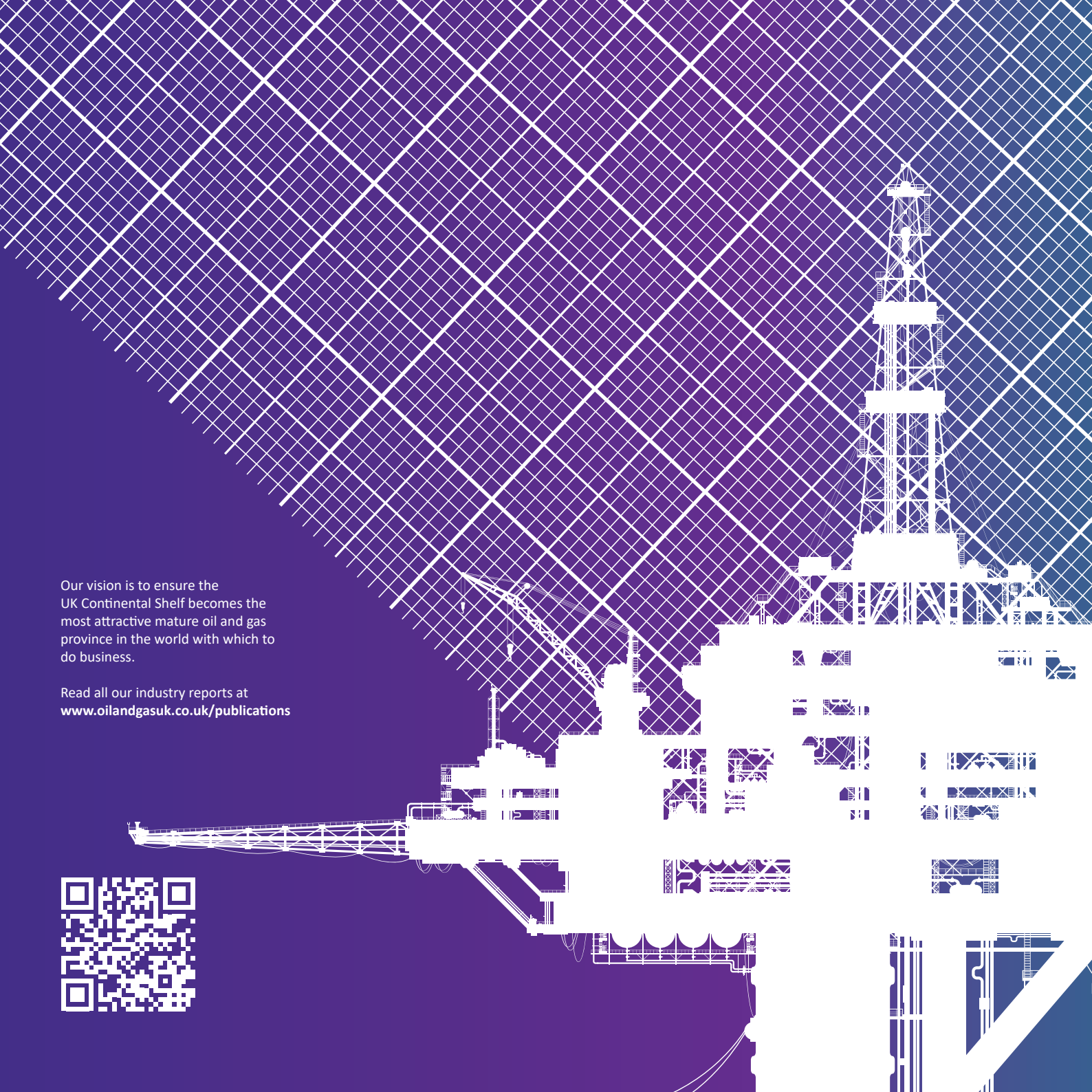
OGUK

UK UPSTREAM OIL AND GAS SECTOR

Pathway to a Net-Zero Basin: Production Emissions Targets



Our 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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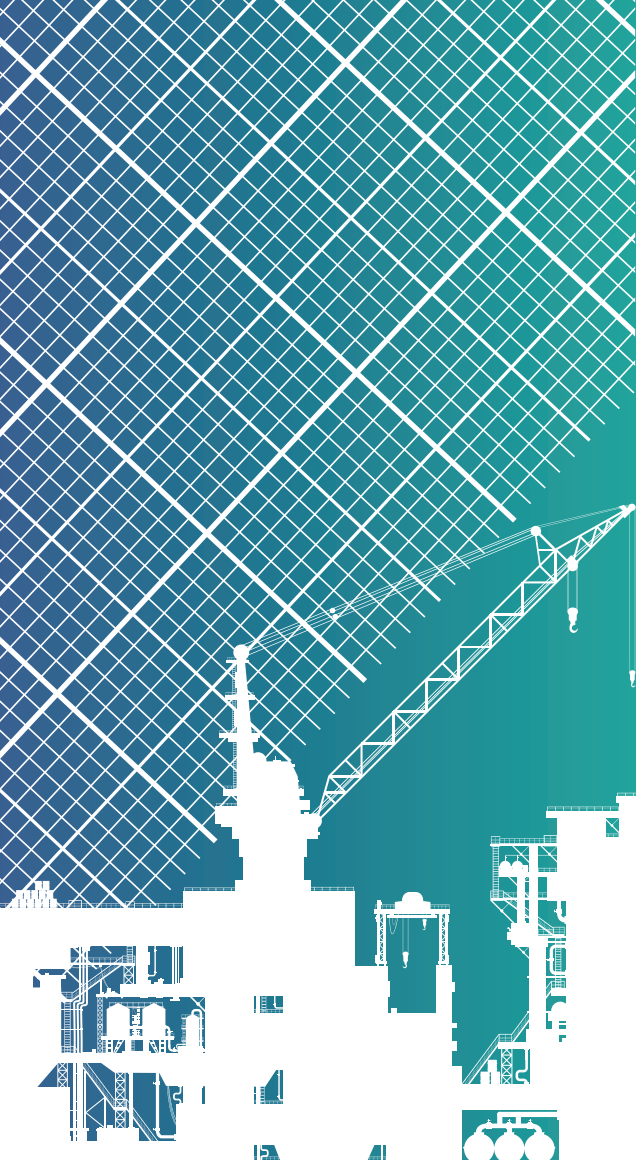

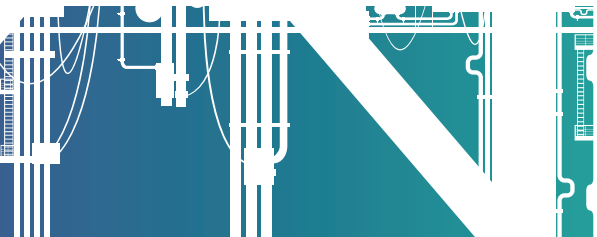

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Pathway to a Net-Zero Basin: Production Emissions Targets

Contents

Foreword

In May 2019, the Committee on Climate Change (CCC), published its report 'Net Zero – The UK's contribution to stopping global warming'. Its call to action recommended the UK take a global lead and become a net-zero greenhouse gas emissions economy by 2050 (and by 2045 in Scotland).

These recommendations were accepted by Governments, recognising the UK and Scotland can move faster to respond to the energy transition using the industrial and technological capabilities of sectors such as the UK's oil and gas industry. Following the incorporation of the CCC advice into law, the UK is committed to becoming a net zero emissions society within three decades.

The UK's upstream oil and gas industry was one of the first major sectors of the economy to embrace the 2050 target when in September 2019, on behalf of industry, OGUK released 'Roadmap 2035: A Blueprint for Net Zero', highlighting the role the sector can play to help the UK achieve the energy transition that is critical to a fully decarbonised economy.

Much has happened since then and it is testament to the sector's commitment to deliver the energy transition that the work to decarbonise our sector has continued at pace, while coping with the COVID-19 pandemic. Roadmap 2035 offers a route to help the UK achieve a green recovery as the economy returns to growth. Our industry is committed to reducing its own emissions and by working with others, with the right frameworks in place, can help the UK decarbonise at pace.

As our recent *Business Outlook* reports have highlighted, much of the global economy continues to rely on oil and gas as a primary energy source. In the UK, oil and gas currently accounts for around 75 per cent of total energy needs.

Transport, heating and industrial use account two-thirds of all greenhouse gas emissions in the UK. This reinforces the point that achieving net zero carbon emissions across the UK will require transformational change, including governments, industries, businesses and individuals.

Emissions associated with the production and processing of offshore UK oil and gas currently account for four per cent of the UK's total greenhouse gas emissions.

While we know emissions associated with the use of oil and gas are much greater, it's a fact that curtailing domestic production would only offshore the issue while increasing the UK's reliance on imports, from potentially more intensive carbon sources adding to global emissions while shifting responsibility to others.

This report outlines our pathway to becoming a net-zero basin by 2050. Importantly, it also provides an opportunity to set out how our skills, capabilities and infrastructure can be used to make a major contribution to enabling the UK-wide ambition of net zero greenhouse gas (GHG) emissions by 2050.

Today we commit to ambitious milestone targets to reduce emissions associated with the offshore production of oil

and gas in the UK: collectively halving the GHG emissions arising from exploration and production (E&P) activities on the UK Continental Shelf (UKCS) by 2030 and then delivering a 90 per cent emissions reduction by 2040.

These targets are set against a 2018 baseline and address the totality of GHG emissions arising from upstream E&P activities on the UKCS, including CO_2, methane and other GHG emissions. Each year, we will publicly show progress against our commitments on a sector-wide basis.

