, E&P companies are continuing to review their portfolios to ensure they are robust enough to withstand price fluctuations, and any new investments generally need to break even at less than \$50/bbl.

Brent opened 2019 at around \$54/bbl and steadily increased to \$74/bbl in April before dropping back to \$65/bbl in July and \$57/bbl in early August. Meanwhile, futures benchmarks have fallen 20 per cent from April levels. This volatility has been driven by a combination of supply and demand considerations. Concerns around supply have been heightened by increased geopolitical tensions in the Middle East and between the US and Iran, while on the demand side the increasingly negative global economic outlook has dampened market sentiment. Global oil demand levels correlate strongly with economic growth, and lower demand levels generally translate into a negative price outlook.

Figure 9: Brent Crude Price



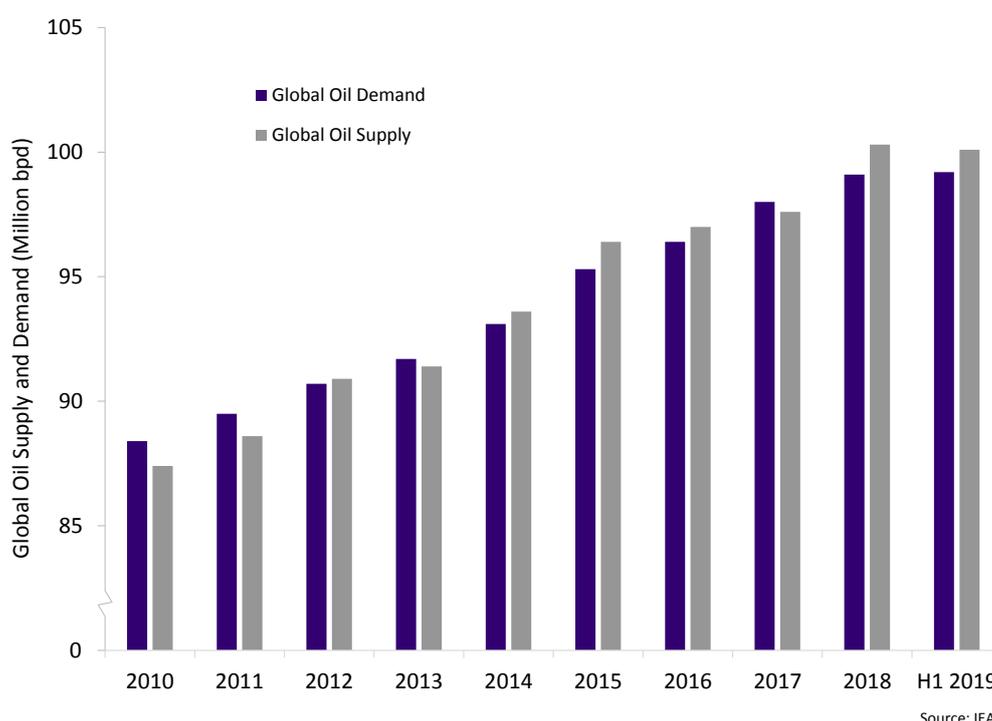
Following strong growth in 2017–18, global economic performance so far this year has slowed, largely as a result of ongoing geopolitical uncertainty. The International Monetary Fund (IMF)⁵ has revised its most recent global GDP growth forecasts for 2019 downwards by 0.5 per cent, to 3.2 per cent; this compares with an overall growth figure of 3.6 per cent in 2018.

⁵ IMF *World Economic Outlook*, October 2018 and July 2019
www.imf.org/en/Publications/WEO/Issues/2019/07/18/WEOupdateJuly2019

Trade tensions between China and the US have had a negative impact on global economic growth as well as the impact of reduced productivity and investment in the Euro area. It is anticipated that economic performance will improve into 2020, with global GDP growth forecast to increase to 3.5 per cent, however this remains uncertain.

In August, the International Energy Agency (IEA) downgraded its oil demand growth forecast to 1.1 million barrels per day (bpd) in 2019 — the third consecutive monthly cut and down from a forecast of 1.5 million bpd this time last year.⁶ The first five months of 2019 saw the lowest level of demand growth (520,000 bpd) for the period since 2008. Demand growth is, however, expected to pick up in the second half of 2019 and into 2020, fuelled by hopes that some improvements in global economic performance may begin to emerge.

Figure 10: Global Oil Supply and Demand Growth



With regards to supply, IEA figures show that levels in the first half of the year were on par with those in 2018 and Wood Mackenzie estimates that total 2019 global supply growth could reach 1 million bpd⁷ — slower than the anticipated growth in oil demand. Rystad Energy estimates that, overall, the market will be relatively well balanced between supply and demand this year.⁸

As in 2018, increased output from US onshore production has dominated supply growth this year. The IEA estimates that US output will increase by a further 2 million bpd in 2019, a growth rate almost double that of the UK's total daily oil production. The continued ramp-up in US production has been accommodated by strong compliance with production cuts by OPEC and partner countries, largely the result of further reductions by Saudi Arabia and the UAE. OPEC production in June marked a five-year low (29.6 million bpd) and member and partner countries have committed to maintaining the cuts for a further nine months, until at least March 2020. Between 2016 and the first half of 2019 US oil production has grown from 9 per cent to more than 12 per cent of global supply, whereas OPEC supply share has fallen from 41 per cent in 2016 to 36 per cent, demonstrating the changing nature of influence in the market.

⁶ IEA *Oil Market Report*, August 2019

⁷ Wood Mackenzie *Global Oil Supply Short-Term Outlook*, July 2019

⁸ Rystad Energy *Oil Market Update Report*, August 2019

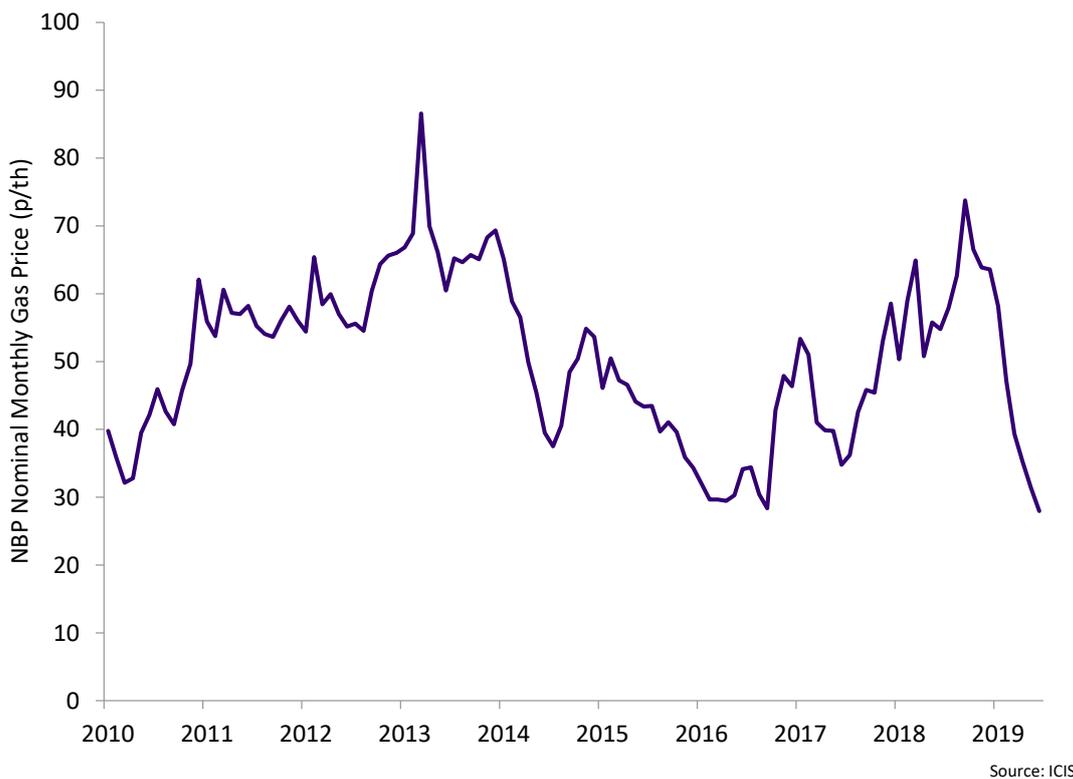
Along with this, the re-imposition of US sanctions on Iran, political conflict in Libya and the economic crisis in Venezuela have removed an estimated 830,000 bpd from the market. At current production rates, the UK is now producing more oil than Venezuela (averaging more than 1.1 million bpd compared with 884,000 bpd) despite Venezuela having 120 times greater proven oil resources.

Looking ahead to 2020, it is anticipated that the global supply will continue to increase, largely due to US output, however significant additions are also expected from other non-OPEC nations such as Brazil and Norway. This will place pressure on OPEC to maintain production cuts to prevent a significant oversupply in the market.

Gas Markets

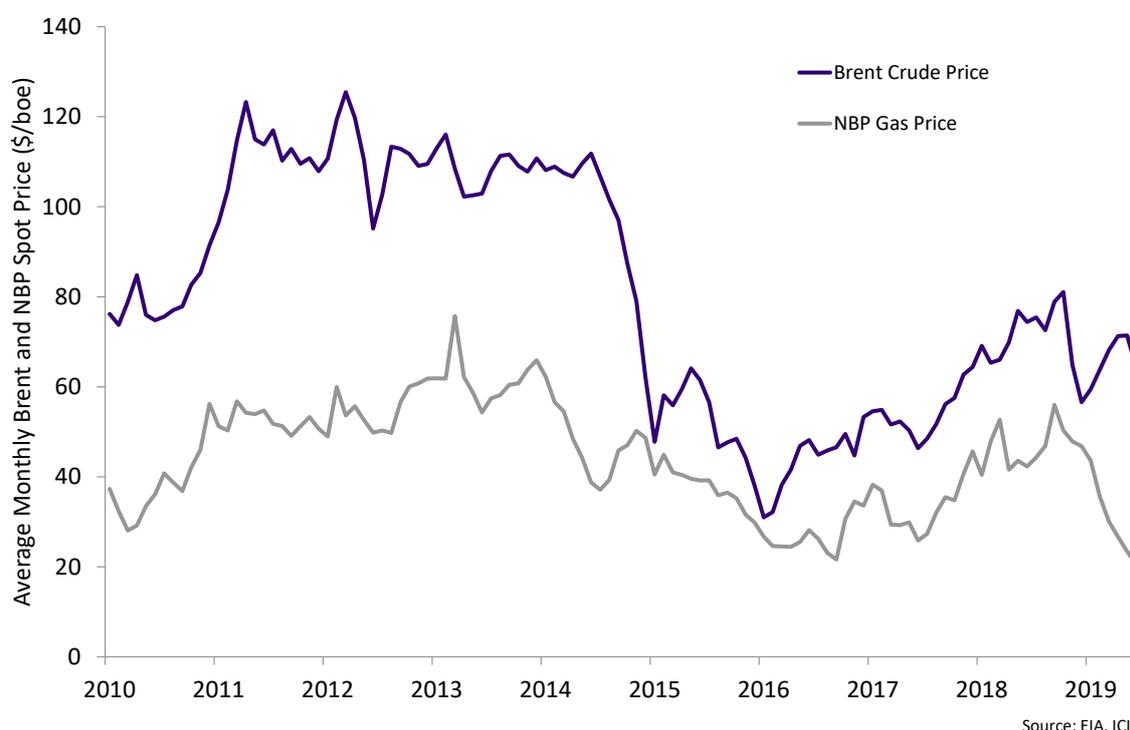
Gas prices have seen significant reductions in the first half of 2019, as both increased supply and lower demand exerted negative price pressure. The average National Balancing Point (NBP) price for the first six months of the year was 40 pence per therm (p/th), one-third lower than the 2018 average of 60 p/th. Moreover, prices hit a low of 23 p/th in June — the lowest daily spot price since 2016 and the lowest monthly average price since 2004.

Figure 11: UK NBP Gas Price



When considered in oil equivalent terms, Brent has traded at a premium to the NBP price, with a significant differential seen in 2019. In the first half of the year Brent averaged more than double the NBP gas price in equivalent terms (\$66/boe compared to \$30/boe). As a result, the rates of return from UK gas production will be lower than oil on a like-for-like basis. This is an important consideration in the context of the transition to a net-zero carbon economy (see section 5).

Figure 12: UK NBP Gas Price and Brent Crude Price



In the UK, increased energy efficiency, warmer temperatures and increased wind power capacity have reduced gas requirements for domestic heating and electricity generation. This has resulted in an overall decline in UK gas demand of 14 per cent over the last 20 years (see section 3.1).

Whilst the regional nature of gas markets remains, its supply is becoming increasingly globalised — particularly through the influence of the LNG market. This is leading to greater price convergence, with the impact felt in the UK mirrored across global gas markets. International gas prices are dropping as a wave of new LNG supplies come onto the market at a time of weaker demand. In the US, the regional price benchmark (Henry Hub) fell to its lowest level since 2002 in June 2019 and in some cases onshore producers in the US Permian are paying infrastructure owners with spare capacity to offload their excess gas.

European prices have been squeezed by the strategies of both Russia and the US to preserve and grow their respective market share. Russian piped gas exports to Europe increased by 8 per cent in the first five months of 2019 compared with last year. At the same time, LNG exports from the US to Europe surpassed those to Asia for the first time and now account for almost 40 per cent of US natural gas exports. This is being driven by the now negligible price differential between Asian and European prices, incentivising the flow of flexible US exports to European markets.

The recent trend of declining gas prices is reflected in the financial performance reported by many oil and gas companies, especially those with a greater exposure to gas in their portfolios, and may also affect approvals of new gas projects.

Brexit

As well as uncertainty within the markets, the UK political climate continues to cause investment challenges across the economy. At the time of writing, the nature of the future relationship between the UK and European Union (EU) remains unclear. The default position is that the UK will leave the EU on 31 October, with or without a deal in place. OGUK is clear that a no-deal scenario is not in the best interests of this industry, or the wider economy, and has outlined the key priorities for the UK's offshore oil and gas industry and its supply chain post-Brexit.

1. **Protect the offshore industry from future EU regulatory changes:** As the largest EU producer of offshore oil and gas, the UK currently takes a leading role at the EU decision-making table in support of our industry. Future changes to regulations or directives by EU institutions could negatively impact the UK oil and gas industry, even after Brexit.
2. **Protect our license to operate by maintaining a strong voice in Europe:** Whether the UK participates in any future EU governance framework or not, a forward-looking European energy policy needs to recognise that, in the context of the energy transition, oil and gas will still remain a key part of both the UK and the EU's energy mix for decades to come.
3. **Ensure minimal friction of trade between the UK and EU:** Although the UK's oil and gas sector has a global reach, it has a significant and valuable supply chain that sources many of its goods and services from the EU and also exports to the EU market. Our industry needs certainty and predictability to deliver its operations safely and efficiently and as such, ensuring the efficient and frictionless movement of goods, services and capital must remain a priority.
4. **Maintain liberalised energy trading and the internal energy market:** The internal market has provided significant benefits to the UK in terms of competitiveness and security of supply. After Brexit, it will be essential to maintain the commercial and regulatory integrity of any new internal energy market spanning the EU and UK.

With the prospect of a no-deal outcome becoming more likely, OGUK is facilitating a number of initiatives with member companies to mitigate potential impacts on operations. This work has covered areas including aviation, chemical supply (REACH regulations⁹), the import and export of goods, employment issues and environmental legislation.