These challenging targets are aspirational and have been developed after detailed assessment of the measures needed to deliver them. They consider (i) changes to operations, (ii) progressive reductions in flaring and venting and (iii) major capital investment programmes to decarbonise production operations.

This is a bold journey which will require a tripartite approach between industry, regulators and government underpinned by an effective commercial, fiscal, and regulatory framework which can help deliver decarbonisation of the whole economy.

Many of the major capital investment projects which will help our sector to decarbonise, including the electrification of assets, the development and deployment of carbon capture and storage (CCS) and hydrogen both on and offshore, will need to be developed at scale to help other industries accelerate their own efforts to decarbonise. These are challenging opportunities which will have to be addressed collectively and will form part of the transformational Sector Deal we are now actively developing with the UK Government.

These targets are the first, but arguably one of the most important steps in demonstrating how this industry, and the UK as an oil and gas producing nation, can work together to deliver a fair, inclusive and sustainable transition.

With this clear pathway to becoming a net-zero basin by 2050, and with timely support from governments, regulators and companies across the sector to address these challenges, we can continue to provide affordable energy supplies, highly skilled jobs, and support thriving communities. We will do this through embracing the opportunities which come from our home-grown industry being at the forefront of low-carbon change.

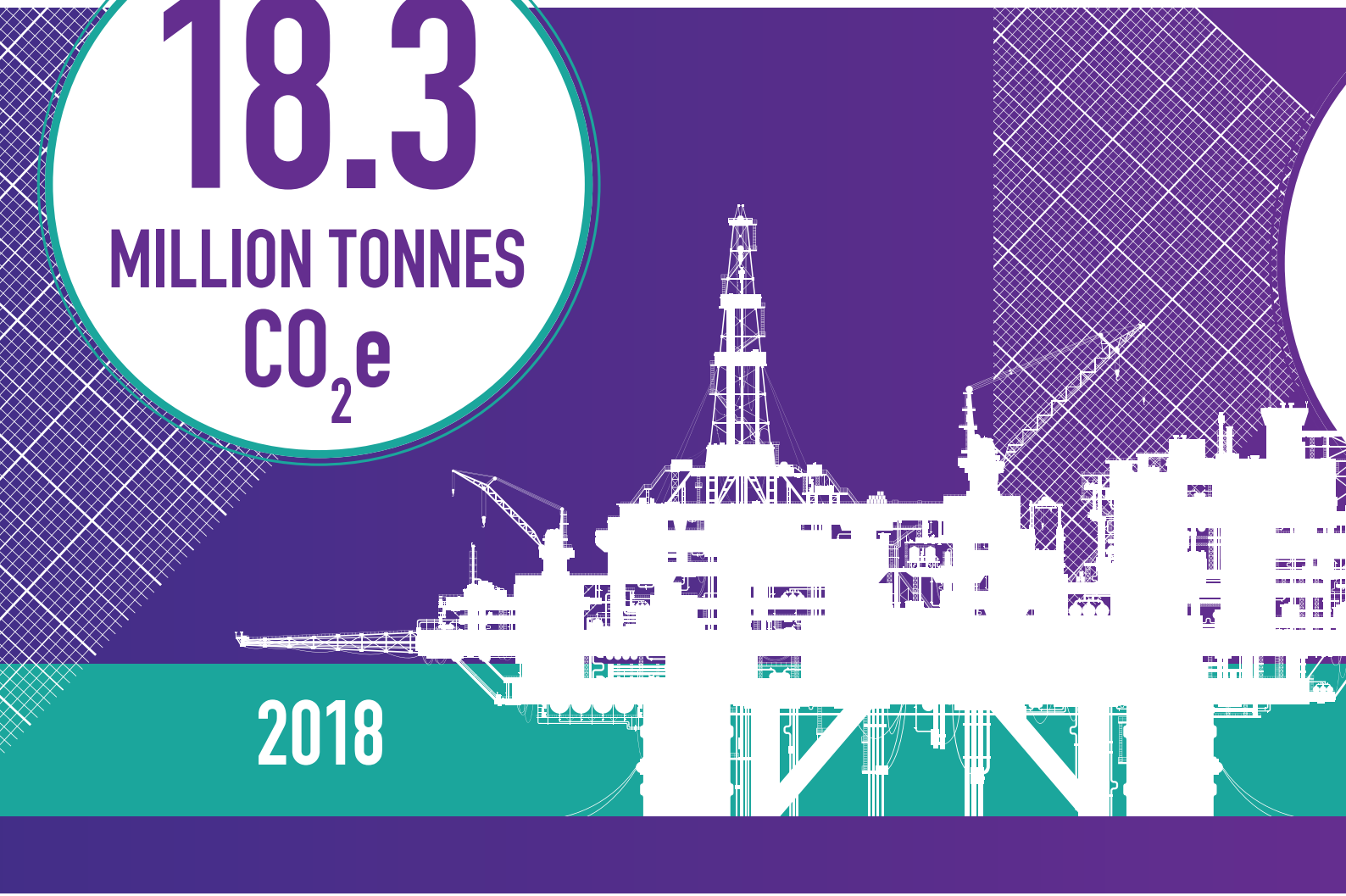
Deirdre Michie OBE,
Chief Executive, OGUK

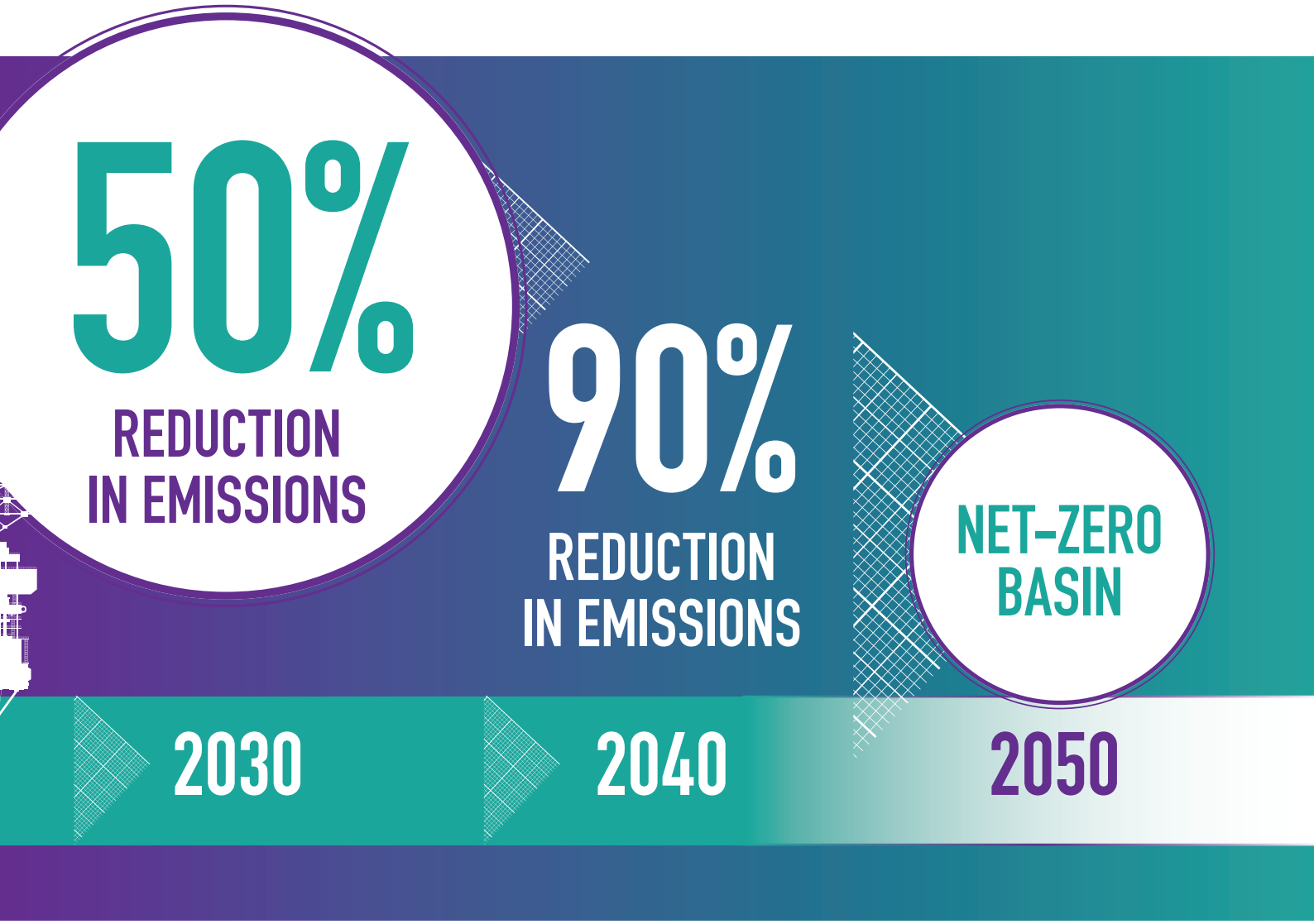
Net-Zero Basin - Our Commitment

18.3

MILLION TONNES CO_2e

2018




50%
REDUCTION
IN EMISSIONS
90%
REDUCTION
IN EMISSIONS
NET-ZERO
BASIN
2030
2040
2050

UK Emissions Context

The UK economy has made significant progress in reducing its emissions from 1990 levels by 43 per cent. This is largely attributed to changes in the power sector, where emissions are down 71 per cent by switching from coal to gas-fired power stations and supported by a growth in renewable energy generation. During this time, the UK has evolved into a service-based economy.

Over the same period emissions from the UK upstream oil and gas industry have also fallen. E&P operations today account for around four per cent of the total UK GHG emissions, whilst still providing 47 per cent of our energy demand.

Last year, the UK was the first major economy to move beyond the original Kyoto protocol by committing to a net-zero society in 2050. This transformative approach requires action across the economy. The CCC net-zero report[1] clearly outlines the scale of the challenge society faces. Changes will be needed in the use of natural resources, coupled with sustained investment in both domestic and industrial energy efficiency alongside societal choices in diet and travel.

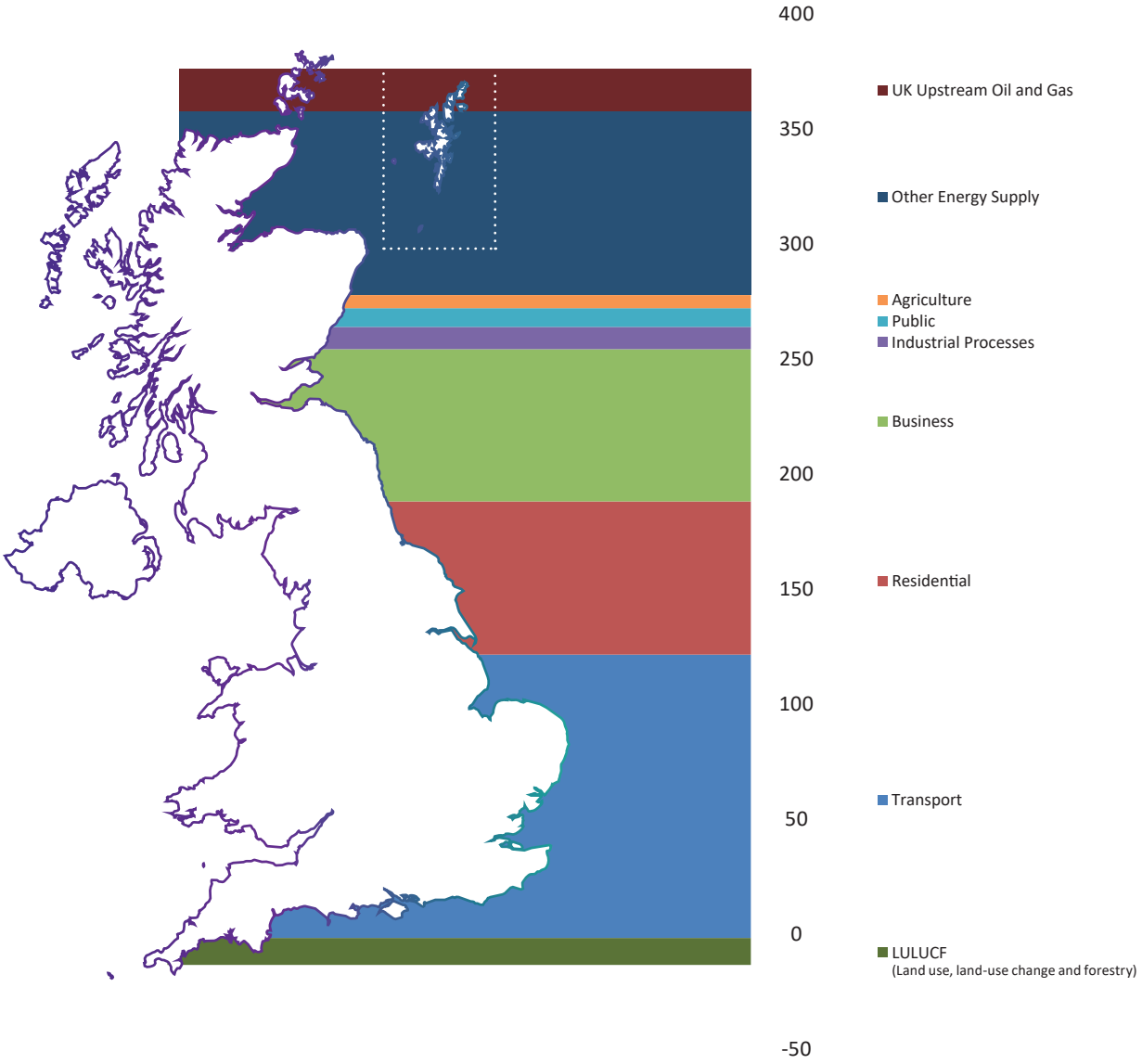
The coming decades see increased electrification of industrial processes, heat and transport, coupled with widespread use of hydrogen. Carbon capture and storage (CCS) will decarbonise many existing industries. Changes in land use will also be required to increase natural carbon storage.

Each sector will need to develop its own decarbonisation pathway and contribution to the UK's net-zero ambition.

For its part, the upstream oil and gas industry is setting ambitious emissions reduction targets consistent with UK climate ambitions and CCC net-zero projections as clear way markers along our decarbonisation pathway, around which action can be coordinated, and performance monitored.

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

UK Emissions 2018 ($MtCO_2e$)



Source: BEIS

Oil and Gas Required for UK Growth

A diverse energy mix is needed to enable the transition to a net-zero future at the same time as supporting UK growth and maintaining our security of supply.

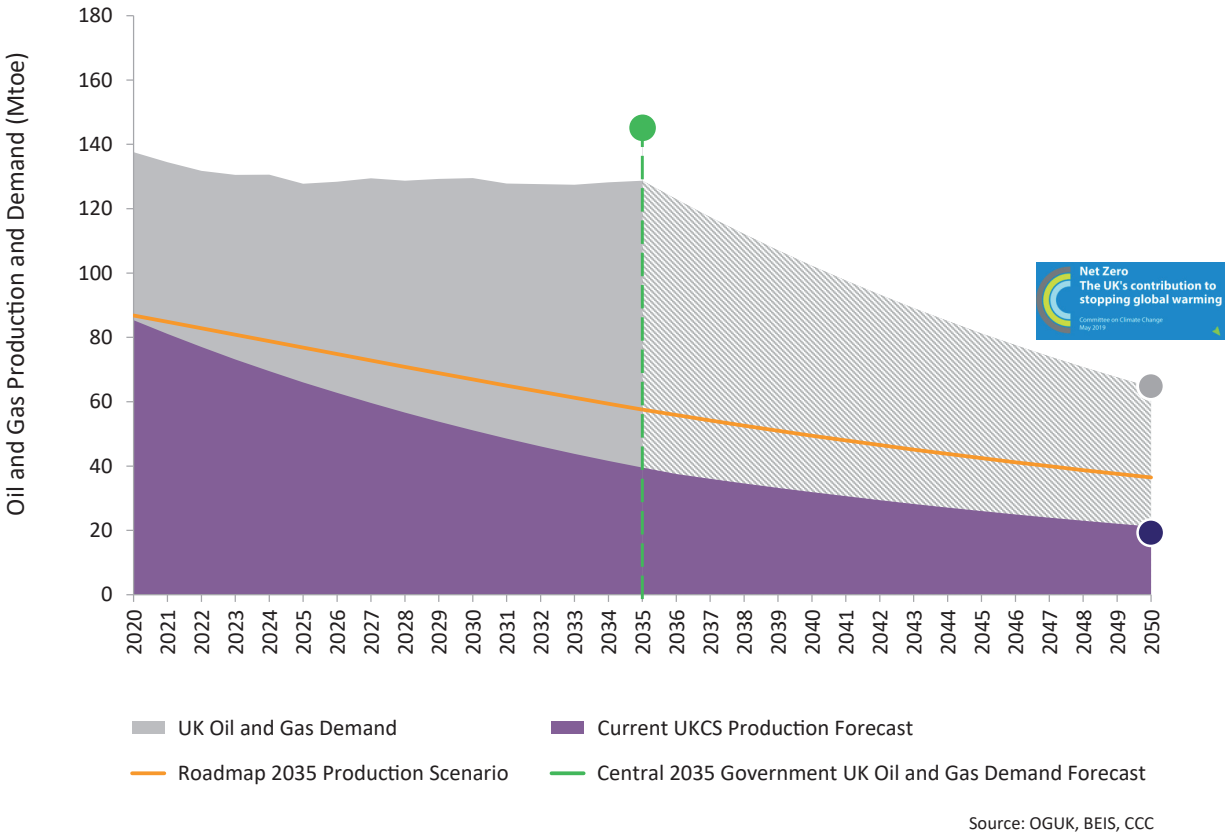
The CCC forecasts that demand for oil and gas in the UK in 2050 will be around 400 million barrels of oil equivalent (boe) per annum. It is currently estimated the UKCS could still be producing as much as half of the energy needed to meet this demand.

Locally produced oil and gas delivers a significant economic benefit to the UK, supporting 270,000 jobs, £10.6 billion worth of supply chain exports and £1.2 billion in production taxes alone, whilst also playing a key role in UK energy security.

Maintaining UK energy security will be reinforced by avoiding premature cessation of UKCS production. Early closure of UK oil and gas risks increasing our reliance on production from other basins. The UK would have much less influence over how these imports are produced. Imports also do little or nothing to help achieve the necessary diversification of the UK's energy mix. Ongoing production in the UK will help sustain the domestic engineering expertise, skills and knowledge needed to deliver low-emission oil and gas production and to support the growth of new hydrogen and CCS industries. Both are key to decarbonisation of the UK's industrial, power and domestic heat sectors and the UK needs these technologies if it is to achieve its legally binding goal of net zero.