OGUK has previously reported that the nature of the UK's exit from the EU could have a range of implications on the industry. It is estimated that reverting to World Trade Organization (WTO) rules may cause the cost of trade for the oil and gas industry to increase by around £500 million per year. Whereas a scenario where the UK can negotiate new free trade deals and has minimal EU tariffs could result in a fall in trading costs of around £100 million per year.¹⁰

⁹ REACH is an EU regulation concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals

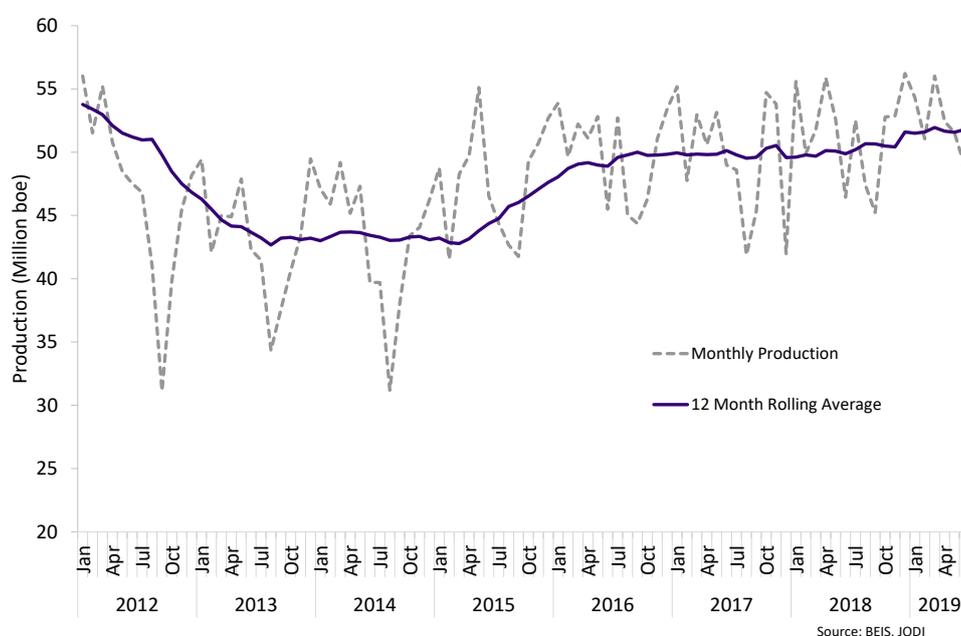
¹⁰ Note that this analysis is based on data from 2016.

4.2 Production Performance

Production on the UKCS increased by 20 per cent between 2014–18, from 517 million boe to 619 million boe (or daily production rates of 1.42 million boepd and 1.7 million boepd, respectively). This was enough to meet around 45 per cent of the UK’s total energy demand and around 59 per cent of oil and gas demand in 2018.

The recent positive trend has continued in 2019 with production in the first six months of the year amounting to 315 million boe, or 1.74 million boepd. This level of output is in line with the same period in 2018 and just over 2 per cent higher than the first six months of 2017. Production would be expected to decrease slightly during the summer months as companies perform maintenance activity, however OGUK expects that total 2019 production will likely be at the higher end of the production forecast made in *Business Outlook 2019*, at around 630–640 million boe (1.73–1.75 million boepd) – 2 to 3 per cent higher than 2018.

Figure 13: UKCS Production Output



The increase in production has largely been driven by oil output, with just over 208 million bbls produced in the first six months of the year (1.15 million bpd). This is almost 6 per cent higher than the same period in 2018 and the total daily average last year. Output so far in 2019 is 25 per cent higher than oil output in the first six months of 2014 (166 million bbls). The year-on-year increase has largely been driven by the ramp up in production at Clair Ridge as it reaches peak output, and continued high production rates from recent new starts such as Kraken, Western Isles, Catcher and Quad 204. In addition, there have been new volumes from the Lancaster Early Production System (EPS) and Orlando. Equinor’s Mariner field also commenced production in August, while the cross-Norwegian border Utgard and Barnacle fields are expected to start-up by the end of the year. The Apache-operated Storr field, in the Beryl area, may also reach first oil this year.

Conversely, gas production has remained relatively flat in recent years, with an actual year-on-year decline of around 7 per cent in the first six months of the year, to 107 million boe (0.59 million boepd). Following an increase of 7 per cent between 2014–15, annual gas production has remained in the range of 220–230 million boe (0.60–0.63 million boepd), with the full-year trend for 2019 expected to be similar. Fewer gas fields than oil fields have been brought online in recent years (Cygnus and Laggan-Tormore being the among the largest), however gas output will be boosted by the Culzean field which commenced production in May 2019. At peak, this development is expected to produce in the region of 100,000 boepd — the equivalent of around 5 per cent of total UK gas demand.

In addition to new volumes coming on stream, the trend of improving production efficiency (PE) has continued. In 2018, PE was 75 per cent — the highest level for a decade and the sixth consecutive year of improvement — with progress during the year equal to an additional 11 million boe, or the eighth-largest producing field in the basin.¹¹ The improvements in PE have been seen across several areas, including:

- A 53 per cent reduction in planned shutdown over-runs
- A reduction in total export losses from 47 million boe to 30 million boe
- A reduction in well losses from 33 million boe to 26 million boe

The Production Efficiency Task Force (PETF), facilitated by OGUK and sponsored by the Asset Stewardship Task Force, guides the cross-industry work to drive further improvements in PE. The PETF is focused on protecting and building on the gains seen in recent years, and work is ongoing across four areas:

- Planned shutdowns, or turnarounds (TARs), are the largest source of downtime in the basin. The PETF has developed *Guidance for the Efficient Execution of Planned Maintenance Shutdowns*¹² to help support improvements in this area. The group is now working on collaborative efforts to ensure that the June 2020 full outage of the Forties pipeline system (FPS) is executed as efficiently and effectively as possible.
- Guidelines have been issued to help *Maximise the Efficiency of Compression Systems*,¹³ which are the largest contributors to unplanned downtime.
- The Terminals Group is focused on maximising the positive contribution of midstream infrastructure on PE. The group is drafting supplementary guidelines for onshore planned shutdown considerations and is also aiming to improve the collaboration between midstream infrastructure operators and upstream producers.
- A group is being formed to further increase the understanding and uptake of new and existing digital technologies, an area which it is believed can enable a step-change in industry performance. The Oil and Gas Technology Centre (OGTC) and Technology Leadership Board (TLB) estimate that up to \$2 billion per year of PE improvements can be gained through increased adoption of digital technology.¹⁴

CASE STUDY

OPEX Group is a leading provider of data science and predictive analysis services for the oil and gas industry — helping oil and gas operating companies to make use of their operational data to solve complex problems, reduce costs, improve performance, and mitigate risk offshore.

As the industry continues to focus on realising the benefits of new technology and digital transformation to support Maximising Economic Recovery and the energy transition, OPEX is at the forefront of developments in this area. By combining data science capability with oil and gas engineering expertise, new solutions to old problems can be found and oil and gas operators can move from a reactive to a predictive mindset, helping to maximise productive performance.

The company is currently working with a number of UKCS operators to help them address regulatory, operational and maintenance challenges.

¹¹ www.ogauthority.co.uk/news-publications/news/2019/production-efficiency-rises-for-6th-consecutive-year-to-75-in-2018/

¹² www.oilandgasuk.co.uk/product/guidance-for-the-efficient-execution-of-planned-maintenance-shutdowns/

¹³ www.oilandgasuk.co.uk/product/guidelines-to-maximise-compression-system-efficiency/

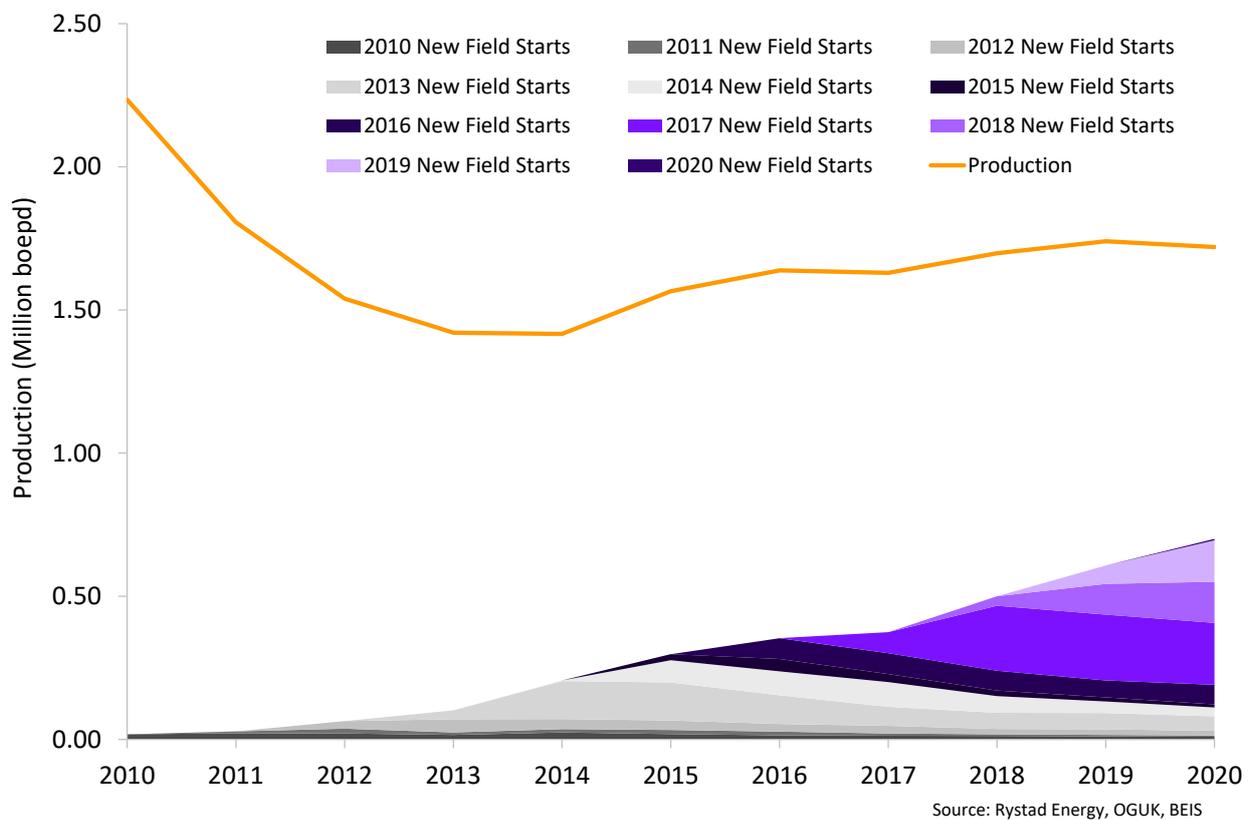
¹⁴ www.theogtc.com/media/2380/digital-landscaping-study-of-the-oil-and-gas-sector-application-of-data-analytics-technologies-to-improve-asset-operations-and-maintenance.pdf

Production Outlook

Looking further ahead, OGUK expects that production will remain stable in 2020 before reverting to a position of managed decline in line with *Roadmap 2035*. This will primarily be caused by a reduction in the number of new field start-ups expected in the early 2020s — the result of the low levels of new investment approvals during the downturn. Figure 14 illustrates the importance of a continual stream of new projects to support production and to ensure that as much of the UK’s oil and gas demand, and wider energy demand, is met from domestic sources.

A significant production decline was seen between 2010–13, coinciding with a period of fewer, smaller new project start-ups. Since 2014, the resurgence in production that has taken place has been driven by a wave of new field starts (42 between 2014 and mid-2019). These new fields have been developed as a result of significant investment decisions made prior to the downturn. Culzean and Mariner will be the last of this current wave of large projects to start production. The relative lack of new investment between 2015–17 is expected to give rise to less production commencing between 2020–22.

Figure 14: UKCS Production and New Field Start-Ups



Maintaining a steady stream of new field investments is crucial to support production levels going forward. In a no-further-investment case, OGUK expects that output from the basin would decline by around two-thirds over the next decade. This would require the UK to import more of its energy needs, negatively affecting the UK’s trade deficit, energy security and employment (see section 3).

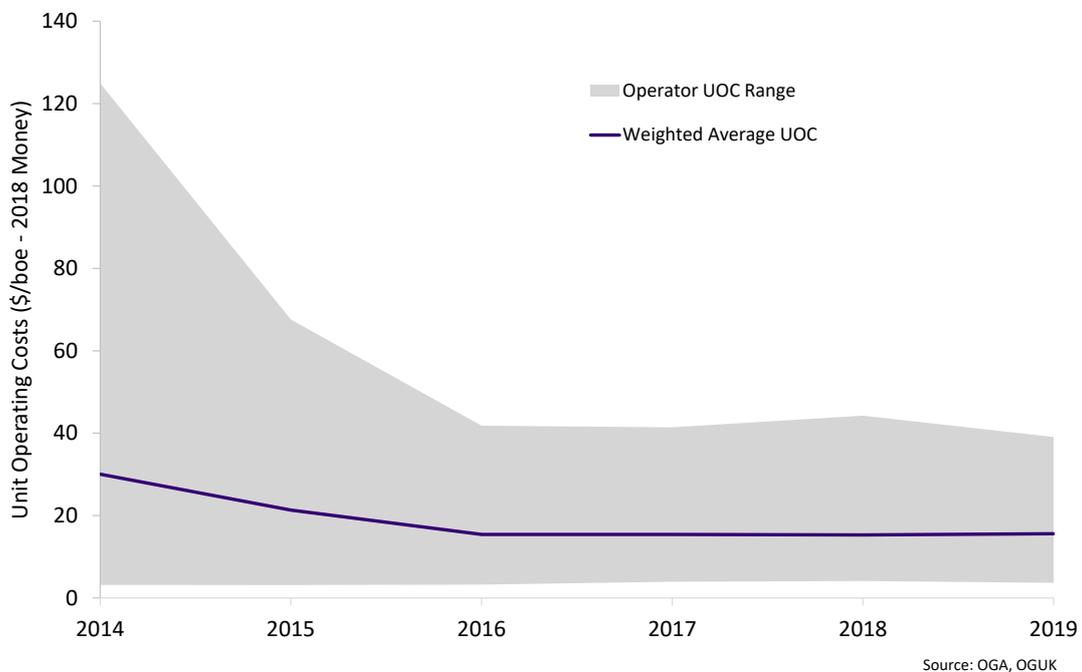
4.3 Expenditure and Investment

Operational Expenditure

In line with strong production performance, UK producers are demonstrating robust cost control. Unit operating costs (UOCs) — a function of operating expenditure and production — are expected to remain at \$15–16/boe in 2019, in line with levels since 2016 and around half the levels of 2014. Almost £3 billion has been taken out of UKCS total operating expenditure between 2014–18 (from £10–7.1 billion), while production has increased by 20 per cent during the same period.

A level of \$15–16/boe represents a more sustainable level for UKCS operations and is in line with the longer-term trend prior to the spike in operating costs between 2010–14. Reductions in UOCs have been achieved across the board on the UKCS, with the upper range of operator UOCs falling by more than \$80/boe.

Figure 15: UKCS Operator Unit Operating Costs



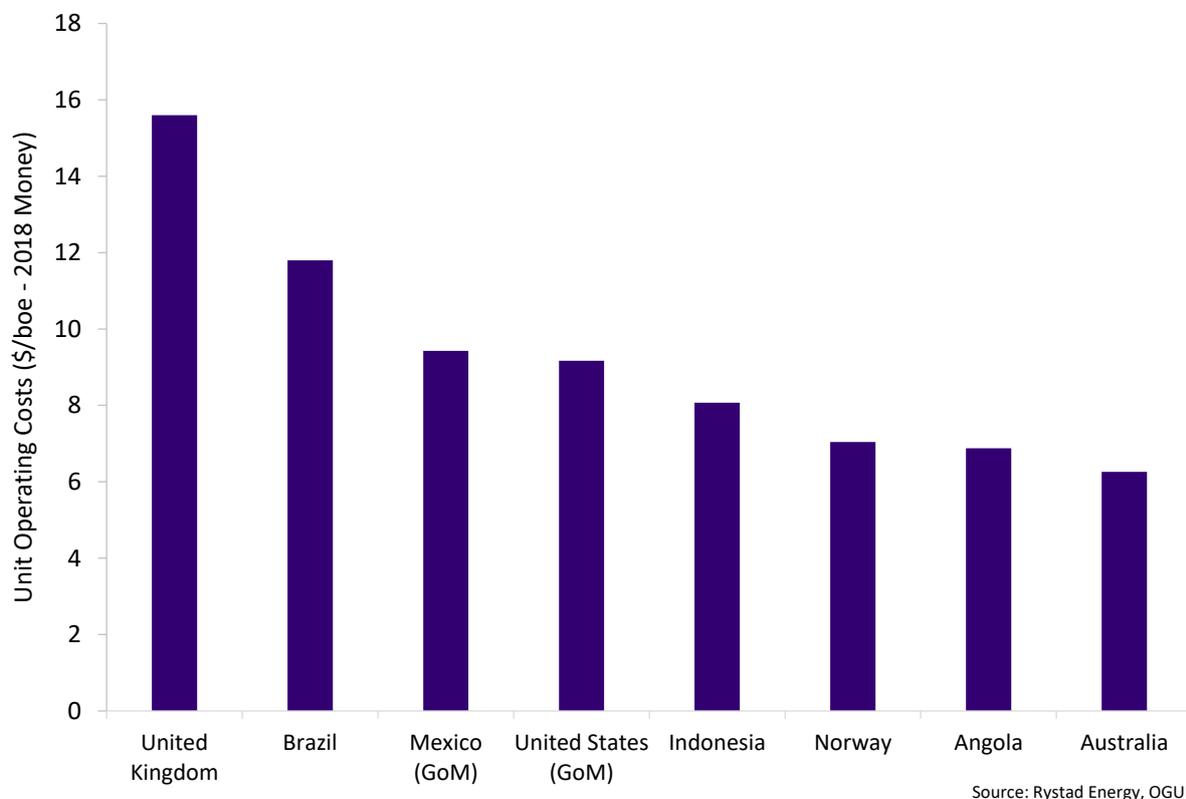
As a result of these reductions, E&P company portfolios are now more competitive and robust, with greater ability to withstand price volatility. Around 7 per cent of fields are anticipated to have UOCs of greater than \$60/boe this year (representing only around 1 per cent of production), in comparison with almost 20 per cent of fields in 2014 (representing almost 10 per cent of production).

A competitive and sustainable cost base is crucial to unlocking new investment in the basin, as any new opportunities have to meet strict investment criteria. E&P companies are therefore fully focused on maintaining, and in some cases building on, cost reductions and efficiency improvements. With financial pressures ongoing within the supply chain, there is a need to continue to drive new contracting and operating models which help support the sustainability of the supply chain whilst unlocking new investment opportunities.

Despite the improvements in UOCs, costs in the UK remain comparably high internationally, mainly due to the maturity of the basin. Production volumes generally fall more quickly than operating costs as assets mature, with this being reflected in increased UOCs over time. Average field production in the basin is around 5,000 boepd, a reduction of more than 20 per cent compared with a decade ago, and more than 70 per cent lower than 20 years ago.

This results in increased technical and economic complexity across the basin, and leaves companies less able to take advantage of economies of scale.

Figure 16: International Comparison of Unit Operating Costs



OGUK’s Efficiency Task Force (ETF)¹⁵ provides the catalyst for cross-industry action to optimise operations across the basin. The ETF is focused on improving performance by facilitating initiatives which contribute towards optimising UOCs and further improving the basin’s global competitiveness. This work covers a range of business and operational processes including logistics, contracting, tendering, procurement and maintenance. Alongside this, the ETF promotes a culture of collaboration, with annual improvements in this area reported in OGUK and Deloitte’s Collaboration Index score.¹⁶

Attracting New Investment

It is important that the competitiveness of the UKCS is measured by more than just the cost of production. It is a combination of a number of factors, including:

- The stability and predictability of the fiscal regime
- The regulatory regime
- The network of infrastructure
- Commercial behaviours and the working relationships between companies
- Access to a well-resourced supply chain and the right people and skills
- The prospectivity and availability of proven resources and investment opportunities

¹⁵ For further information, see OGUK’s Efficiency Hub www.oilandgasuk.co.uk/efficiencyhub/#efficiency-hub+category:efficiency-task-force

¹⁶ www2.deloitte.com/uk/en/pages/energy-and-resources/articles/collaborating-for-success-making-the-most-of-UKCS.html

The overall competitive package of the UKCS provides a comparative advantage over other basins, despite its relatively high cost base. The OGA estimates that the internal rate of return (IRR) — a measure of the profitability of investments — is at least 13 per cent higher on the UKCS than other comparable basins. The UK also offers quicker capital payback times (with recent investments averaging around six years) and lower investment break-even costs (less than \$40/bbl in recent investments).¹⁷

This competitive advantage has been translated into new activity and investment in the basin. Buoyed by the entrance of new investors on the UKCS, more new field investments were committed to in 2018 than in 2015–17 combined. Attracting a steady stream of new capital to the basin will be crucial to sustaining production levels, providing energy security and supporting the UK supply chain.

As outlined in *Business Outlook 2019*, OGUK expects that 2019 will be a year of stabilisation in terms of total capital expenditure, with around £5–5.5 billion expected to be spent. The challenge is now to sustain this in the years to come as the UK transitions to a net-zero economy.

Evolving Operator Landscape

In recent years the UKCS has seen significant change and a continued evolution of the E&P landscape as major operators have rationalised their portfolios and new entrants have been attracted to the UK due to its improved competitiveness. In 2008, the ten largest producers accounted for approximately two-thirds of UKCS production; by 2018, that share had fallen to around 50 per cent. The landscape has continued to evolve in 2019, which has seen major corporate transactions with a combined value of more than \$5.4 billion, as shown below.

2019 Merger & Acquisition Activity	
 CHRYSAOR	Chrysaor's acquisition of the majority of ConocoPhillip's UK portfolio in a deal reported to be worth almost \$2.7 billion
 ITHACA ENERGY	Delek Group's (parent company of Ithaca Energy) purchase of Chevron's UK assets in a \$2 billion deal
 ROCKROSE ENERGY	Marathon Oil's divestment of its UK portfolio to Rockrose Energy for \$95 million
 النفط والغاز PETROGAS E&P	Petrogas NEO UK picking up a number of assets from Total E&P for around \$635 million
 one dyas	The merger of ONE and Dyas
 DNO EST - 1971	DNO's takeover of Faroe Petroleum
 TALON Petroleum	Talon Petroleum's takeover of Encounter Oil, giving the explorer an enhanced footprint on the UKCS

¹⁷ www.ogaauthority.co.uk/media/5727/oga_may_2019_v1_artwork.pdf

In addition to this there have been a number of smaller asset purchases and farm-ins to exploration and pre-development opportunities. It is clear that the UKCS is a basin which can satisfy the strategies of a wide range of investors, and ensuring investment opportunities are in the most appropriate ownership is resulting in increased recovery across the assets. For this reason, OGUK believes that the increased diversity of companies in the basin is positive and should be embraced.

The new wave of investors is also being welcomed by companies across the supply chain. New entrants are generally more reliant on the support and services of the supply chain and are often more able to embrace new ways of working adopt alternative approaches and contracting models.

New Field Approvals

Many of the projects which have received recent approval have benefitted from significant cost reductions, achieved through project re-scoping and adopting new ways of working and supply chain models, as well as technological improvements. This is evidenced by the fact that the projects approved in 2018 have average development costs in the region of \$9/boe. Although average development costs vary depending on the scale and nature of individual projects, this represents the lowest level for a decade and a similar level to projects which gained approval in Norway last year.

So far in 2019, three new fields have received investment approval: Seagull, operated by Neptune Energy; Storr, operated by Apache North Sea; and the Sillimanite field, which straddles the UK-Netherlands border, is being progressed by Wintershall DEA (pending approval of the field development plan [FDP]). It is expected that Seagull will begin production in late 2020 and be tied back to the existing ETAP infrastructure, while Storr could begin production in late 2019 and will be tied into the Beryl infrastructure via the Skene field. The Sillimanite field is expected to commence production in 2020.

CASE STUDY

Neptune Energy is operator of Cygnus in the southern North Sea, the largest producing gas field in the UK. The company is committed to growing its operations and takes an 'area plan' view of Cygnus, as well as looking forward to participating in the 32nd Offshore Licensing Round.

Neptune has moved forward several exploration and development projects as operator at a lower cost and on faster schedules than traditional approaches, including last year's acquisition of the Seagull development and Isabella prospect.

With Seagull — a multi-well subsea project connecting the oil and gas field with the BP-operated ETAP facility — Neptune anticipates an additional 50,000 boepd at peak. It is a strong example of a collaborative effort among operators and the supply chain, supporting the principles of MER UK.

Neptune has been active in exploration and participated in the drilling of three wells on the UKCS in 2018–19. The Isabella prospect is considered one of the largest undrilled exploration opportunities in the central North Sea, with spudding anticipated later in 2019.

In addition, there have been some examples of significant brownfield investments to upgrade existing fields and infrastructure. Repsol Sinopec has confirmed it will reinstate production from the Galley field which has been shut in since 2012 and INEOS FPS is investing £500 million to upgrade and extend the life of the crucial Forties pipeline system, which transports around 40 per cent of UKCS liquids production.

Overall, OGUK now expects that 8–10 new fields could receive investment approval in 2019, potentially releasing around £2 billion of new investment and up to 240 million boe in resources. Although this estimate is lower than initial forecasts outlined in *Business Outlook 2019*, there remains a relatively healthy pipeline of projects still being progressed towards final investment decision (FID) in the basin.

Prospective Field Investment Decisions	
	Premier Oil is planning to approve further development opportunities around its Catcher hub, in the form of the Laverda and Catcher North subsea field tiebacks. ¹⁸
	The i3 Energy-operated Liberator field is being progressed towards FDP. ¹⁹
	Independent Oil and Gas (IOG) hopes to make an FID on its Blythe and Vulcan gas hub in the southern North Sea in the second half of 2019, following a farm-down to CalEnergy.
	Wintershall-DEA is progressing the Winchelsea project in the southern North Sea. ²⁰
	Parkmead aims to make FID on the Perth development in late 2019, with first production slated for early 2022. The field will be tied into the Scott infrastructure in the central North Sea. ^Δ
	Ping Petroleum is making progress on the Avalon field and hopes to be in a position to commence drilling activity in late 2019. ^Δ
	Front-end engineering and design (FEED) has been commenced for Cambo, operated by Siccar Point, with indications that an investment decision could be reached in late 2019 or early 2020.
	Repsol Sinopec is progressing plans for the Tain field in the central North Sea, which would be tied back to the Bleo Holm FPSO. ²¹
	Dana Petroleum hopes to make an investment decision on its Platypus field tieback to the Cleeton platform in the southern North Sea in Q1 2020. ^Δ
	Hibiscus Petroleum is currently in the pre-FEED stage of its Marigold and Sunflower developments in the central North Sea. ^Δ
	The host facility for Shell's Jackdaw facility has been selected (Shearwater) and the project is now moving into the FEED stage. This has benefitted from the investment sanctioned in 2018 to upgrade the gas export infrastructure around the Shearwater hub. ^Δ
	EnQuest is currently assessing options for its Eagle investment opportunity. ²²
	Equinor is progressing work on the Rosebank field west of Shetland, with the application of learnings from across its portfolio in order to optimise the development. An investment decision is now being targeted for 2022.

¹⁸ <http://www.premier-oil.com/operations/uk>

¹⁹ <https://i3.energy/operations/liberator/>

²⁰ <https://wintershalldea.com/en/where-we-are/united-kingdom>

^Δ <https://itportal.ogauthority.co.uk/pathfinder/currentprojectsindex.html>

²¹ <https://www.energyvoice.com/oilandgas/north-sea/197524/repsol-sinopec-plan-targets-additional-10million-north-sea-barrels/>

²² <https://www.enquest.com/media/press-releases/article/operations-update-3>

Although good progress is being made, delivery of these projects still carries an inherent degree of uncertainty. It is crucial that industry and government continue to work constructively to maintain the UK's comparative advantage over other global basins, otherwise the UKCS may lose out amidst strong competition for international investment. Maintaining stable and predictable fiscal conditions throughout any governmental or political change is a vital component of this.

Supply Chain Sustainability and Investment

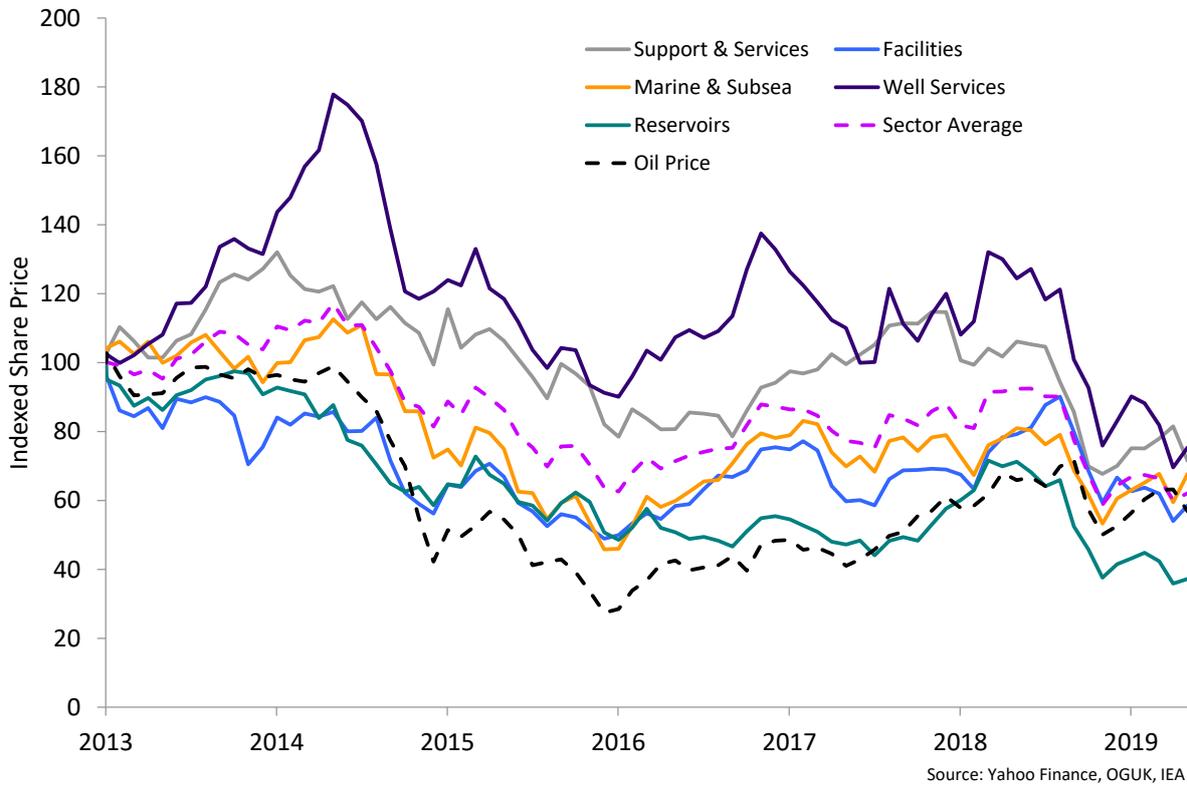
While it is vital that the UKCS remains as competitive as possible to unlock new opportunities, it is also important to ensure that a healthy balance is achieved between cost control and ensuring the sustainability of companies within the supply chain. The ability to access a strong and well-resourced supply base is crucial in meeting long-term demand from operators and to ensure that overall cost pressures are controlled. The UK market needs to be seen to present a good long-term business opportunity for supply chain companies which allows them to be able make an appropriate return on their investment. Loss of supply chain capacity will ultimately lead to lower levels of innovation and a tighter market with a more volatile cost base.

In recent years, as the industry has seen lower investment levels, reduced contract rates and a drive to improve efficiency, the revenues of the UK supply chain have fallen by around one-third, from almost £40 billion in 2014 to £27 billion in 2017 (based on the latest available data).²³ Alongside this, supply chain companies have seen lower margins; in some cases these have even become negative (i.e. contract rates are below levels of operating expenditure). Data provided by Rystad Energy show that the revenue and margin reductions have been greater in the UK when compared to a global benchmark. Some asset-intensive sectors (such as drilling and aviation), also need to take into account capital costs on top of operating expenses.

These trends have had a negative impact on the sentiment of investors. Figure 17 overleaf outlines the indexed share price of a number of companies which form a representative share of the different sectors of the UK supply chain. Although there are variations within and across sectors, the average share price of these companies is around 40 per cent lower than it was in 2014 and amongst the lowest levels of the last five years. This reinforces that confidence in the market remains fragile, reflecting the ongoing challenges that supply chain companies continue to face.