To remain competitive as a basin and as a key provider of UK energy needs into the future, the emissions intensity of UK oil and gas production must continue to fall. Having produced oil and gas for over 50 years, the UKCS is a mature basin with a mix of assets from the recently installed to those which have been in operation for over 40 years. Historically, emissions intensity has increased, as assets age and production declines. Production has also moved into deeper waters and increased in complexity, leading to greater energy requirements to produce the oil and gas. To manage this, innovation and concerted effort is needed to continually drive down on emissions intensity through reducing emissions, improving our energy efficiency, and reducing waste gas generation.

Production vs Forecast Demand



Source: OGUK, BEIS, CCC

Emission Reduction Targets: Scope and Scale

The emission reduction targets we are adopting apply at basin-wide level - not per operator or individual asset. Whilst all operators will need to reduce emissions, different portfolios are at different stages in their lifecycle and therefore will be driven by different opportunities. They also encompass the totality of GHG emissions from the upstream oil and gas sector, including those emitted at offshore oil and gas installations, onshore terminals processing UK oil and gas, offshore shipping supporting UK oil and gas production (logistics and drilling rigs) and aviation transportation (helicopter journeys). The targets cover the full scope of greenhouse gases (GHGs): carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons and sulphur hexafluoride gases. Please see Appendix for further detail.

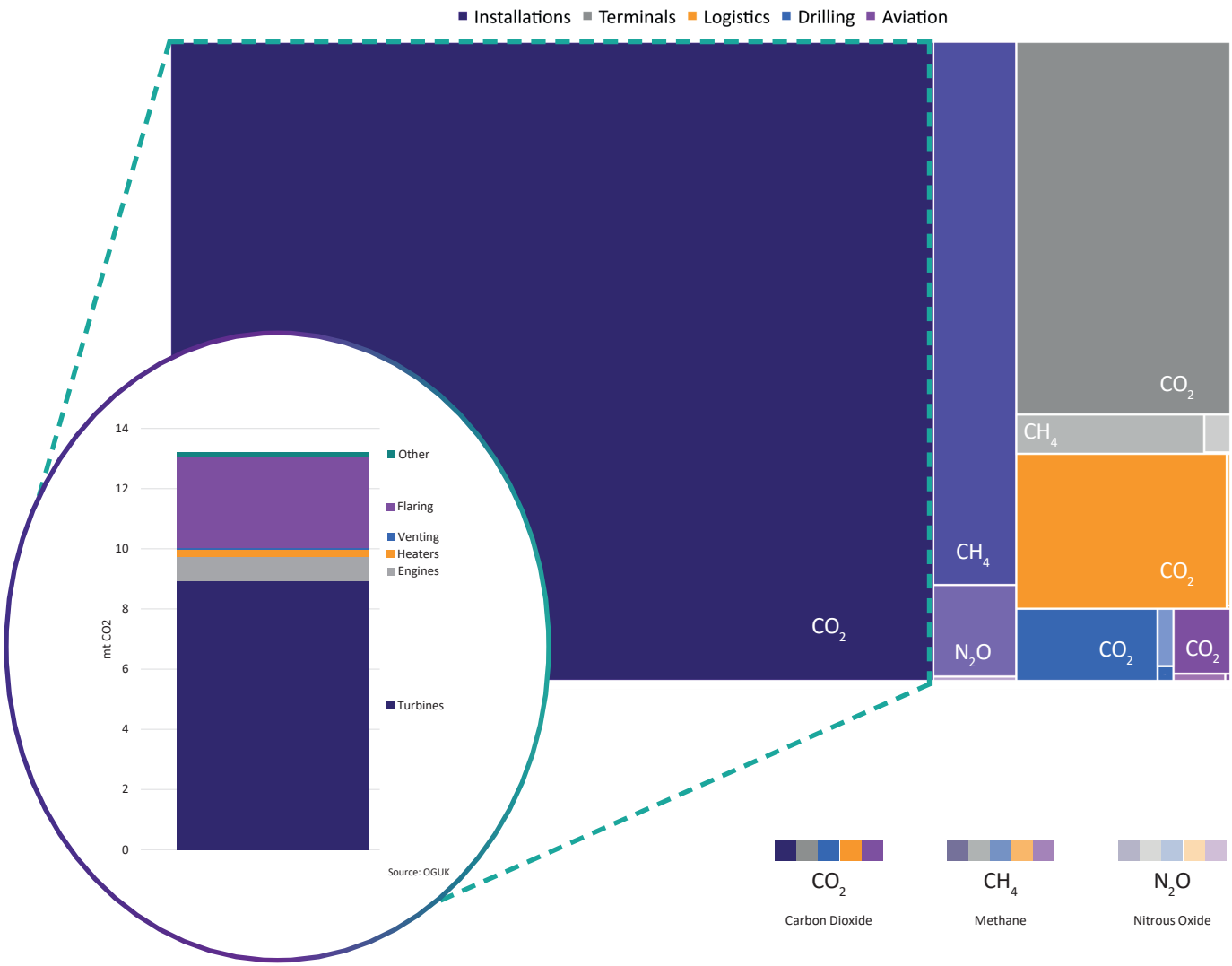
In 2018, 18.3 million tonnes of CO_2 equivalent (CO_2e) GHGs were emitted from upstream oil and gas operations, representing 4 per cent of total UK emissions.

14.6 million tonnes CO_2e (80 per cent) were associated with the production of oil and gas at offshore installations. 14 per cent of emissions are from onshore terminals and 5 per cent from logistics. The majority (91 per cent) of emissions were CO_2, with methane representing the second largest (8 per cent of total upstream emissions on a CO_2e basis).

Across the sector the main sources of emissions are from power or heat generation, gas compression, flaring and venting. In 2018, 70 per cent of emissions from offshore assets were associated with power or heat generation from turbines, engines and heaters, while 29 per cent were from flares and vents.

Achievement of these reductions will be supported by improvements in the measurement and monitoring of emissions. Such improvement is vital to enable and progress the monitoring and assessment of emission reduction targets.

UKCS Offshore Installation GHG Sources



Achieving Emissions Reductions

The sector is committing to emissions reductions of 50 per cent by 2030 and 90 per cent by 2040, accounting for all GHG emissions from all upstream oil and gas operations (compared with a 2018 baseline, including reductions from the decommissioning of assets).

A combined approach is needed to reduce the carbon footprint of the UK's upstream oil and gas production activities. There is a gap between what is currently technically feasible and what is commercially feasible to deliver this ambition. Collective innovation by industry, regulators, and our partners in government is needed to facilitate these investments and ensure they can be delivered alongside the continued energy security that remains crucial for the economy.

Further work is ongoing through OGUK, across the industry and with regulators on developing investible solutions to help meet these targets. Measures under consideration will address the affordability, development, and deployment of new technology and assess the business and regulatory models underpinning them.

Three primary means of reducing upstream emissions have been identified which are expanded in the following sections:

1. **Operational Improvement** (incremental)
2. **Reduced Flaring and Venting** (operational)
3. **Step-Change Action Requiring Investment** (capital)

UKCS Net-Zero Ambition: Key Work Streams Underway

<table>
<tr><th>Fugitives, Flaring and Venting</th><th>Day to Day Operations</th><th>Reducing CO_2 Emissions from Power Generation</th><th>Broader Area Solutions / Regional Electrification</th><th>CCS, Hydrogen, Other</th></tr>
<tr><td>Minimise purge flow vent systems</td><td>Reprioritised operations (on / offshore)</td><td>Power generation system - operational optimisation</td><td rowspan="2">Platform electrification (E-power import and or local renewable generation)</td><td rowspan="3">CCUS & Hydrogen projects inc:-
• Acorn
• Net-zero Teeside
• Zero-carbon Humber
• Hynet North West
• South Wales
• Southampton
• Project Cavendish / SE / London</td></tr>
<tr><td>Maximising flash gas recovery</td><td>Use of digital dashboards</td><td>Single turbine operations</td></tr>
<tr><td>Flare system operational and standards reviews</td><td>Digital machine learning</td><td>Use of gas for power generation</td><td>Interconnection of platforms / systems approach</td></tr>
<tr><td rowspan="2">Methane Measurement inc:
• Drone sensors and surveys
• Infra-red detection</td><td rowspan="3">Artificial intelligence technology</td><td>Maintenance and reliability focus</td><td rowspan="2">CNS & WoS Electrification studies
Floating wind integration</td><td>Combined Energy Decarbonisation Hubs, e.g. Orkney, Shetlands, offshore</td></tr>
<tr><td>Rotating equipment - systems optimisation</td><td>Blue and green Hydrogen</td></tr>
<tr><td rowspan="2">New projects, new techniques</td><td>New control systems</td><td>Connecting powerlines, UK / Norway</td><td rowspan="2">Solar, wind and tidal deployment</td></tr>
<tr><td>Improved use of dry gas seal systems</td><td>Alternative renewable power supplies</td></tr>
</table>

Source: OGA, Industry Sources

Opportunities for Emissions Reduction

The opportunity for emissions reduction varies across assets within the upstream sector.

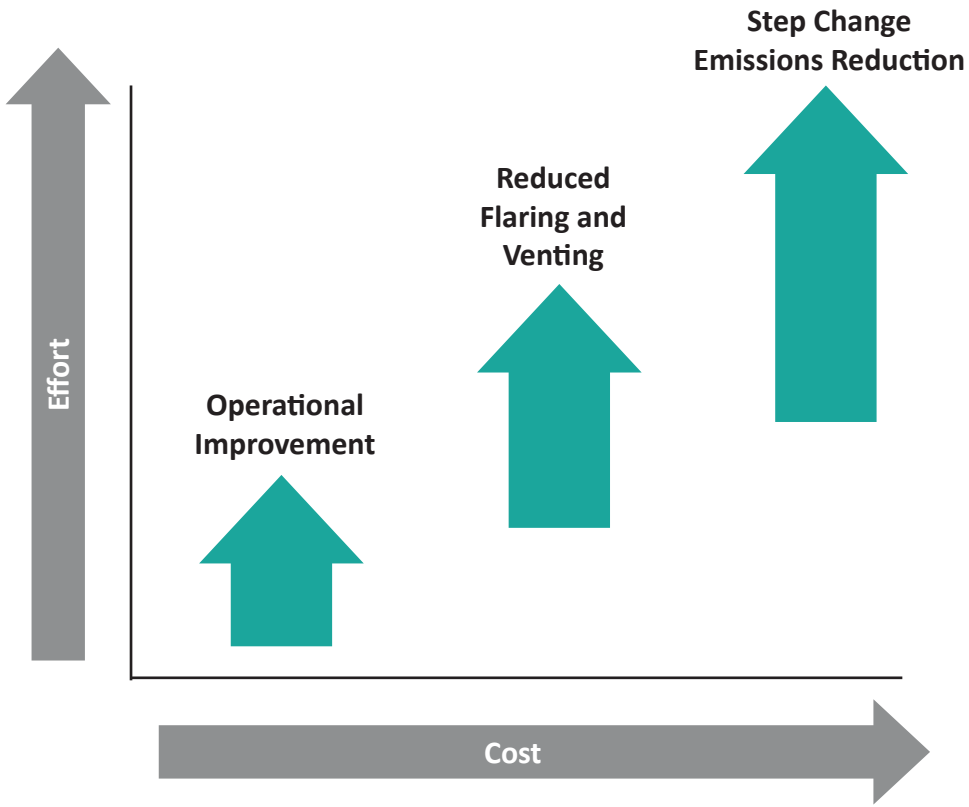
Factors which may influence the reduction potential for individual assets include the age and maturity of the asset, future production potential and time to end of field life as well as the lifetime projection of emissions.

These factors will also impact the viable options available for reduction of emissions (abatement) at specific assets. Abatement options will further depend on location (e.g. onshore, offshore, water depth, distance from shore or distance to connected infrastructure), the production process adopted, and the type and chemistry of the hydrocarbons produced.

The cost and effort required to achieve emissions reduction from incremental operational improvements is significantly lower than that required for step-change emission reduction. This also reflects the size of the opportunities (abatement potential) – the largest-scale emissions reductions will only be achieved via significant investment, requiring a coordinated effort from industry and government.

The time taken to realise emission reductions from operational improvements reductions is shorter (perhaps one to two years) than from step-change actions which require much longer to define, develop and implement solutions (greater than five years) as these are large and complex projects.

Abatement Potential Curve



Work is already underway through the collective efforts of operators, contractors, the government regulators and supporting bodies such as OGUK and the Oil and Gas Technology Centre (OGTC).

Installations across the UKCS are at different stages in addressing carbon abatement; some have already achieved significant reduction through operational improvements and are facing increasingly challenging choices, others are exploring the opportunities available.

Operators are also investigating how the upstream sector can work with others to create combined initiatives to reduce emissions from the use of hydrocarbon products.

Emissions reduction will be underpinned by innovation and technology developments through all three of the primary means – led by the OGTC Net Zero Solution Centre.

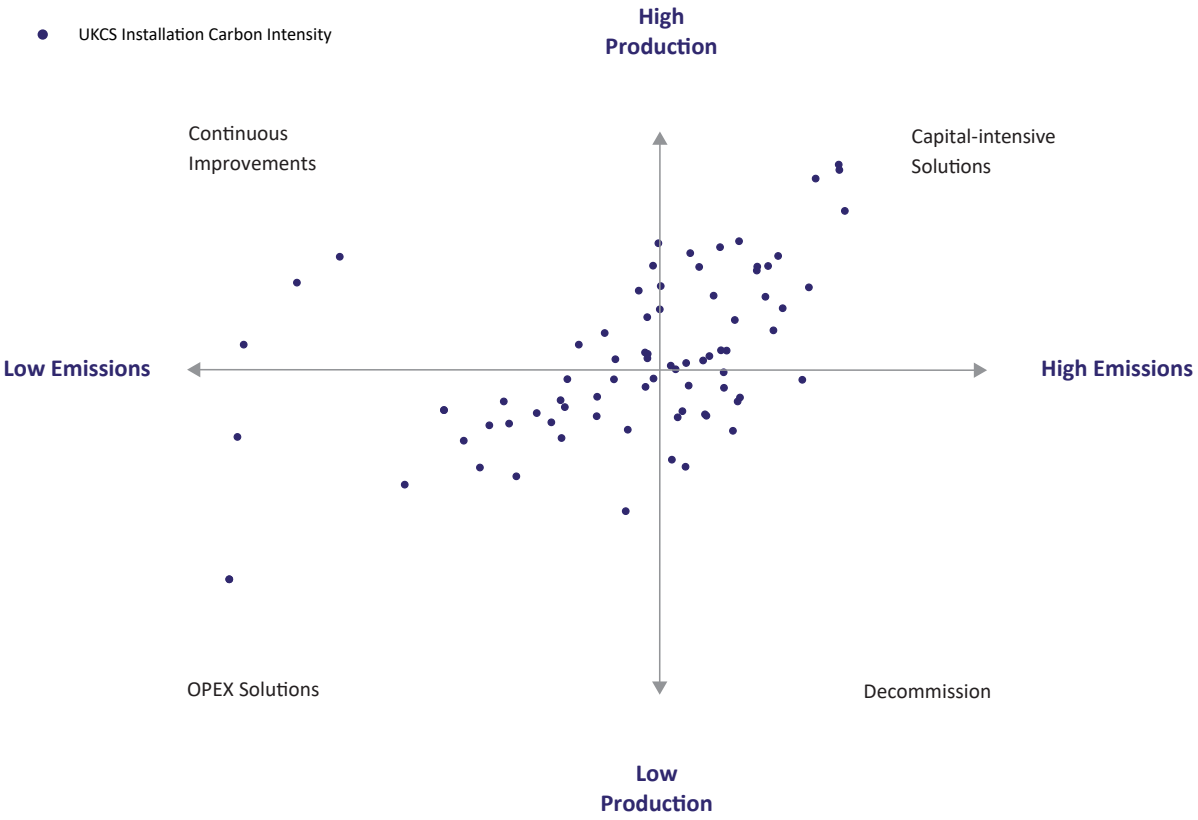
Company: Premier Oil/OGTC
Project: Powerbuoy Trial at the Huntington Field

Since August 2019, Premier Oil has been trialling the PB3 PowerBuoy at the Huntington field. The project, supported by the Oil and Gas Technology Centre (OGTC), uses technology from wave energy developer Ocean Power Technologies in partnership with the Acteon Group.

Whilst moored to the seabed, the Buoy uses wave power and an energy storage system to provide emissions-free power for sensors and instruments. The device constantly charges itself and streams data back onshore for review. In future, the system could be used to monitor live subsea information.

The technology can aid decarbonisation and deliver other value-adding opportunities when paired up with different payload configurations, such as to support small field developments or as a charging/communications hub for autonomous underwater vehicle (AUV) applications.

Offshore Installation Intensity and Abatement Options



Source: OGUK, ETS

1.) Operational Improvement

Operators are realising emissions reduction in the near term through continued improvements to production efficiency, energy efficiency, streamlining operational processes, consideration of fuel use, as well as the upgrading and/or re-sizing of equipment.

Over the past five years absolute emissions in the upstream sector have remained stable even as production has increased by 20 per cent. This means that today we are emitting fewer GHG emissions per barrel of oil and gas produced, than five years ago. This has resulted in a decline in the carbon intensity of UKCS production. Sustained focus on maintaining production efficiency and improving energy efficiency will make an important contribution to these emission reduction targets.

Of the 50 per cent target by 2030, a limited amount will be achieved through operational improvement. Most of these emissions reductions will be achieved early in the period. Operational improvements offer the opportunity for emissions reduction on all assets on the UKCS regardless of their age, maturity or production profile. The scale of reductions achievable through these operational improvements varies among assets and operators. Newly installed installations utilising new, efficient equipment and processes will have limited capacity for further incremental emissions reduction at present, whilst some older assets may offer more scope for shorter-term improvement at lower cost.