²³ EY *OFS Report* www.ey.com/uk/en/industries/oil---gas/ey-review-of-the-uk-oilfield-services-industry-january-2019

Figure 17: Share Price Performance of a Cross-Section of Supply Chain Companies

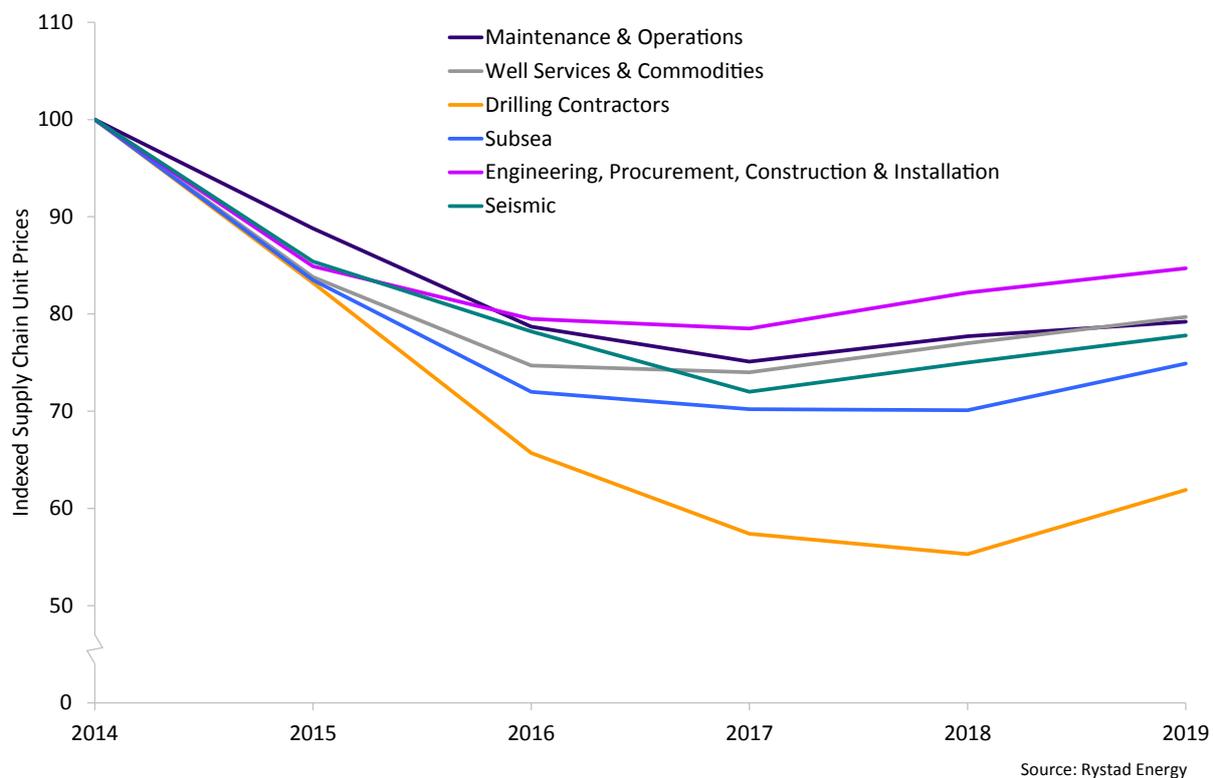


OGUK anticipates that supply chain revenues will have largely stabilised in 2018 and some growth may be seen in 2019, reflective of wider industry expenditure and investment levels. As outlined in *Business Outlook 2019*,²⁴ two-thirds of OGUK members expect to report an increase in revenues this year.

In a study commissioned by OGUK, Rystad Energy estimates that the growth in UK oilfield services market may even reach 16 per cent this year and then grow at an average rate of 5 per cent per year from 2020–24. However, it should be recognised that this growth is from a low baseline and may not be reflected in all areas of the supply chain.

²⁴ OGUK *Business Outlook 2019* www.oilandgasuk.co.uk/product/business-outlook-report/

Figure 18: Offshore Supply Chain Cost Index



As business begins to pick up, it is important that the focus on efficiency and performance improvement is maintained — only by doing so will the spiral of cost inflation, as seen in previous cycles, be avoided. New business and contracting models, innovation, partnerships and true collaboration are all vital to achieving a sustainable balance between cost control and a reasonable return on investment for supply chain companies. Increasing the focus on value-driven outcomes rather than solely on costs will require all companies to work even more constructively, with a more balanced share of risk and reward. There are many examples of these collaborative approaches and this work needs to continue at an increased pace. Experience shows companies are most effective at developing and implementing new contracting strategies when the whole organisation, at all levels, is committed to achieving such an outcome — senior leadership acting alone cannot achieve the same impact.

OGUK members have developed a new set of Supply Chain Principles which aim to further improve the commercial relationships between operators and contractors and drive an overall more sustainable supply chain across the basin.

Supply Chain Principles	
	Risk and costs should be borne appropriately, be proportional to the work scope and not be forced on anyone; opportunity or good performance should benefit everyone, and performance-based contractual rewards should be investigated.
	Contractual terms and conditions (e.g. length of contract and/or work scope) will seek to use industry standard contracts when appropriate and all parties will commit to mutuality of payment terms (including 'mutual SC payment terms'). These should reflect that the supplier has to invest for the future of the UK and make an adequate return on its investment in innovation and new technology.
	All parties should ensure they have the competence and skill to deliver the work being tendered and will not accept re-bidding as a means of driving price down.
	Contract cancellations should not be without good reason or cause. If an operator or contractor must have the ability to terminate a contract, the circumstance or risk should be outlined, explained and understood, not hidden.
	Purchasers shall endeavour to optimise their tendering and audit requirements to ensure that the supplier's resources, time and costs are not unnecessarily impacted or wasted.
	Tender processes and evaluations should be based on value-added rather than unit rates and be flexible to evaluate alternative offers as part of the bidding process.
	An alternate bid (either technical or commercial) which an operator sees as a winning proposition should be selected for award on its merit. Current practices of sharing alternate solutions with other bidders to allow them to price against it should cease.
	Operators and contractors should discourage the practice of "low ball" bidding - which invariably leads to multiple contract variations and affects re-negotiation in the early phase of the contract.
	To support respective labour agreements in place across the workforce, operators should agree clear rate escalation mechanisms and move away from the practice of fixing labour rates for multiple years.
	Where a supplier (or potential supplier) feels unfairly treated or taken advantage of, they should notify the operator Managing Director who will ensure speaking up is not held against them.

Many supply chain companies have increasingly diversified their businesses into other industries in recent years. This strategy has been crucial to help many survive the downturn in the sector, by enabling them to spread financial risk and balance their exposure within the oil and gas market. In OGUK's *Business Outlook 2019* it was shown that more than half of OGUK members surveyed have already diversified into other energy sectors, however oil and gas business remained as their primary source of income. The drive to achieve a net-zero economy will provide further opportunities (see section 5.2), with estimates suggesting that achieving this aim could require up to £1 trillion of investment.

CASE STUDY

Baker Hughes, a GE company (BHGE), Montrose Subsea Centre of Excellence is an industry-leading manufacturing campus designed to deliver a fully connected "one-stop" shop. The campus is an important milestone for BHGE globally, believing it to be one of the most advanced facilities of its type in the world.

The expansion represents a £31 million BHGE investment supported by a £4.9 million grant from the Scottish government, through Scottish Enterprise.

The upgraded and expanded campus enables BHGE to offer product innovation, from design to delivery, from one location servicing customers across the world. The advanced manufacturing technologies serve global activities today and enable continuous product innovation and technology advancements for the future. The commitment by BHGE and Scottish Enterprise to invest in people development will also drive long-term global business sustainability. One campus brings greater efficiency for customers and eliminates extra transportation between sites, helping to reduce environmental impacts. The investment has created at least 160 jobs, exceeding initial targets of 100 and taken total headcount to around 570.

BHGE also doubled its apprenticeship intake in 2019 by launching a programme that develops the skills of current and future employees.

Decommissioning Excellence

As a mature basin, activity takes place across the oil and gas lifecycle on the UKCS, from exploration through to decommissioning. Effective management of late-life and decommissioning operations is important to ensure that MER is achieved. This is being helped by the wave of corporate and asset transactions in recent years, with many new entrants bringing fresh thinking to revitalise under-invested, often late-life assets.

OGUK's *Decommissioning Insight Report 2018*²⁵ outlined that decommissioning expenditure in the UK is expected to be stable over the next decade at around £1.5 billion per year. Looking further out, OGA's *Decommissioning Cost Estimate Report 2019*²⁶ forecasts that annual decommissioning expenditure will peak in 2030, at almost £2.5 billion per year. The OGA is working with industry to reduce total costs (based on a 2017 baseline) by 35 per cent — a target which industry is already halfway to achieving. This cost estimate has fallen from almost £60 billion to £49 billion over two years, with the aim of achieving £39 billion by 2022.²⁷

²⁵ *Decommissioning Insight Report 2018* www.oilandgasuk.co.uk/wp-content/uploads/2019/03/OGUK-Decommissioning-Insight-Report-2018.pdf

²⁶ *OGA Decommissioning Cost Estimate 2019* www.ogauthority.co.uk/media/5906/decommissioning-estimate-cost-report-2019.pdf

²⁷ The £39 billion figure is based on a 2017 baseline. Total outturn costs are likely to be slightly higher due to new infrastructure additions.

Much of this reduction has come from increased understanding of the details involved in these decommissioning work scopes, which has acted to reduce any cost uncertainty. However, some of the additional reductions can be attributed to more effective ways of working and innovative contracting as industry continues to learn, gain greater experience in decommissioning and begin to industrialise some of the processes involved.

Industry pays for the full cost of decommissioning in the first instance and, since this expenditure is a normal cost of doing business in the UK, tax relief is provided on this decommissioning expenditure. The OGA estimates that around £16.8 billion may be accessed by industry as tax relief, a reduction from the previous estimate of £24 billion.²⁸

The fiscal regime's treatment of decommissioning is important. Continued certainty regarding tax relief reduces investment risk and increases the attractiveness of the UK in a competitive global environment. Recognising this, government has made a permanent commitment to industry that tax relief on decommissioning expenditure will continue to be available on a long-term basis, by putting Decommissioning Relief Deeds (DRDs) in place in 2013. As a result of the DRDs, risk premiums have been reduced and £6 billion of capital has been unlocked for reinvestment which would have not otherwise been available.

CASE STUDY

Well-Safe Solutions is exclusively focused on bringing new solutions to the well decommissioning market, offering the first fully integrated 'Tier 1' service provision in this domain. Well-Safe will deliver safe and efficient multi-operator, multi-well decommissioning operations using dedicated and bespoke assets deployed as part of the 'P&A club' concept in collaboration with clients. This innovative commercial approach offers significant benefits through sharing value and risk over an aggregated work scope which enables continuity and leads to continually improving performance with lower and more predictable costs.

To enable this model, it became evident that ownership of key assets was necessary to be able to provide that long-term price stability and predictability. Well-Safe has recently acquired the Well-Safe Guardian, a semi-submersible rig, which is currently undergoing conversion into a bespoke well decommissioning asset. With the addition of a saturation dive spread and riserless subsea intervention system, the unit aims to deliver a materially different solution to the decommissioning market.

As a part of the Forth and Tay Alliance — which aims to establish Dundee as a hub for North Sea decommissioning — and in conjunction with other service companies, Well-Safe will deliver full scale well decommissioning solutions from design engineering through to execution, whilst simultaneously supporting regulatory reporting and HSE leadership.

Supply Chain Opportunity

Estimates from Wood Mackenzie suggest that \$82 billion will be spent globally on decommissioning activity over the next decade.²⁹ This provides a significant opportunity to use the UK industry's experience to unlock new global opportunities for the supply chain.

²⁸ www.ogaauthority.co.uk/media/5960/exchequer_cost_decommissioning_august_2019.pdf

²⁹ Wood Mackenzie – *Upstream decommissioning: where's next and who pays?* July 2018

www.woodmac.com/reports/upstream-oil-and-gas-upstream-decommissioning-wheres-next-and-who-pays-22918

The UK government recently called for evidence under the banner of *Strengthening the UK's Offshore Oil and Gas Decommissioning Industry*.³⁰ The consultation had two central themes:

1. How the UK decommissioning industry could further improve its ability to serve the UK market, support MER UK and reduce the overall costs of decommissioning
2. What could be done to encourage the domestic industry to export its decommissioning expertise abroad and position Scotland, together with the rest of the UK, as a world-leading hub for decommissioning

OGUK believes that a strategic approach should be adopted, building a global decommissioning capability in three phases:

1. **Excelling in the UK market:** In the immediate term, UK-based companies should seek to maximise their share of the domestic decommissioning market, building on areas where a competitive advantage already exists and creating alliances with others where the UK lacks suitable capability.
2. **Competitive regionally:** In the short term, the UK supply chain must take full advantage of the regional decommissioning market around the North Sea, much of which can be handled by UK facilities and using UK capability to its full extent. Forecasts suggest that 48 per cent of global decommissioning expenditure will be spent in the North Sea area with the UK, Denmark, the Netherlands and Norway all anticipating an extensive decommissioning portfolio over the ten-year window.
3. **Targeted international ambition:** In the longer term, the UK should pursue opportunities globally based on its reputation for delivering North Sea projects. However, it should be recognised that some capabilities developed for the regional/North Sea market may not be as relevant internationally. It is essential to identify the areas (both activities and services) where the UK has an advantage when considered against local competitors to develop an international hub for decommissioning.

4.4 Resource Progression Activity

Around 45 billion boe have been recovered from the UKCS since production began in the basin in 1967, with an estimated 10–20 billion boe of potential resources still to be recovered. Having the correct investment framework in place is crucial to help unlock this remaining opportunity.

The latest data from the OGA³¹ show that, at the end of 2018, estimates of the remaining potential of the basin could be categorised by:

- **5.5 billion boe of proven and probable (2P) reserves.** Reserves considered to be economically and technically recoverable and contained in currently producing fields, or fields under development. Proven reserves have a greater than 90 per cent chance of being recovered, whereas probable reserves have a more than 50 per cent chance of recovery.
- **7.5 billion boe of contingent (2C) resources.** Contingent resources are known opportunities which are potentially recoverable but do not currently have committed investment plans in place.
- **4.1 billion boe of prospective resources (mean estimate).** Prospective resources are those in mapped leads and prospects which have not yet been drilled.

³⁰ https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/785544/strengthening-uk-offshore-oil-gas-decommissioning-industry-cfe.pdf

³¹ www.ogauthority.co.uk/news-publications/news/2019/uk-oil-and-gas-reserves-and-resources-report-published/

Increased investment in resource progression activity (exploring, maturing, commercialising and developing opportunities) will be crucial to unlock the full potential of the UKCS. Continued exploration and appraisal (E&A) activity is required to find, and then increase the understanding of, new field development opportunities. Alongside this, securing investment for the development of new fields and barrel-adding opportunities within existing fields, and increasing levels of development drilling and value realised is vital.

Exploration and Appraisal Activity

Following the record-low levels of activity seen in 2018, there has been a welcome increase in exploration activity in the first half of 2019. Eight exploration wells commenced drilling in the first seven months of the year — the same number as those drilled during the whole of 2018. The increased activity levels demonstrate the attractiveness of the UKCS and the confidence that E&P companies have in the prospectivity and future of the basin.