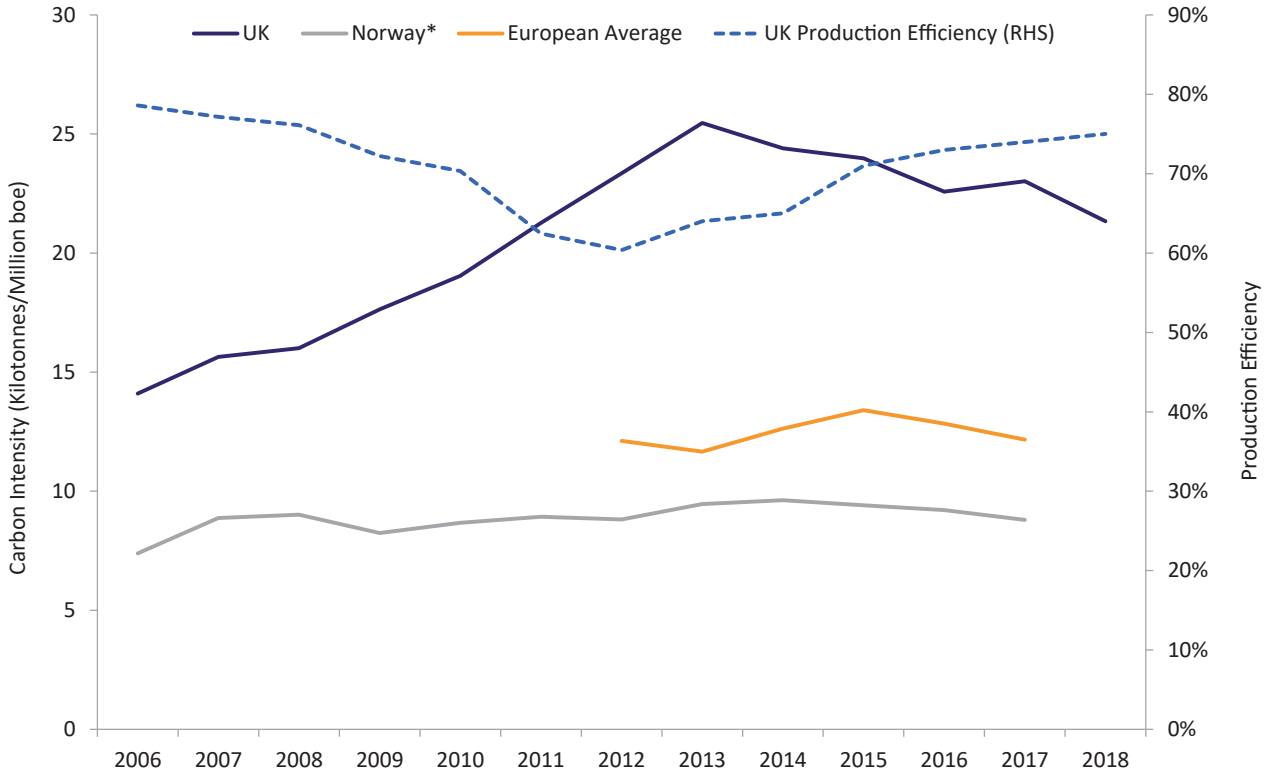
Offshore platforms are not connected directly to the onshore power distribution network, and so power is usually generated offshore using gas produced directly from the reservoir. Historically this has been viewed as ‘free’ fuel. Power is generated for heating and lighting and for production processes such as gas compression.

A combination of fuel sources is used at onshore terminals including fuel gas received as part of the product processing.

Increased consideration is being given for the impact of changes to operational practices on energy demand, power generation and flare management. OGUK is already working with members to share good practice on the routine inclusion of carbon and energy management into such decision-making processes.

Improvement examples include replacing valves, re-sizing pumps or reducing spinning reserve on power generation turbines. Ideas have been gathered from offshore energy audits and direct from the offshore workforce. A programme of sharing successes is ongoing through OGUK.

Offshore Installations Carbon Intensity - International Comparison



Source: OGUK, IOGP, NOROG

N.B. Norwegian production heavily weights European production average, and is often serviced by power from shore, by a renewable dominated electricity grid.

Company: BP
Project: Gas turbine routine fuel changeovers at Glen Lyon

The Glen Lyon FPSO has four gas turbines which typically use fuel gas to provide electrical power to the plant. Each turbine is dual-fuel, meaning they can also operate on diesel.

In order to check this dual-fuel facility, each unit is run on diesel for four hours each month. This is to perform a number of key performance checks while on a liquid fuel. The Glen Lyon team identified that these checks could be performed in 15 minutes, reducing the duration of diesel combustion by 3.75 hours.

By replacing diesel combustion with gas, the mass of CO_2 is reduced by 2,048 tonnes per year. Gas also has a higher energy value so less needs to be burnt to generate the same power as diesel. In addition to these reductions and diesel savings, this change prevents the turbine burners being choked up so quickly and efficiency savings as these burners do not require needless replacement.

This improvement was Identified and executed through BP's *Challenge, Check and Change* initiative.

Image Courtesy: BP

2.) Flaring and Venting Reduction

Gas is flared at offshore assets as part of the production process, both as routine flaring for disposal of waste gas and sometimes for safety reasons. In the latter case, flares are used to remove highly combustible gases effectively and quickly from the vicinity of an asset's people and infrastructure.

Just over 1.2 million tonnes of gas were flared on UK offshore installations in 2018. Flaring is the second largest source of CO_2 emissions on offshore installations (3 million tonnes CO_2 in 2018).

In 2018, 95,100 tonnes of gas were vented offshore, consisting of 51 per cent CO_2, 25 per cent Volatile Organic Compounds (VOCs) and 24 per cent methane. Venting also occurs as part of the production process, during the management control of pressure on offshore platforms and occasionally when it is not possible to light the flare (for example, when there is insufficient gas volume or the gas composition is such that ignition is not possible).

Offshore installations must maintain the ability to flare for safety. However, a significant reduction in routine flaring and conservation of gas will be required to meet the targets announced and to achieve net zero emissions by 2050. A target of 30 per cent reduction in flaring emissions, over and above natural decline, between now and 2030 is incorporated into the targets.

Many more recent oil and gas developments on the UKCS have been designed and built to enable zero-routine flaring. Operators are seeking to realise their commitments on flaring in existing field development plans, by driving the commissioning of gas recovery and vapour recovery systems.

Continuous Reduction of Methane Emissions

Flaring and venting are significant sources of methane emissions for the sector. Together with members OGUK is developing a detailed Methane Action Plan for release later in 2020. The aim of the Plan is to promote continuous reduction in methane emissions supported by improvements in quantification.

The Methane Action Plan will capture collective action to reduce and phase out routine flaring and venting offshore such as: the consideration of zero-routine flaring in the design of new-builds; improved gas recovery in field development plans; the development and implementation of flare management plans that detail how monitoring is to be done and set performance indicators; and ensure understanding of the impact on flaring intensity arising from changes to operations or maintenance regimes or equipment so this can be incorporated into planning and decision making.

Methane is incorporated into the overall targets (as they apply to a CO_2e baseline), however given its high global warming potential and near term warming effects – an additional sector specific methane target will be set as part of the Methane Action Plan.

3.) Step-Change Opportunities – Significant Investment

Achieving ambitious emissions reduction targets will ultimately require a step change in emissions performance focusing on the largest sources of upstream emissions: power generation, process heat generation and gas compression that currently use gas or oil fuels.

Future, step-change action (abatement options) could include:

i **Full or partial electrification of offshore assets through**
- Connection to offshore renewables
- Connection to the onshore power distribution network

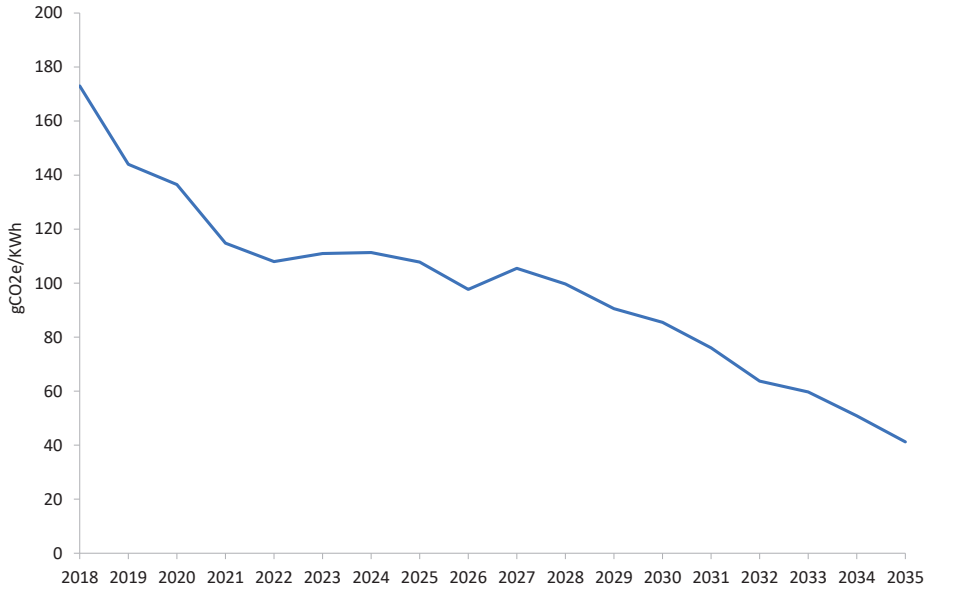
ii **Localised offshore capture and storage (CCS) of CO_2 on or near-site**

iii **Creation of offshore integrated energy hubs**

iv **Increased use of electrical power at onshore terminals and processing plants**

On the UKCS, locally generated offshore power is on average four to five times more emissions intensive (935gCO_2/kWh in 2018) than electricity from the UK national grid. Whilst the UK has increased its renewable energy production (33 per cent of electricity generation in 2018), the onshore network is not yet fully decarbonised (and gas remains a major source of UK power production). Although emissions intensity is forecast to continue to decline over the next decade alongside the increased electrification of other parts of UK society.