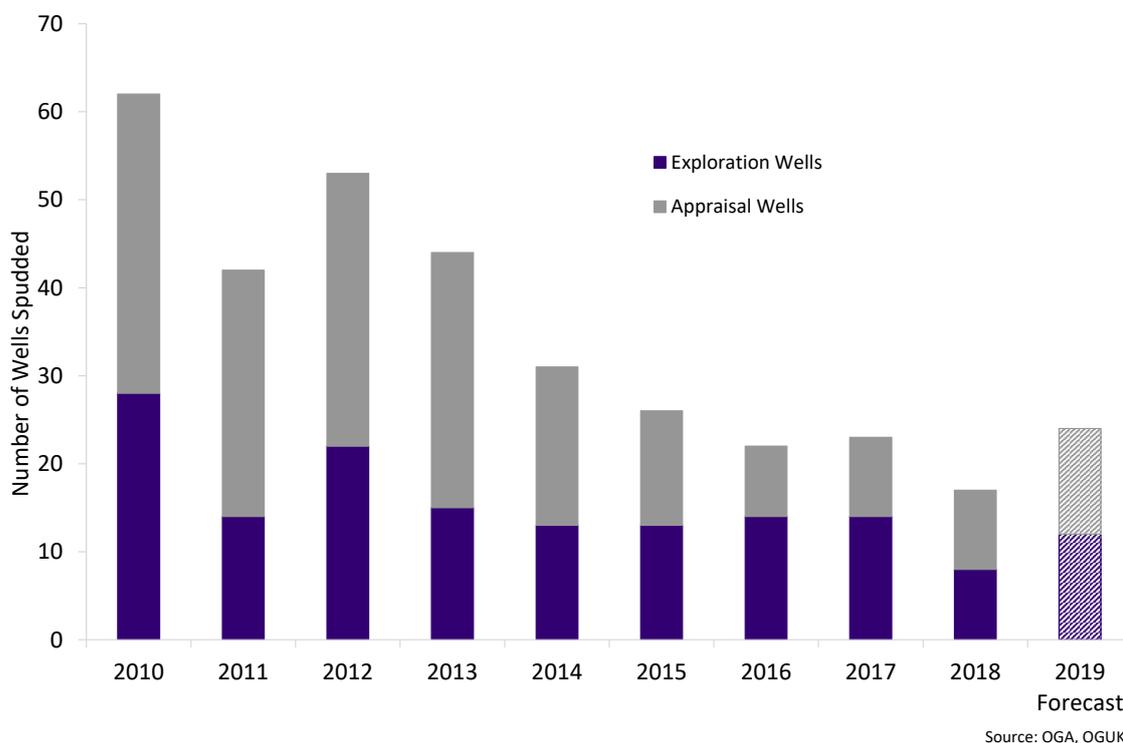
Despite low levels of activity in recent years the UKCS has seen good examples of exploration success, with up to 485 million boe discovered from wells drilled in 2018 alone. Nevertheless, it should be remembered that exploration activity does carry a high level of technical and commercial risk. Overall success across the wells for which results have been announced so far this year has been limited, but the nature of these wells must be taken into account, especially given the targets are in relatively underexplored areas and plays with relatively higher levels of technical risk. The wells spudded so far in 2019 include:

- **Pip and Bigfoot** — Operated by Equinor, it was announced that these wells in the central and northern North Sea did not encounter commercially viable hydrocarbons.
- **Blackrock and Lyon** — Operated by Siccar Point Energy, the results of these wells have been mixed. The Lyon well, which was targeting up to 3 trillion cubic feet (tcf) of gas, was a dry hole. However, the Blackrock well has proven the existence of charged reservoirs along the Corona Ridge between the Rosebank and Cambo fields. This result will be used to define further targets in the area.
- **Warwick Deep** — Operated by Hurricane Energy, the well did not encounter commercial hydrocarbons.
- **Darrach** — Operated by ONE-Dyas. Drilling opportunities at this well, located in a relatively underexplored region of the Mid-North Sea High, are ongoing at the time of writing.
- **Rockhopper** — Operated by Shell, the well was advanced from 2021 with drilling ongoing at the time of writing.
- **Andromeda** — Operated by Spirit Energy, the well is targeting the prospect in the southern North Sea. Close to the West Pegasus field, any future development could make use of the Cygnus infrastructure, if successful.

In addition to the exploration wells, ten appraisal wells have also been drilled at the time of writing:

- **Mabel** — The results of the Chrysaor-operated well have yet to be disclosed.
- **Verbier** — Operated by Equinor, the results have led to a downgrading of the estimated resources in place to around 25 million boe.
- **Colter** — Further work will be required by Corralian Energy to refine the reserves estimate.
- **Jasmine Area** — Operated by ConocoPhillips, drilling operations are ongoing at the time of writing.
- **Lincoln** — Operated by Hurricane Energy in the fractured basement play west of Shetland, drilling operations are continuing at the time of writing.
- **Buzzard Area and Cragganmore** — CNOOC is conducting appraisal work on these targets in the central North Sea and west of Shetland, respectively.
- **Glendronach** — Operated by Total, the west of Shetland discovery is one of the largest on the UKCS for a decade. Drilling operations are ongoing at the time of writing.
- **Harvey** — Independent Oil and Gas (IOG) is currently appraising the southern North Sea prospect.
- **Tolmount East** — Premier Oil is appraising this opportunity in the area of the Tolmount hub.

Figure 19: Exploration and Appraisal Activity on the UKCS



Looking forward, there is a healthy pipeline of exploration and appraisal activity, as a variety of plans are put in place for the second half of 2019 and further prospects matured towards drill-ready states. It is expected that overall levels of activity will be in line with those seen prior to 2018, at around 12–14 exploration wells and a similar number of appraisal wells. Westwood Global Energy estimates that a total of five exploration and four appraisal wells could begin drilling in August alone — this would mark the highest level of monthly activity since August 2010.³²

Notable prospects expected to be drilled in the remaining months of 2019 include:

- **Howick** — CNOOC plans to drill this west of Shetland prospect.
- **Lifjellet** — Equinor has high expectations for the prospect, noting that it is a “well to watch”.
- **Chimera** — This target is expected to be drilled by Cairn Energy in the central North Sea, targeting more than 150 million boe.
- **Isabella** — Neptune Energy plans to explore this opportunity in the southern North Sea.
- **Liberator West** — i3 Energy intends to conduct further appraisal in the Liberator area in the central North Sea.
- **Avalon** — Summit Petroleum plans to conduct further appraisal of this field, and wells are expected to be converted to development wells if successful.
- **Aspen** — The prospect, operated by ENI, is expected to be drilled in the southern North Sea.

³² www.energyvoice.com/oilandgas/north-sea/205244/most-north-sea-wells-due-to-spud-since-2010/

Thirty-seven licences were awarded across 30 companies in the 31st UK Offshore Licensing Round, representing a near 50 per cent increase in awards compared with the previous frontier round (the 29th Round), and 13 more companies offered licences. It is also encouraging that 70 per cent of the awards contain commitments to obtain or reprocess seismic data which will aid future success rates. Two licences will also progress straight to the field planning stage: Shell with an award in the area around the Penguins field in the northern North Sea; and Chrysaor with a licence in the central North Sea containing the Phoenix discovery. The 32nd Licence Round is now open for applications and the results of the 31st Supplementary Round (focused on the Greater Buchan Area) will be announced later this year.

The level of interest seen in recent rounds demonstrates the continued attractiveness of the basin to a range of different E&P companies. The support of government and regulators remains key, with recent examples of support welcomed by industry:

- The National Data Repository (NDR) has been established to house the UK's petroleum-related data and information in an accessible way, which will help companies unlock the remaining potential of the UKCS. Geophysical, well and infrastructure data are all held in one data centre, enabling licensees to share their data with each other, and providing an important vehicle for companies to apply new technological techniques which should enable more accurate interpretation of the subsurface.
- The government has invested in the collection and reprocessing of new seismic data covering underexplored areas which were selected after industry engagement. The programme has helped to support the UK oil and gas industry by providing seismic data in areas which have not been surveyed for many years. The funding has also allowed other geological studies to be conducted and the findings released to industry to complement the data, increasing understanding of the petroleum systems active in the UKCS.
- Industry and regulators are also working together to bring greater transparency to the licensing process in the UK. This should allow industry to better understand when awards will be made and what external factors may affect the licensing timeline. OGUK's annual Exploration Conference also provides a unique opportunity for licensees to share recent lessons learned gained from drilling E&A wells in the North Sea and Atlantic Margin. Delegates are able to learn from each other's experience and take away learnings to implement in their own companies when planning and executing E&A wells. OGUK proactively encourages operators to share the lessons they have learned after drilling operations are complete.

Unlocking Opportunities to Increase Recovery

The recovery factor of fields in production has remained unchanged over the past decade, with around 43 per cent of total reserves in place being recovered. The increasing technical and economic challenges as the basin has matured have been key issues in limiting cross-industry improvements in recovery factors, however even a small improvement can unlock significant value; the OGA estimates that a 1 per cent increase would unlock an additional 340 million boe. Better understanding of barrel-adding opportunities — including increased well intervention activity and enhanced well delivery — will all contribute towards improving overall recovery rates. The development and uptake of new technologies, constructive working across E&P companies and partnerships with the supply chain are all key to improved industry performance.

Along with the Asset Stewardship Task Force, OGUK is leading a number of cross-industry initiatives with the aim of driving increased recovery rates. These are aligned under the themes in the table below.

Figure 20: OGUK Reserves Progression Work³³

Focus Area	Problem Statement	Progress
 Reserves Progression	2.3 billion boe of contingent resource locked inside existing field determination areas. What can industry do to help unlock these volumes?	OGUK has developed a self-evaluation tool to allow E&P companies to identify gaps in their workflows that could help unlock additional volumes.
 Identifying & Ranking Opportunities	Are all economic opportunities identified, and what is the optimum ranking/budgeting approach?	Unlocking investment for barrel-adding activities guidance to be published in Q3 2019.
 Data-driven Approach	Balancing value with complexity, what are the highest impact industry opportunities?	Following a Well Optimisation workshop in Q1 2019, the group has identified maximising subsea well interventions, with a focus on cost reduction as an area of priority.



CASE STUDY

Hunting International has partnered with Titan Oil Recovery Inc to market a new Organic Oil Recovery (ORR) technology which can help reduce, or even reverse, production decline from reservoirs and help restore shut-in wells.

The technology has the potential to help increase overall recovery rates by manipulating, and treating, microbes which are found naturally in reservoirs. The technology can also reduce hydrogen sulphite levels by preferentially targeting certain species of microbial life. The approach has been tested in more than 300 wells on 48 commercial oil and gas fields around the world, resulting in a success rate of 94 per cent and an average increase in flow rates of 92 per cent, and will begin field trials on the UKCS later this year.

³³ For more information, download OGUK's *Reserves Progression Self Verification Tool* www.oilandgasuk.co.uk/product/reserves-progression-self-verification-tool-and-comms-pack/

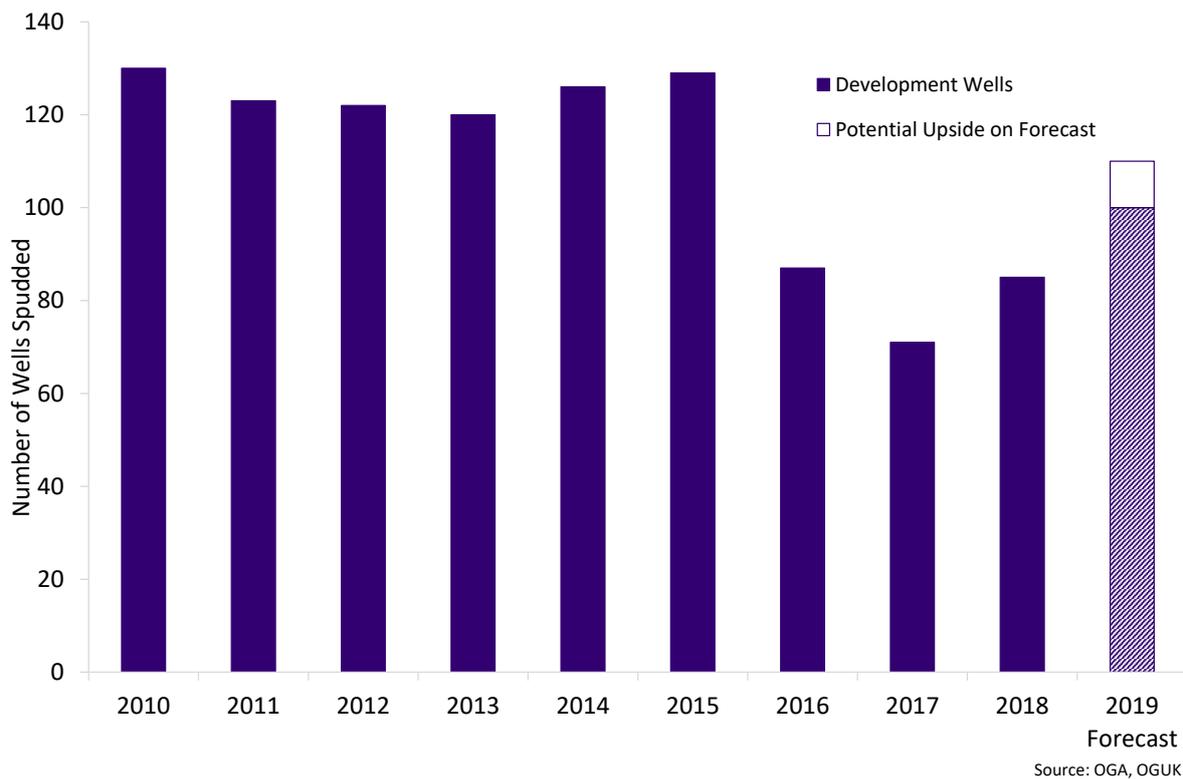
Development Drilling

Development drilling is crucial to unlocking contingent resources, as the relatively low level of drilling in recent years reflects the slowdown in new field approvals and general capital discipline across the industry.

Seventy development wells were drilled in the first seven months of 2019, compared with 58 in the same period in 2018, a 20 per cent increase. Development drilling levels are being boosted by drilling operations across several projects which gained development approval in 2018, as well as infill drilling on brownfield assets. Sixteen production operators have drilled development wells so far this year, with some operators recommencing drilling operations on assets for the first time in many years. Repsol Sinopec, for example, is reactivating drilling packages on its Claymore and Piper Bravo platforms — a move that is expected to help recover up to an additional 9 million boe — and similar work is now taking place elsewhere in the basin.³⁴

Based on this trend and the visibility of upcoming work plans, it is anticipated that more than 100 development wells will be drilled on the UKCS this year, for the first time since 2015. This is encouraging and hopefully represents a return to a more sustainable rate of drilling across the basin.

Figure 21: Development Well Drilling on the UKCS

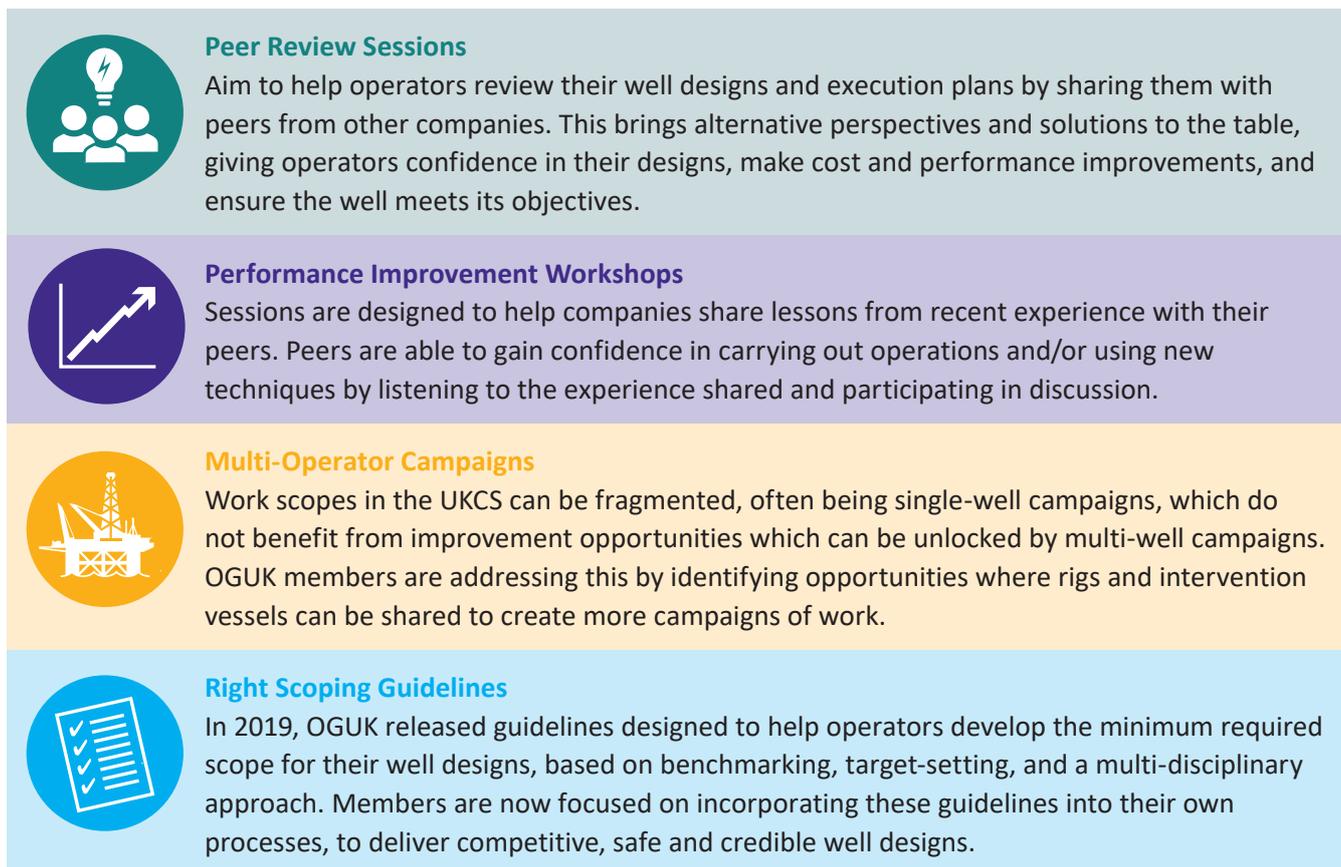


The recent focus across industry on competitive well delivery is also having a positive impact, with improvements made across operational performance and in the uptake of more constructive supply chain models. For development drilling rates to continue to stabilise, industry must maintain its focus on effective well delivery, increasing value and continuing to adopt new and innovative commercial models with supply chain partners.

³⁴ www.energyvoice.com/oilandgas/north-sea/197524/repsol-sinopec-plan-targets-additional-10million-north-sea-barrels

Industry has made good progress and must continue to work collectively to maximise value for both E&P and supply chain companies. OGUK’s Competitive Well Delivery initiative aims to unlock more opportunities on the UKCS which will contribute to an increase in drilling activity across the basin. The initiative is making good progress across several focus areas, outlined in Figure 22.

Figure 22: OGUK Competitive Well Delivery Focus Areas



OGUK’s Wells Forum, which supports this initiative, also helps safeguard other aspects central to a competitive basin. The industry’s globally renowned technical guidelines, published by OGUK, cover the entirety of the well lifecycle and help protect the industry’s licence to operate. Additionally, the forum addresses emerging risks and challenges that the wells community faces in a collaborative and open manner.

CASE STUDY

In 2018 Shell made seven project investment decisions for the UKCS, including the development of the Penguins field in the northern North Sea, and Fram, Arran, the Shearwater gas hub and the Gannet Export infrastructure investments in the central North Sea. These new project sanctions have a direct impact on increased drilling activity over the next three years, with more than 20 development wells associated with these projects. Shell also plans to drill up to five exploration and appraisal wells over the next three years, resulting in a level of drilling activity not seen for over a decade.

CASE STUDY

The operator of the Jasmine area has implemented 'relational contracting' principles with key suppliers forming a 'Well Alliance' between seven well operations suppliers who play a critical role in their drilling campaign. The Alliance demonstrates commitment to a new collaborative way of working, based on relational contracting principles such as problem solving, joint working and performance measurement.

To acknowledge and reward supplier contribution to overall performance, the Alliance Incentive Scheme was implemented, whereby savings are shared between the client and Alliance members. The proportion shared increases on a sliding scale, to incentivise contractors to deliver superior performance. Identified improvement opportunities have already realised significant value for all parties.

CASE STUDY

During well operations, drilling tools and equipment can often become lost or stuck downhole (around half of these jobs involving the retrieval of drilling cable), creating potential problems around the performance of the well. Gaia Earth Sciences has developed a new technology to help mitigate this problem — the Cable Protection System — which helps reduce friction on the cable and ensures it remains suspended above areas of risk in the well.

The system also helps predict and model cable sticking and allows drilling engineers to optimise their well paths. This provides confidence that the well operations will be completed successfully and efficiently and also avoid costly subsequent interventions. The technology is designed and manufactured in the UK (in Wales) and has been exported and applied globally, delivering a 98 per cent success rate and significant cost improvements.

5. Oil and Gas Industry Roadmap to 2035: A Blueprint For Net-Zero

In Summary

The global population continues to grow, and as societies become more wealthy, economic growth drives demand for energy, especially within developing economies. This presents the challenge of continuing to meet society's needs for access to energy in a safe, sustainable, secure and affordable manner. In almost all credible future scenarios, the energy provided by the oil and gas industry will continue to be a vital part of the global energy mix.

However, societal expectations are changing as the world seeks to respond to climate change through behavioural, technological and economic adaptation. The oil and gas industry, and the wider energy sector, is evolving in line with this challenge that we collectively face.

The UK is the first G7 economy to commit to achieving net-zero emissions by 2050, and 2045 in Scotland. Over the last fifty years, the UK domestic oil and gas industry has helped provide secure and affordable energy to drive economic growth, and it has the potential to do so for decades to come.

Delivering the UK's net-zero ambition can be supported by the oil and gas industry with its skills, resources and expertise. The sector can continue to supply secure energy while contributing to climate goals by reducing emissions from its own production operations, helping to mitigate emissions from across the economy and advancing the development of low-carbon energy sources.

To enable this approach, and following extensive cross-industry consultation and engagement, *Roadmap 2035* has been developed to outline the current and future activity being undertaken by industry in line with the ambition for the sector in a net-zero UK economy. This roadmap represents the evolution of Vision 2035 and outlines how everyone involved in this industry can help secure its exciting future whilst meeting society's needs in a sustainable and safe manner.

The UK oil and gas industry supports the ambition to achieve a net-zero carbon economy



Oil and gas will continue to make a vital contribution to the energy mix and energy security post-2050



The industry has the skills, experience and resources to help the UK economy achieve net-zero



5.1 Roadmap to 2035

The UK oil and gas industry is already taking action to ensure that the UKCS becomes a net-zero basin by 2050, by addressing the carbon footprint of its production operations. Alongside this, the sector has an important role to play in developing and commercialising the technology which will help enable the UK to become a net-zero economy. Becoming a global leader in this area will create opportunities for the UK oil and gas industry to provide knowledge and capability to the global market.

In doing so the industry will help ensure continued energy security, by meeting as much as possible of the UK’s oil and gas needs from home-produced resources. Achieving this will help sustain supply chain opportunities in the UK, generate new opportunities around the world and ensure that the industry can retain and attract the diverse and talented workforce it needs, supported by a collaborative and inclusive culture.

To help deliver this ambition, specific nearer-term deliverables have been identified, with many of them already in progress and others in active planning. These are outlined in *Roadmap 2035* which will continue to develop along with industry. Following significant cross-industry engagement, the roadmap is the evolution of Vision 2035. By 2035 the industry will be on track to:

- Become a net-zero GHG emissions basin by 2050
- Meet at least 50 per cent of UK oil and gas demand from domestic production — thereby minimising imports
- Grow and diversify energy supply chain export revenues to £20 billion per year
- Secure at least 130,000 direct and indirect jobs
- Create over £10 billion in economic value through technology and innovation

ROADMAP 2035 A BLUEPRINT FOR NET-ZERO

Supporting net-zero

- On track to be a net-zero oil and gas basin
- Developing Carbon Capture Usage and Storage and other low-carbon technologies, at scale
- Underpinning an increasingly diversified energy system

Helping meet UK energy needs

- Providing over half of the UK’s oil and gas demand
- Delivering over 1 million barrels of oil and gas each day
- Foundation of an integrated energy system on the UK Continental Shelf

Developing people and skills

- Developing a diverse workforce with transferable skills, supported by an inclusive culture
- Attracting 40,000 people, a quarter of which will be in new roles
- Be recognised as a global leader in carbon management

Driving technology and innovation

- Establishing a Net Zero Technology Solution Centre
- Creating more than 100 new technology start-ups, adding £2 billion in economic value
- Adding over £10 billion in economic value through technology and innovation

Growing the economy and exports

- Continuing to add billions of pounds of value to the UK economy
- Increasing exports from the diversified oil and gas sector to £20 billion each year
- Increasing the number of supply chain firms exporting by 50%

Oil and Gas Industry Roadmap to 2035

Roadmap 2035 signals an exciting future for the UK oil and gas industry. It builds on the capabilities that the sector has been developing for over 50 years. Industry now needs to cement its place in the UK’s energy future, with support from government, regulators, investors and our wider society.

As has been outlined, industry is already making good progress across a number of areas. The basin is now more attractive to new investors, production performance remains strong, drilling activity is increasing and new technologies are making a positive impact. It is important that industry retains its focus on performance as it helps the UK transition to a net-zero economy. The following section outlines how industry is evolving within this context, and how it will be vital to helping the UK reach net-zero.

To find out more about industry’s *Roadmap 2035*, go to www.energyvision2035.com.

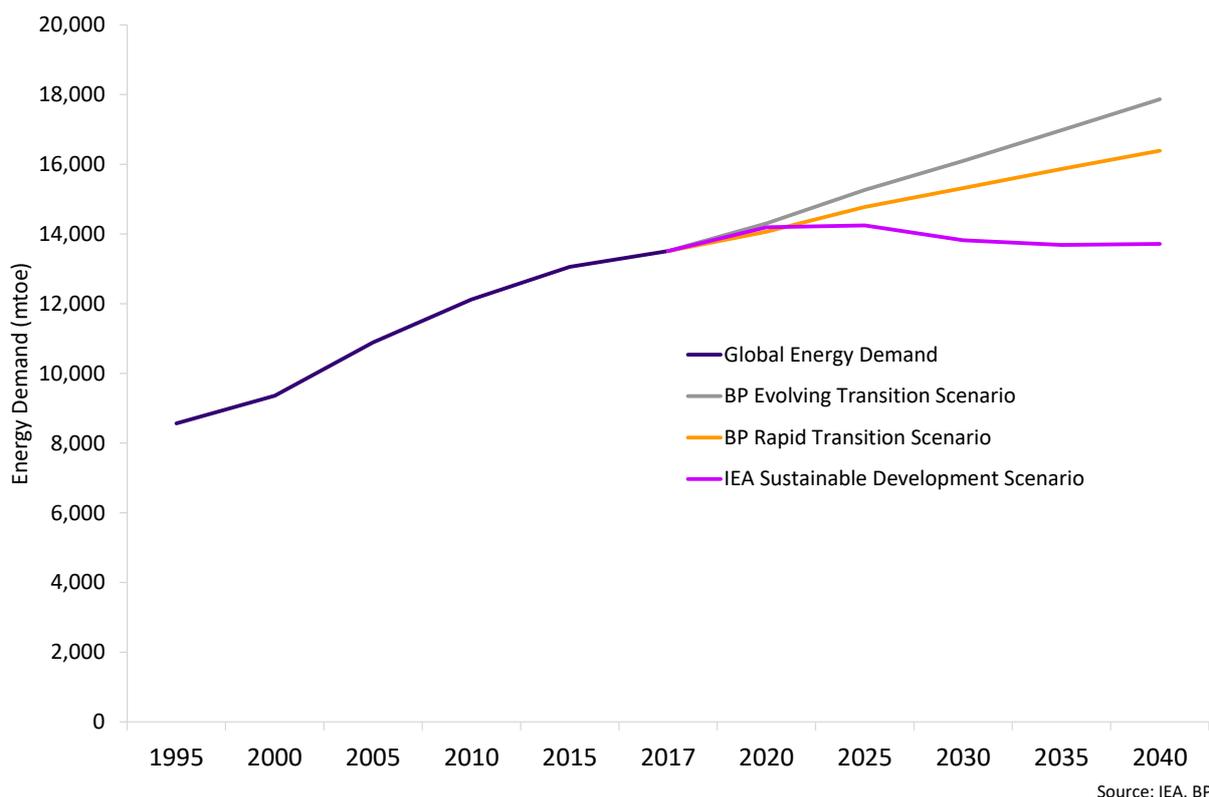
5.2 Net-Zero 2050 — The Crucial Role of the Oil and Gas Industry

Energy systems are evolving rapidly — both in the UK and globally. As outlined in *Roadmap 2035*, to ensure that the full potential of the UK oil and gas industry is realised, companies will continue to address the challenges presented by ongoing energy transitions. It is also key that industry’s actions, progress and potential are communicated effectively to society and investors to demonstrate performance and intent.

Meeting Global Energy Needs

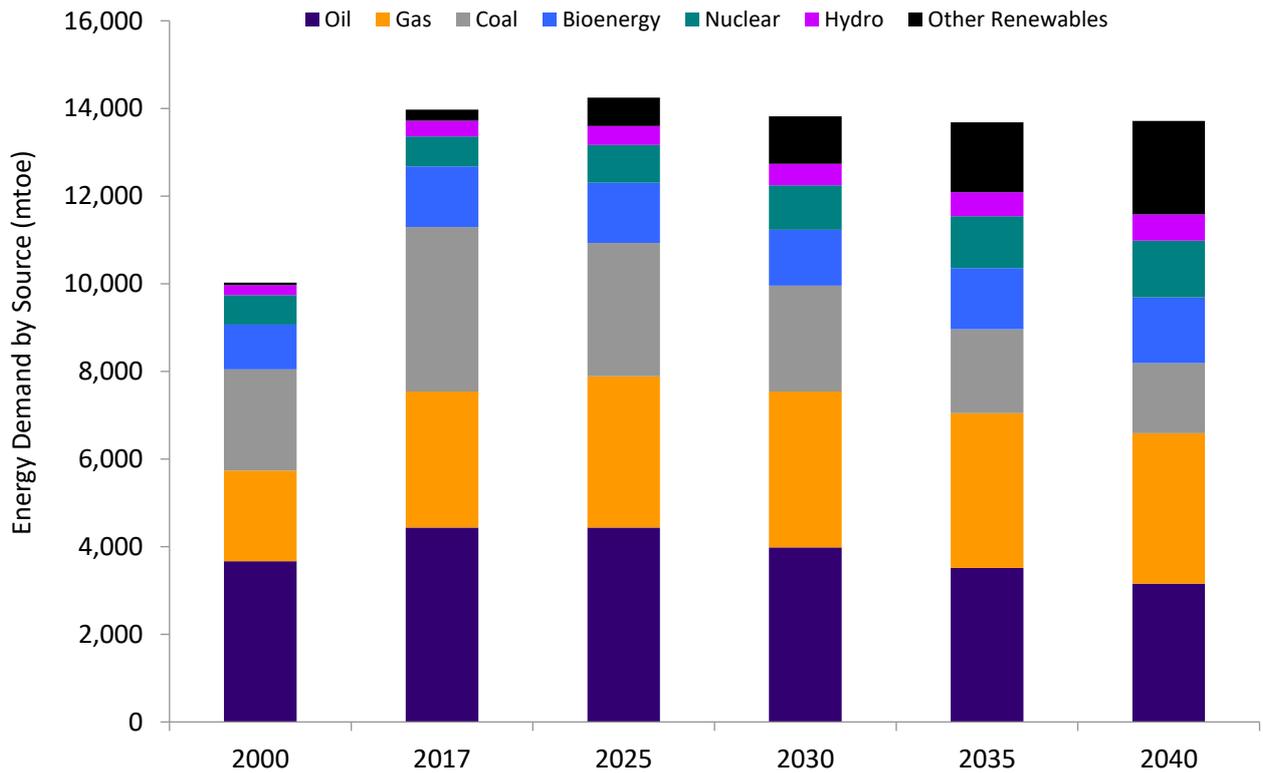
Global energy demand has increased by two-thirds since 1995 and, although there are a range of scenarios for how demand could evolve, most show continued growth in the decades to come. Some of this increase will be offset by improving energy efficiency, but it is clear that any growth needs to be met safely, sustainably, securely and affordably.

Figure 23: Global Energy Demand Growth



Even in the most ambitious scenarios, such as the IEA Sustainable Development scenario shown in Figure 24, oil and gas will continue to provide a vital contribution to meeting global energy demand. In this scenario, which is consistent with limiting global warming to less than 2°C, oil and gas would still be required to meet 48 per cent of energy demand in 2040, compared with 54 per cent at present. The same path would also see the relative importance of gas increase from 22 per cent to 25 per cent of demand.

Figure 24: Global Energy Demand Forecast Under the Paris-Compliant, IEA Sustainable Development Scenario



Source: IEA

However, the ways in which oil and gas is produced and consumed will continue to evolve in line with the expectations of both society and investors. This transformation is already underway as oil and gas producers, their suppliers, governments and other industries drive policies to ensure that global energy supply is sustainable, affordable and secure.

UK Oil and Gas and the Objective of Net-Zero Emissions

In May 2019, the CCC advised government to set an objective of net-zero GHG emissions for the UK by 2050.³⁵ The UK government responded to this in June, replacing the previous objective of the Climate Change Act 2008 (which mandated an 80 per cent reduction in GHGs by 2050, compared with 1990) with a net-zero target.

To date, the UK has reduced its total GHG emissions by 42 per cent since 1990, whilst at the same time reducing primary energy demand by around 10 per cent and growing GDP by around 75 per cent (in real terms).

Carbon dioxide (CO₂) and other GHGs are emitted from both the production and consumption of oil and gas. Overall, emissions associated with production of oil and gas are equivalent to around 3 per cent of total UK emissions. Meanwhile, the consumption of oil and gas accounts for around 75 per cent of total primary energy use and is responsible for the majority of UK GHG emissions. It is therefore clear that reducing emissions is a collective challenge facing the whole of the UK, its economy and society.