Forecast Electricity Emissions from Major UK Power Producers



Source: BEIS

i. Full or partial electrification of offshore assets

In 2018, over 60 per cent of CO_2 emissions for our sector came from offshore electricity generation. The switching of offshore power from gas turbine generation to electricity from shore or from local renewables offers the possibility of a step-change in emissions reduction. This could be achieved through connection of offshore platforms to an onshore power grid, for example the UK's National Grid (or even to Norway's grid), and/ or connections to offshore renewable energy developments. This could include large-scale renewable developments providing power into the onshore grid, or smaller localised renewable developments providing power to specific offshore infrastructure.

The technology, offshore renewable resources and infrastructure are not currently in place to facilitate such offshore electrification of either existing or new assets. Enabling this will require significant investment and is likely to take a decade to deploy at scale.

At present electrification of offshore assets is not commercially affordable and poses a challenge to achieving these ambitious targets. OGUK is working with member companies and the Oil and Gas Authority (OGA) on potential mechanisms to unlock the potential for offshore electrification, which will require a collective approach to address the challenges.

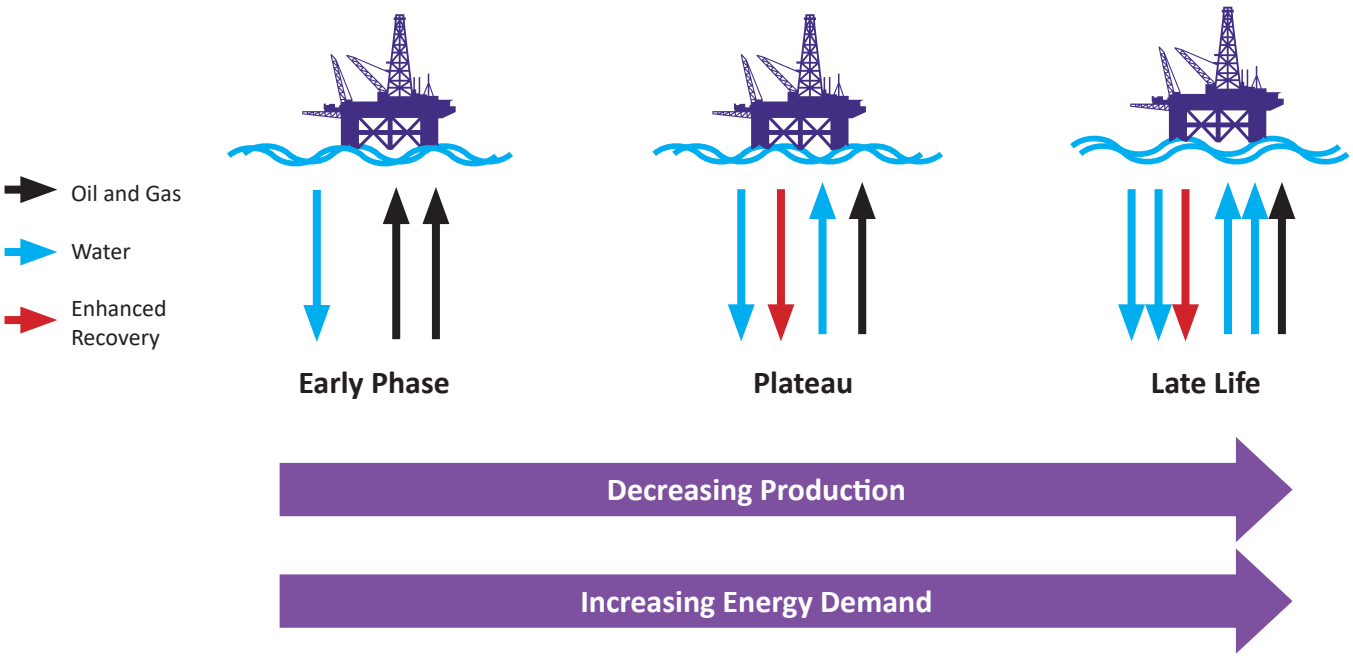
Widespread offshore electrification requires:

- The development of an offshore electrical distribution network, installation of cabling and resolution of cable ownership and investment returns
- Further technology development and maturity to realise deployment of deep-water renewables such as floating wind and resolution of funding approaches to resource this
- Streamlining of the consent and licensing timeframes (currently ~10 years) for offshore renewables
- Resolution of challenges such as additional back-up power supply and variation in power demand over the lifetime of an asset

The electrification of a small number of newly designed platforms near to shore has already been achieved in the Norwegian sector. The conversion of existing assets (brownfield) to electrical power poses additional challenges around the upgrade and replacement of connected equipment to allow for conversion to electrical drive and AC/DC switching, space and weight limitations and structural challenges as many older platforms were designed and built around their turbines.

Operators are working with OGTC, OGUK and the OGA and those in academic, renewable and power sectors to address the technical challenges to increased offshore electrification.

Challenges of Emissions Intensity and Maturity Offshore



ii. Localised CCS

The use of CCS on individual assets to capture CO_2 from power turbine or compressor exhausts could incorporate sequestration of CO_2 into a reservoir for storage and/or enhanced oil recovery (EOR) or transportation to shore of captured CO_2 for processing and then offshore sequestration. Development of localised CCS is most likely to be viable when part of a larger CCS project

iii. Offshore integrated energy hubs

The future development of offshore hubs (in which a number of interconnected offshore platforms share a centralised renewable power supply) perhaps producing hydrocarbons or hydrogen and/or storing CO_2 in offshore reservoirs could be used to realise a step-change in emission reduction from upstream oil and gas operations and to lay the foundations for large scale emissions capture for the wider UK economy.

iv. Increased use of electrical power at onshore terminals and processing plants

Most onshore terminals are connected to the national grid, and some or all of their power is supplied from grid electricity. Fuel gas and other hydrocarbons are often used for generating process heat and compression because they are currently more efficient than electrical heating alternatives.

Step-change actions to reduce emissions at these terminals could include increased use of electrical power, re-sizing to reduce the number of compressor trains and consolidation of processing to increase efficiency by maximising throughput. Alternative approaches to process heat generation include harnessing waste heat from other processes such as hydrogen production.

Research is ongoing on the opportunities to reduce emissions in the exploration, logistics, decommissioning and aviation sectors. Solutions could include increased used of electrical power and batteries and the use of alternative fuels such as ammonia or hydrogen.

4.) Natural Decline

Decommissioning is a natural part of an oil and gas basin's lifecycle and exists alongside exploration and production activity on the UK Continental Shelf. The UKCS has been successful in both maximising production from existing assets and extending their lifetime. The decision to cease production and move to decommissioning of the offshore installations takes into account many factors including oil and gas price.

Forecasting emissions is complex, but using the best available data, it is estimated that around one-half to two-thirds of the emissions reduction over the next decade could be the result of natural decline. Natural decline includes the introduction of both new production and the decommissioning of older more energy intensive assets on the UKCS as production from the basin declines. This leaves a considerable proportion of the reduction that require significant effort from across sector through a combination of operational improvements, reduced flaring and venting and step-change actions. In the near term, over the next five years, natural decline only delivers around six percent of emissions reduction. This dynamic highlights the importance of new production and the development of low emissions technology which will together transform the emissions outlook.

Additionally, UKCS operators are looking at ways to reduce emissions generated post-cessation of production (COP) and during the decommissioning process. These emissions are included within the scope of the emissions targets.

Image Courtesy: Repsol Sinopex Resources UK

5.) Improved Monitoring of Emissions

The formation of targets and assessment of performance requires the establishment of a clear emissions baseline. OGUK, with industry support, commits to continued performance monitoring and additional monitoring against these targets.

OGUK has initiated an annual data collection and analysis of verified CO_2 emissions data which will be used to assess collective industry progress. This data is also used for an annual benchmarking exercise and is already proving valuable in stimulating discussion on good practices and sharing of successful emission reduction ideas.

Verified CO_2 emissions data from heat and power sources is collated on an annual basis for most offshore platforms, terminals, and the aviation sector. Industry has begun improving the identification and reporting approaches to quantifying other CO_2 sources offshore.

Further action is required to improve the collection, quantification, measurement and monitoring of other GHGs such as methane emissions, as captured in the Methane Action Plan.

OGUK is working with members, partners across the supply chain and regulators on reporting requirements and the need for improved centralised reporting mechanisms.

6.) Future Oil and Gas Development

The development of targets for the upstream sector has incorporated projections for new development[2] and new production coming on stream in the near term. In 2018 emissions from offshore installations decreased by 3 per cent, as few fields came into production.