The CCC outlined six areas of specific focus in the drive to a net-zero economy:

- Resource and energy efficiency
- Societal choices (e.g. less meat in diets)
- Extensive electrification
- Development of a hydrogen economy
- Development of carbon capture, usage and storage (CCUS)
- Changes in land use

The UK offshore oil and gas industry is well placed to respond to the challenges and opportunities presented by the energy transition. The sector is taking action now to better assess and reduce the emissions from the production of hydrocarbons in the UK, with the aim of becoming a net-zero basin by 2050. It is also supporting the development of carbon mitigating technologies which offset emissions resulting from the use of oil and gas in the wider economy (such as CCUS). In addition to this, both oil and gas producers and supply chain companies are increasingly diversifying their footprints to support the development of alternative, low- carbon energy sources.

³⁵ www.theccc.org.uk/publication/net-zero-the-uks-contribution-to-stopping-global-warming/

There are several pathways that oil and gas companies can follow to contribute towards the drive towards net-zero carbon emissions in the UK. This ranges from helping to maintain indigenous oil and gas production at a lower emissions intensity (thereby helping to provide energy security by displacing international imports) to incremental investments in alternative energy sources.

Figure 25: UK Oil and Gas Energy Transition Pathways

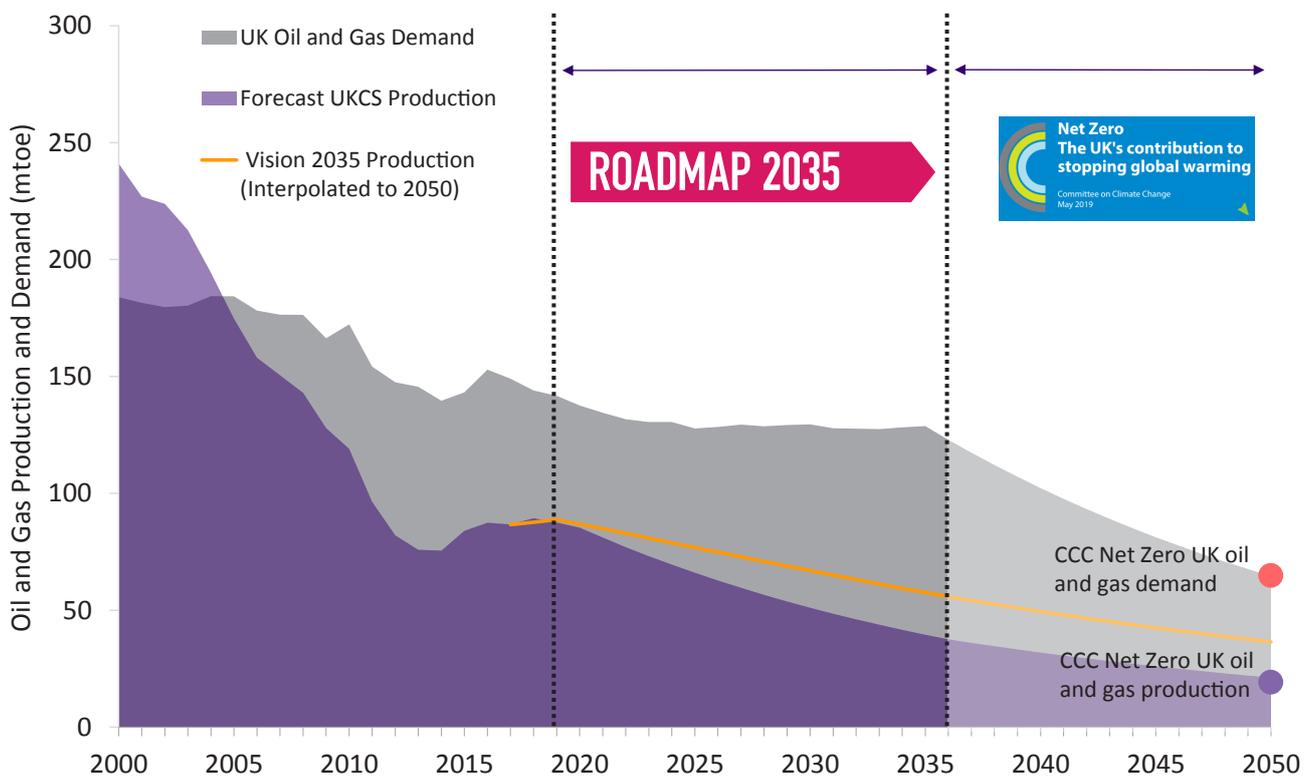
PROGRESSING UK Oil and Gas Production on the Path to Net-Zero Emissions	DEVELOPING a World-Leading Offshore Low-Carbon Industry	SUPPORTING and Deploying Emissions Mitigation Technologies	EXPANDING Other Low-Carbon Business Opportunities
Aim to be producing 1.1 million bpd in 2035	0.5 MTCO₂e GHGs from production and operations by 2050	Support the development of a CCUS industry	Expand and support low-carbon business
Reduce reliance on international imports, maintaining energy security	Significantly reduce emissions intensity from operations	Advocate for hydrogen fuels development around the UK	Enable the transfer of skills across the offshore energy sector
Maintain international competitiveness in alignment with Roadmap 2035	Understand and reduce wider upstream emissions (logistics, supply chain)	Explore other mitigation technologies	

Pathway 1 — Progressing UK Oil and Gas Production on the Path to Net-Zero Emissions

The drive to maximise economic recovery from the UKCS is compatible with the ambition to achieve net-zero emissions, given that industry is acting to reduce its carbon footprint.

As outlined in section 3.1, the UK consumed just over 150 mtoe of oil and gas last year, around 75 per cent of total domestic primary energy use. Around 90 mtoe (59 per cent) of this was produced from the UKCS and the remainder is imported from other countries. Alternative energy sources, mostly for electricity, will continue to grow quickly to displace some of these requirements but there remain some areas, such as heavy goods transport, aviation and industrial use, where there are not yet suitable substitutes for fossil fuels. The CCC estimates that in 2050 UK oil and gas demand will still be around 65 mtoe, 30 per cent of which will be met by production from the UK, according to baseline forecasts. Continued investment to find, develop and produce new resources will be crucial to the effective management of production in line with this, and the UKCS must remain competitive if this to be achieved.

Figure 26: UK Oil and Gas Production and Demand Scenarios³⁶



Source: BEIS, CCC, OGUK

³⁶ Values post-2035 have been interpolated. Oil and gas demand post-2035 is not expected to exactly follow the shown trajectory, the rate shown is simply for explanatory purpose. New policies will likely smoothen the curve from its current position to the end goal.

Along with this, the UKCS faces the challenge of reducing its own emissions to ensure that the industry maintains societal and political support. In 2018, GHG emissions from oil and gas production represented around 3 per cent of the UK annual emissions total, in addition to emissions from support services and from transporting natural gas to end customers. Many companies have already made commitments to reduce these emissions (e.g. adopting zero-flaring policies, methane intensity targets and/or CO₂ targets) and will be further incentivised to reduce emissions via the next phase of the EU Emissions Trading Scheme (EU ETS), or a similar post-Brexit carbon-trading system.

UK offshore operators, supported by the supply chain, will need to continue to transform operations to produce oil and gas in a lower-carbon manner. In practice, this means progressively increasing the ambition of emissions reduction to reach almost zero-emissions oil and gas production by 2050, with any remainder being mitigated.

Overcoming these challenges will mean that the oil and gas industry can continue to contribute to energy security in the decades to come and in a net-zero UK economy. Cutting off the supply of domestic oil and gas will do nothing to address climate change and simply means the UK will need to import more of its energy needs. A pragmatic approach to the energy transition will help ensure the UK sustains its economic growth whilst decarbonising the energy system. Moreover, the expertise, technology and resources of the domestic oil and gas sector can also help accelerate the pace of a managed transition.

**WHAT
INDUSTRY
HAS
ALREADY
DONE:**

Reversed the decline in UK oil and gas production and increased output by **20 per cent to around 1.7 million bpd since 2014** — helping to minimise the UK's reliance on energy imports.

**WHAT
INDUSTRY
CAN DO:**

Roadmap 2035 seeks to keep output above **1 million boepd**, serving the needs of society and avoiding further increases in dependence on international imports.

**WHAT
WILL BE
REQUIRED:**

A continued focus on attractive investment conditions — including support to maintain a stable regulatory and fiscal framework.

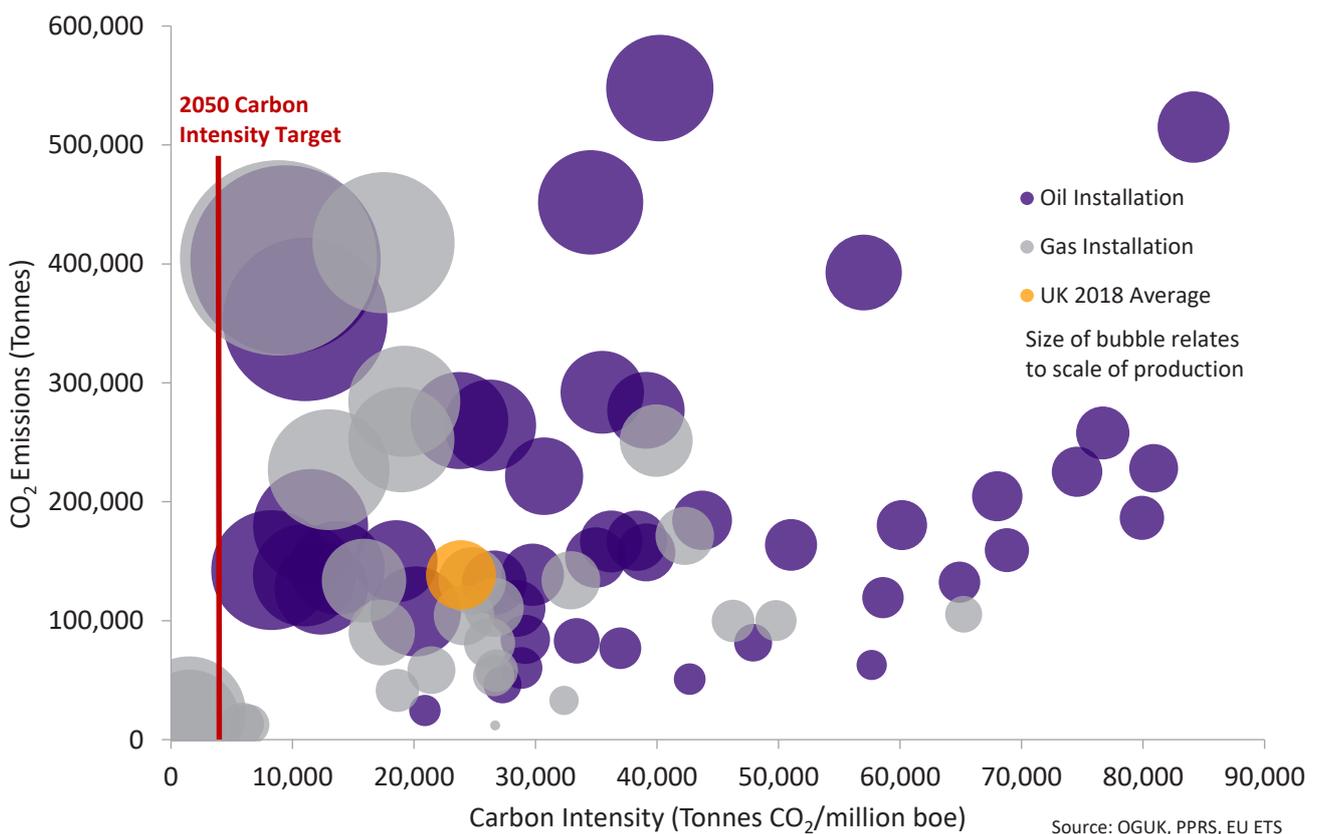
Pathway 2 — Developing a World-Leading, Low-Carbon Offshore Oil and Gas Industry

The CCC has set a target for emissions from the production of oil and gas in the UK of 500,000 tonnes of CO₂ equivalent (CO₂e) in 2050. Based on UKCS production projections it is estimated that UK operators will need to deliver production with an emissions intensity of 4,000 tonnes CO₂e/million boe, or less, by that date — compared with an estimate of just under 24,000 tonnes CO₂e/million boe today.³⁷

Carbon intensity levels provide a good indication of industry’s performance in this area, with CO₂ emissions independently verified as part of the EU ETS. There has been some progress in this area, evidenced by a 16 per cent improvement in carbon intensity since 2013, as production has increased and CO₂ emissions have remained relatively stable

Figure 27 provides an indication of the scale of the challenge that the UKCS faces in terms of reducing the emissions intensity of producing fields. In 2018, the UKCS had an average carbon intensity of 21,000 tonnes CO₂/million boe, whereas surface installations within the remit of the EU ETS (e.g. a platform or FPSO) had an average carbon intensity of almost 24,000 tonnes CO₂/million boe.

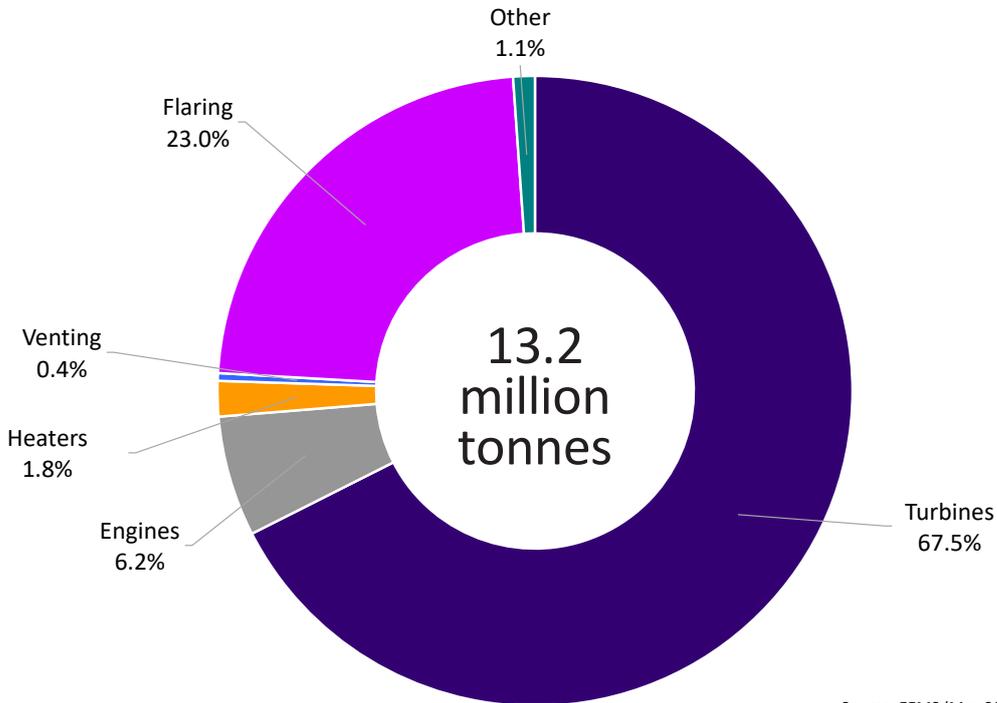
Figure 27: UKCS Surface Installation Carbon Intensity



Gas turbines, which are predominantly used to generate off-grid power offshore, are the largest source of offshore emissions. Decarbonising offshore power generation presents one of the largest opportunities when exploring how to deliver these reductions, however significant progress will also need to be made in reducing emissions from the flaring and venting of waste gases.

³⁷ OGUK Environment Report 2019 www.oilandgasuk.co.uk/product/environment-report/

Figure 28: UK Upstream Production CO₂ Emissions by Source, 2018



CASE STUDY

A project to connect BP’s ETAP produced water reinjection system and bypass the asset’s seawater injection pumps has reduced CO₂ emissions by 11,000 tonnes per year.

When oil and gas is produced, water found in the reservoir is also brought to surface. This produced water can often be treated before being released back into the sea and is also often pumped into a reservoir to increase the pressure as a method of enhanced recovery, as it results in increased flows of hydrocarbons towards producing wells.

The ETAP production facility originally provided seawater injection to two of its fields, Mungo and Machar. When water injection to Machar stopped in February 2018, only Mungo was injecting seawater, leading to issues operating the large, fixed-speed water injection pumps and resulting in the dumping of treated water into the sea.

Re-routing ETAP’s produced water to be injected into the Mungo field has helped remove a bottleneck in ETAP’s produced water system. By connecting the produced water reinjection system to the injection wells, the seawater injection pumps could be bypassed. No longer using the seawater injection pumps reduced the electrical load on ETAP by around 5 megawatts, reducing CO₂ emissions by 11,000 tonnes per year.