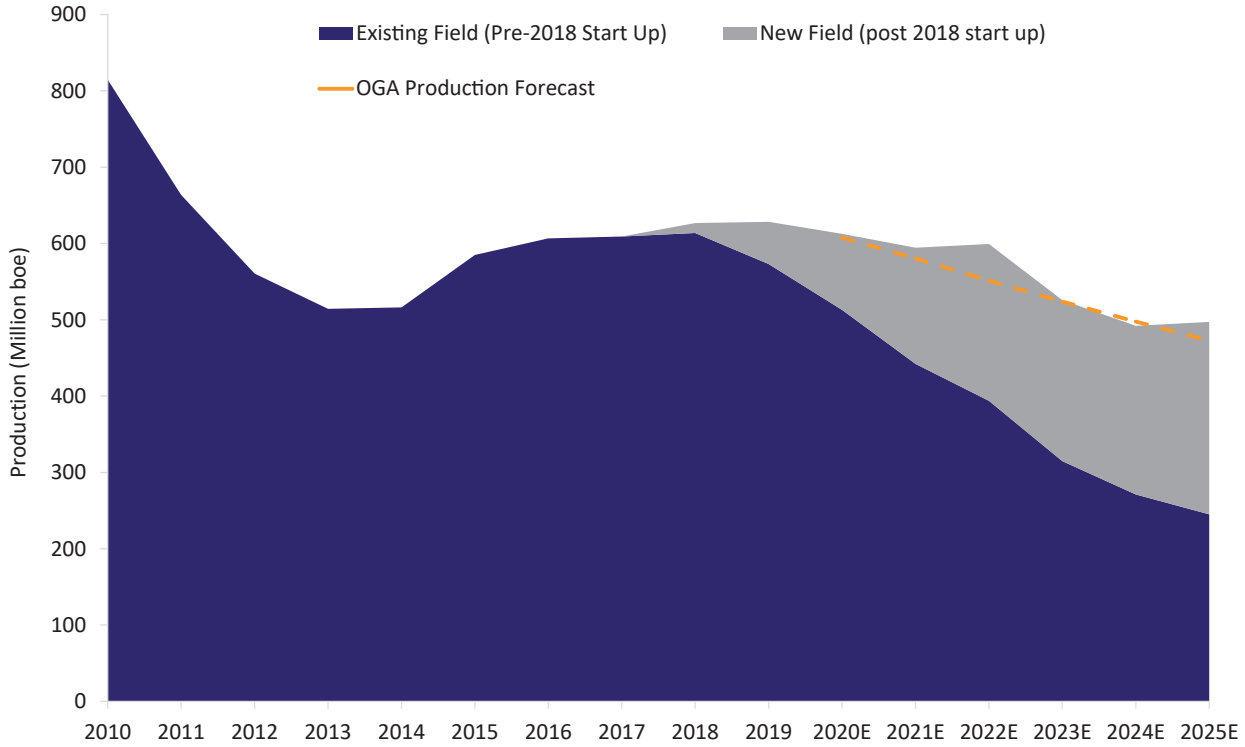
Over the next two to three years OGUK forecasts an initial slight rise in emissions as new production already in development is added from large fields coming online. As the targets are built on a 2018 baseline, increased effort will therefore be required to realise emissions reduction in line with the targets, at the same time as adding new lower carbon production to the basin.

It is anticipated that operators will need to consider how new developments are compatible with these industry targets as part of their design. For example, reduction in power generation emissions (perhaps through electrification, maximisation of gas recovery and zero-routine flaring and increased use of digitalisation). This will require future technology development and deployment which is being championed by the OGTC through the Net Zero Solution Centre.

For new production already commissioned or under construction, the technology and infrastructure (such as electrical distribution) is not yet in place to facilitate full decarbonisation. Effort here is focused on the adoption of technologies and approaches in design that maximise energy efficiency and minimise waste gas generation.

[2] Fields that are yet to start producing (in development or under development)

Production Forecast - Existing vs New Field Developments



Source: Rystad Energy, OGUK, OGA

Policy Frameworks Supporting Decarbonisation

OGUK is working with members to develop proposals for collective action, cost and policy recommendations and potential delivery mechanisms to meet these ambitious emission reduction targets. Such support is needed to bridge the gap from what is currently technically and economically feasible and the necessary accelerated emissions reduction. This includes an assessment of the options to meet the targets through operational improvement, reduced flaring, addressing emissions from power generation through step-change actions with their associated investments.

If we cannot deliver some of the step changes we have planned, the proportion of these emission reductions to be met through decommissioning of UKCS production will be higher and this would risk increased reliance on imports and associated carbon leakage (putting responsibility on other countries from which imports are sourced).

There are a range of options which individual members and OGUK are discussing with government in the context of the transformational Sector Deal proposed by the UK Government which is now under development. Delivery of such a deal could act as a major catalyst to the objective of delivering a thriving, low-carbon indigenous energy industry that can play a major role in a green economic recovery from the COVID-19 pandemic and the associated collapse in commodity prices. It will also unlock opportunities for large parts of the UK to decarbonise on the back of new technology and infrastructure that we are uniquely placed to deliver at scale.

The commitments made by our sector on emission reduction are independent of the above Sector Deal and we look forward to continued policy discussion on the different options with government. However, our vision for the oil and gas sector, which we will continue to communicate, is of our role as an integral part of a wider industrial and energy system.

Identified Priorities for Emissions Reduction

Continued support and recognition for role that UKCS plays in the UK's net zero future	A post-Brexit carbon pricing mechanism that recognises the need for support for step-change decarbonisation of upstream oil and gas activities and the risk of carbon leakage	Increase scope for innovation in offshore wind technology to power oil and gas production, through a separate CFD for offshore floating wind
Cross-regulator support and commitment to establishing strategic offshore electricity networks, to support offshore energy integration	Develop regulatory model for CCS and commit to support transport and storage and infrastructure development into the 2030s, to ensure that a pipeline of projects is in place to progressively deploy at scale	Create effective business models for Industrial CCUS and hydrogen e.g. Contract For Difference (CFD) that supports projects in the near term

Company: EnQuest
Project: Sullom Voe Transformation

The Sullom Voe Terminal (SVT) is currently undergoing a programme of transformation to ensure it remains competitive and fit for purpose. As part of this transformation, new power generation and compression options are being considered. The main sources of GHG emissions from SVT result from power and steam generation from the adjacent power station and flaring. The current power station is oversized at 100 MW and does not meet the requirements of a modern SVT. It is also inefficient and operating under a derogation that will expire at the end of 2025.

Meeting the expected future power and gas compression requirements will involve the commissioning of a new power solution. With typical power demand expected in the range of circa 8MW, the plans envisage installing three Taurus 60 (4.8-MW) gas turbine generators (GTGs) and operating them on a two out of three basis (or half their capacity). This is expected to result in a saving of more than 60% in terms of tonnes of CO_2e emitted over the next 15 years.

Taking into consideration the remaining operational life of the power station, a green power solution is also being examined. In addition, EnQuest is actively looking at opportunities such as flare reduction and plant operational efficiencies to further reduce GHG emissions in line with the Group's aim to reduce emissions across its portfolio.

Name: Euan Bathgate
Job Title: VP, Engineering Support
Company: OPEX Group
Location: Inverurie, Aberdeenshire

Inverurie resident and oil and gas worker Euan Bathgate has driven the development of a new solution which helps oil and gas companies reduce CO_2 intensity and emissions across their operations. Euan, a VP for OPEX Group in Aberdeen, led the development of X-PAS Emissions which uses predictive technologies combined with traditional engineering to improve energy efficiency on offshore installations.

Euan explains: "The new solution provides an opportunity for operators to reduce CO_2 by dynamically calculating the lowest possible emissions for a given production target and plant configuration. Users of the system have full visibility of the energy use and emissions intensity of their assets and are prompted with the operational decisions and actions they can take to reduce emissions".

The former offshore worker says a lot has changed during his time in industry, but there will still be a role for oil and gas as part of a diverse energy mix. This underlines the importance of producing oil and gas with as little emissions as possible; "What we're doing makes our customers' existing data valuable and we see this solution as an important part of mix because it can make an impact on emissions immediately, while industry also works on the bigger capital solutions such as hydrogen and Carbon Capture Usage and Storage."

Appendix: Supportive Information

i. Information Sources

Data sources include The EU Emissions Trading Scheme (ETS) 2018 verified data, the Environmental and Emissions Monitoring System, national Pollution Inventories and the National Implementation Measures (NIMS) verified compliance data.

ii. Scope of Targets

The GHG Protocol Corporate Standard classifies a company's GHG emissions into three 'scopes':

- Scope 1 emissions are direct emissions from owned or controlled sources
- Scope 2 emissions are indirect emissions from the generation of purchased energy
- Scope 3 emissions are all indirect emissions (not included in scope 2) that occur in the value chain of the reporting company, including both upstream and downstream emissions

For the purposes of evaluating the upstream oil and gas production industry as an entity, OGUK has broadly used the definition outlined in IPIECA's *'Petroleum industry guidelines for reporting greenhouse gas emissions'.* Scope 1 emissions are defined as UKCS oil and gas installations, onshore terminals processing UK oil and gas, offshore shipping supporting UK oil and gas production (logistics and drilling rigs) and aviation transportation (helicopter journeys). At present verified measured and monitored CO_2 emissions exist for ETS installations only.

OGUK is working with partners and the supply chain to agree metrics for emissions reporting and reduction in future. This will be the first step in establishing and capturing opportunities for emissions reduction in the wider value chain.

Scope 2 emissions, or the emissions related to the electricity from a purchased energy stream, are not included in the targets, as operators have little control over the intensity of the purchased electricity (it is simply assumed to be at the average intensity of the grid). Yet these emissions will be estimated and reported by OGUK in an annual report.

iii. GHG Targets

The proposed targets relate to the six GHG's as defined by the Kyoto protocol: carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons and sulphur hexafluoride. Reductions will be against IPCC Fifth Assessment Report, 2014 (AR5) global warming potentials.

iv. Absolute Targets

Under Current legislation, all sectors are expected to develop pathways to reach net-zero emissions by 2050. Whilst production is not directly proportional to emissions, increased production generally tends towards greater emissions. The stated targets will remain irrespective of revisions to production forecast changes

Get Involved

OGUK encourages all members to join the debate and support the industry's work in delivering on our climate ambitions.

To hear about our relevant forums and workgroups, and where your views can make a difference, visit our website:

oilandgasuk.co.uk

or email the team:

sustainability@oilandgasuk.co.uk

If you'd like to hear more about membership of OGUK, get in touch with our membership team:

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