This is equivalent to 25 per cent of the BP North Sea Sustainable Emissions Reduction target for 2019.

Oil and gas producers have strong incentives to reduce GHG emissions, from an ethical, environmental and financial basis. Alongside increasing societal and investor pressures, greater financial exposure to rising carbon prices has brought a clear focus on the imperative to reduce emissions. These issues will be factored into decisions around recovery of the UK’s remaining oil and gas resources and could mean that some resources become unattractive to develop. However, new technology developments — such as using renewable energy to power installations, or methods of reducing flaring and venting — are offering lower-carbon means of producing oil and gas.

Although production from the UKCS will decline over time, a number of fields being developed now or which have recently been brought on stream will be in operation beyond 2050. The North Sea will reflect a much more diverse energy mix in the future which includes wind, wave, and CCUS alongside oil and gas production. This will help to ensure that the maximum energy potential of the basin is realised.

**WHAT
INDUSTRY
HAS
ALREADY
DONE:**

Reduced the carbon intensity of production operations by **16 per cent since 2013** as production has increased and emissions have remained relatively stable. Operators continue to make changes to processes and equipment offshore to improve emissions performance further.

**WHAT
INDUSTRY
CAN DO:**

Commit to **reducing the emissions intensity** of oil and gas production in the UK over time to support the UK’s net-zero economy targets. In doing so, industry is committed to, and is already developing, testing and deploying the technologies required to drive a step change in emissions performance and emissions management. This is also a **cultural change** which places environmental performance alongside safety as an underlying business driver.

**WHAT
WILL BE
REQUIRED:**

Industry collaboration to continue incremental **efficiency improvements**, particularly in production and energy usage offshore and to upgrade processing and power generation technologies. Alongside this companies can consider widespread electrification of offshore production facilities using renewable sources of energy supplied from on or offshore. Such change will benefit from supportive, engaged regulators and a predictable carbon-pricing regime.

Pathway 3 — Supporting and Deploying Emissions Mitigating Technologies

Alongside actions to reduce the emissions intensity of oil and gas production, the industry is well placed to support the reduction of emissions produced from the use of oil and gas — which constitute a much greater proportion of emissions in the UK. The UK oil and gas industry has the technical and commercial capabilities, skills and resources to support the development and implementation of CCUS and hydrogen capacity at scale.

The CCC has already noted that both CCUS and hydrogen are essential and the objective of net-zero places a premium on those technologies that have the potential to deliver large reductions, as opposed to incremental improvements. Furthermore, the continued evolution of the offshore energy sector towards becoming a low-carbon industrial hub through such technologies will cement longevity to the basin and all energy-related activity.

Carbon Capture, Usage and Storage

CCUS will be crucial to achieving net-zero emissions. CCUS involves capturing CO₂ emissions at source — therefore preventing them from entering the atmosphere — and either storing them or using them for alternative means.

The CCC report envisages that CCUS will be critical in achieving the net-zero objective, and forecasts that the UK will need to capture and store up to 175 million tonnes of CO₂ per annum by 2050 (nearly half of current total UK CO₂ emissions). Taking an integrated approach to the development of CCUS infrastructure at scale, beyond the proposed initial clusters, will be essential. At the time of writing, the Department for Business, Energy and Industrial Strategy (BEIS) is consulting on the most appropriate business models for the development of CCUS and the re-use of oil and gas assets for CCUS projects. OGUK is working with member companies to respond on behalf of industry.

The UK is in a unique position to lead in the development of CCUS, owing to its geographic location, geological storage potential and experienced supply chain. Furthermore, oil and gas company assets, expertise and investment will be central in implementing this technology. While initial costs required to implement CCUS in power generation, heavy industry and other sectors are high, a government-supported programme of investment rolled out across the UK will advance its development. This approach has been crucial in other low-carbon energy sources, such as wind power.

With an estimated 10,000 CCUS projects required to be online around the world by 2070 to limit global warming to 2°C,³⁸ the global CCUS industry is forecast to be worth in the order of £100 billion per year by 2050.³⁹ This compares with 18 operational projects, five under construction and 20 in the early stages of development at present.⁴⁰

The level of required investment presents diversification opportunities for both operators and supply chain companies. Whilst CCUS projects are still typically sub-commercial, as technologies develop, carbon prices increase and business models evolve, CCUS may become investible on its own merits, supporting a range of increasingly diversified business portfolios.

³⁸ www.shell.com/energy-and-innovation/the-energy-future/scenarios/shell-scenario-sky.html

³⁹ www.iea.org/publications/reports/TransformingIndustrythroughCCUS/

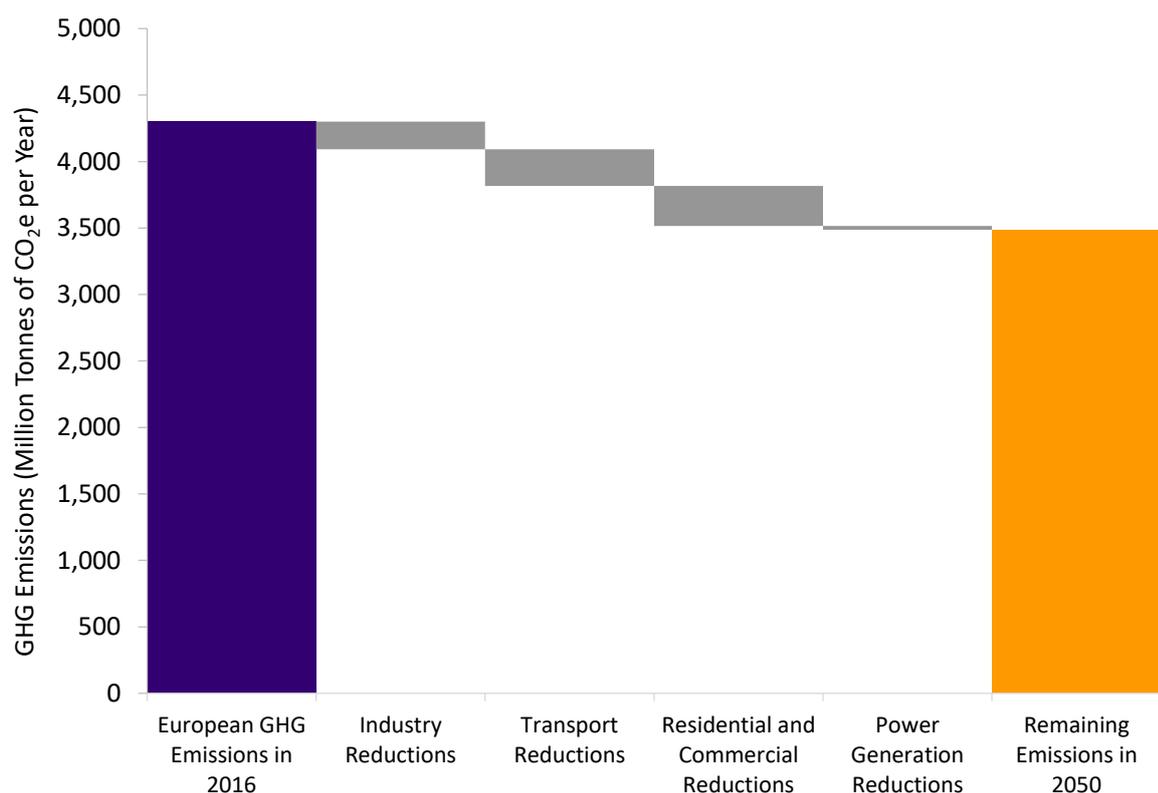
⁴⁰ www.globalccsinstitute.com/resources/global-status-report/

Hydrogen

Hydrogen will also form a central element of the next phase of decarbonisation in the UK, as confirmed by the CCC. As a fuel source, hydrogen does not produce any harmful emissions when used, emitting only heat and water vapour. Hydrogen can be produced both via reformation of natural gas (methane) and from electrolysis; both sources of supply will be needed to help meet future energy demand. Methane reformation provides a more immediate basis for the first phase of development, since it will be some time before there are reliable surpluses of renewable electricity available to produce sufficient quantities of hydrogen, especially as the demand for electricity is expected to increase significantly through the use of electric vehicles. However, it should be acknowledged that the production of hydrogen through methane reformation needs to be combined with CCUS to be a net-zero source of energy.

The development of a hydrogen-based economy provides a number of advantages and opportunities for the oil and gas industry, and the wider economy. This includes the re-use of the existing gas network infrastructure for domestic and industrial use, rather than electrifying all forms of energy supply — helping to provide a diverse mix of fuel types to aid decarbonisation in the most effective manner. The potential impact that the use of hydrogen could have on European GHG emissions is outlined in Figure 29. By 2050, emissions savings of around 800 million tonnes of CO₂e per year (19 per cent of current emissions) could be achievable.⁴¹

Figure 29: The Potential for Reducing Europe’s GHG Emissions via Hydrogen



Source: Sintef

Hydrogen and other decarbonised gases are particularly suited to meet a large proportion of industrial and domestic heating, as well as the requirements of heavy, long-distance freight services. Increasing the use of natural gas for freight and public transport will be an important stepping stone to this objective.

⁴¹ Sintef, IFP – *Hydrogen for Europe* pre-study

**WHAT
INDUSTRY
HAS
ALREADY
DONE:**

Oil and gas companies have already supported the implementation of **CCUS at 18 sites** around the world, **capturing many million tonnes of CO₂**. OGUK member companies are active in all the current UK cluster projects on an individual basis and through the Oil and Gas Climate Initiative (OGCI).

**WHAT
INDUSTRY
CAN DO:**

Work with governments and regulators to develop a commercial, regulatory and technical framework which will allow the required assets to be made available for transport and storage of carbon, and to provide a reliable storage service to projects that capture CO₂.

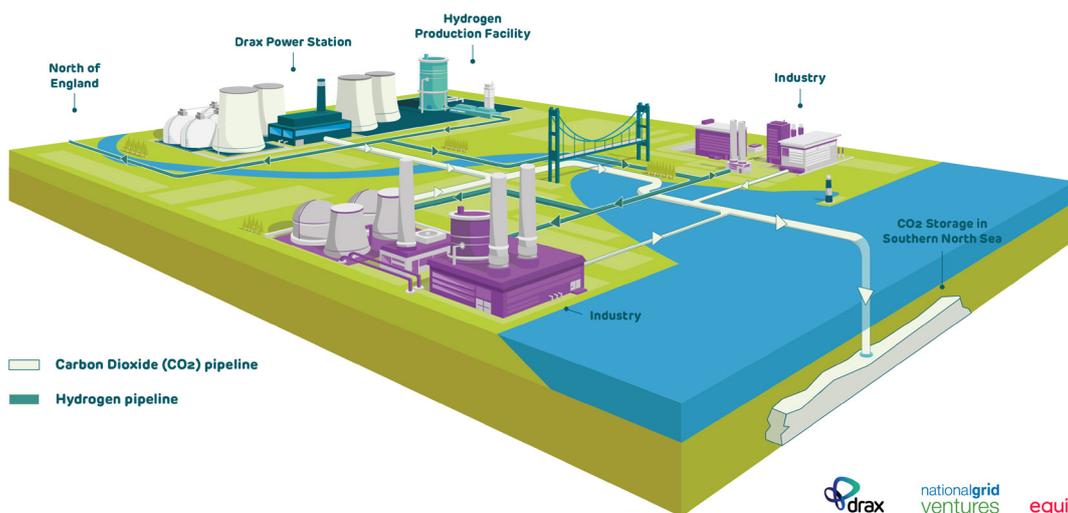
**WHAT
WILL BE
REQUIRED:**

A positive investment framework and long-term commitment including: infrastructure liability, measurement, reporting and verification; amendments to EU/UK legislation; recognition that decarbonised gas is key to meeting UK industrial and domestic heat requirements; and further supportive legislation to develop a UK hydrogen industry.

CASE STUDY

In 2019, Drax Group, Equinor and National Grid Ventures signed a memorandum of understanding committing to work together to explore how a large-scale CCUS network and a hydrogen production facility could be constructed in the Humber by the mid-2020s.

WHAT A ZERO CARBON CLUSTER COULD LOOK LIKE IN THE HUMBER REGION



The partnership could lead to the Humber becoming the world's first net-zero carbon region and home to a new world-leading hydrogen economy.

The three companies will work together to:

- Explore the opportunity to scale-up the innovative bioenergy carbon capture and storage (BECCS) pilot project at the Drax Power Station in order to create the world's first carbon-negative power station in the 2020s
- Explore the potential development of a large-scale hydrogen demonstrator within the Drax site by as early as the mid-2020s, in line with the CCC's recommendation that hydrogen should be produced at scale in at least one industrial cluster by 2030
- Explore the strategic opportunities in developing a cutting-edge hydrogen economy in the region

Pathway 4 — Expanding Low-Carbon Business Opportunities

Oil and gas companies can make a significant direct contribution to the pace and success of the energy transition through investment and the provision of assets, services and expertise, in a wide range of alternative energy sources. Companies are, at both a global and local level, responding to the energy transition in a variety of different ways, including modifying their business strategies, developing important new technologies and investing in alternative energy sources. A diverse energy mix is required to achieve a low-carbon, affordable energy supply with minimal disruption and therefore investment is required across all sources. A positive framework is required to increase renewable and low-carbon investment, whilst maintaining conventional energy supplies.

Achieving the net-zero ambition could require in the region of £1 trillion of investment, presenting significant opportunities for companies within the oil and gas supply chain through diversification. Many companies continue to increase their footprint in a variety of future-facing energy solutions, such as solar, biofuels, and wind. When polled, over half of OGUK members indicated that they have explored, or are active in, diversification into projects outside of oil and gas.

It has been estimated that the world's largest 24 publicly listed oil and gas companies invested \$3.4 billion in low-carbon energy in 2018, and a total of \$22 billion since 2010.⁴² Although this still represents a relatively small portion of upstream companies' capital budgets, it is growing rapidly. Along with this many companies are also making their alternative energy investment targets public. These investments are complementary, rather than in competition with investment in oil and gas portfolios

WHAT INDUSTRY HAS ALREADY DONE:

Oil and gas companies are active in a range of different alternative technologies both in the UK and globally. Oil and gas companies are **taking the lead** in many of the technologies and investment that will be required to achieve a net-zero outcome.

WHAT INDUSTRY CAN DO:

Investment in alternative energy sources will grow over time if there is an attractive framework in place. However, appetite for particular opportunities will remain dependent on individual company strategies. Companies within the supply chain can also apply their **expertise, resources and capabilities** to advance the development of low-carbon energy sources.

WHAT WILL BE REQUIRED:

All successful companies, including oil and gas businesses, **evolve their business strategy** to reflect political and societal demands. Initiatives aimed at divestment based on crude characterisations of businesses are likely to be a disincentive for companies to invest in any one technology type and removes a valid stakeholder voice in strategy formation.

⁴² www.cdp.net/en/investor/sector-research/oil-and-gas-report

CASE STUDY

Atkins, an SNC Lavalin Company, has diversified its business model to take advantage of opportunities provide by low carbon energy sectors alongside existing oil and gas and wind divisions. This includes direct investment and the creation of multi-skilled engineering teams.

Atkins is applying traditional oil and gas capabilities to support other low carbon energy solutions in harsh environments. Along with this, Atkins has invested £1 million in low-carbon alternatives to hydrocarbons and new solutions for existing hydrocarbon infrastructure, including CCUS and waste-to-fuel projects.

CASE STUDY

Wood recognises the transition from traditional fossil fuels presents an opportunity to further diversify its business while creating a sustainable future for its people and the communities where they operate.

Wood's journey to broaden its capabilities is clearly aligned with the energy transition and emerging global trends in supply and demand. Wood's strong heritage in oil and gas combined with an ever-increasing role in the development of renewable power generation and infrastructure, ideally positions the company to meet the needs of a low-carbon future.

Wood is already active in this space, leading a first-of-its-kind project to reduce CO₂ emissions for an international climate change investment fund by designing a gas power plant with carbon capture.

On Scotland's west coast, Wood is supporting the growth of lower-carbon alternatives by advising on how the existing gas network could be used to transport hydrogen as a fuel for local ferries.

The company is also continuing to support long-standing customers through the energy transition into clean energy. In the Netherlands, Wood recently completed work as owner's engineer on Shell's first solar PV plant which will generate power for the onsite chemical facility.





OGUK

oilandgasuk.co.uk

info@oilandgasuk.co.uk

 @oilandgasuk

 Oil & Gas UK

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