EMISSIONS REPORT 2022

OFFSHORE ENERGIES UK

Delivering on our commitment: scenarios for decarbonising oil and gas production

OEUK OFFSHORE ENERGIES UK

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

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

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EMISSIONS REPORT 2022

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Foreword

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This document provides a status report on the industry's efforts to reduce greenhouse gas emissions (mainly CO_2 and methane) from oil and gas production, a key part of the North Sea Transition Deal. The outcomes are already visible: emissions in 2021 were down over 20% on the 2018 base year the lowest level in the history of the basin, and on track with industry targets for 2025 and 2027. Industry remains committed to the 50% target for 2030 and the objective of net zero by 2050. However, it still needs government actions to enable capital projects such as platform electrification to help it achieve these targets.

Reliable and responsible supplies of energy from the UK continental shelf have never been more important. Energy markets, and the gas and power markets in particular, have been in turmoil following Russia's invasion of Ukraine and the restriction and then closure of major gas exporting infrastructure. Meanwhile, importing hydrocarbons from more distant sources, although necessary at times, increases overall emissions.

The UK is expected to require up to 2.2bn tonnes of oil equivalent (the same as 15bn boe) on its pathway to net zero. As well as being inherently more reliable, UK production benefits the economy, adding gross domestic product, tax revenues and supporting jobs. Critically, the oil and gas industry relies on a sophisticated supply chain which is required for the energy transition. The government's decision to release the results of its 'Climate Compatibility Checkpoint' consultation earlier this month on new oil and gas projects will boost UK energy security while minimising greenhouse gas emissions

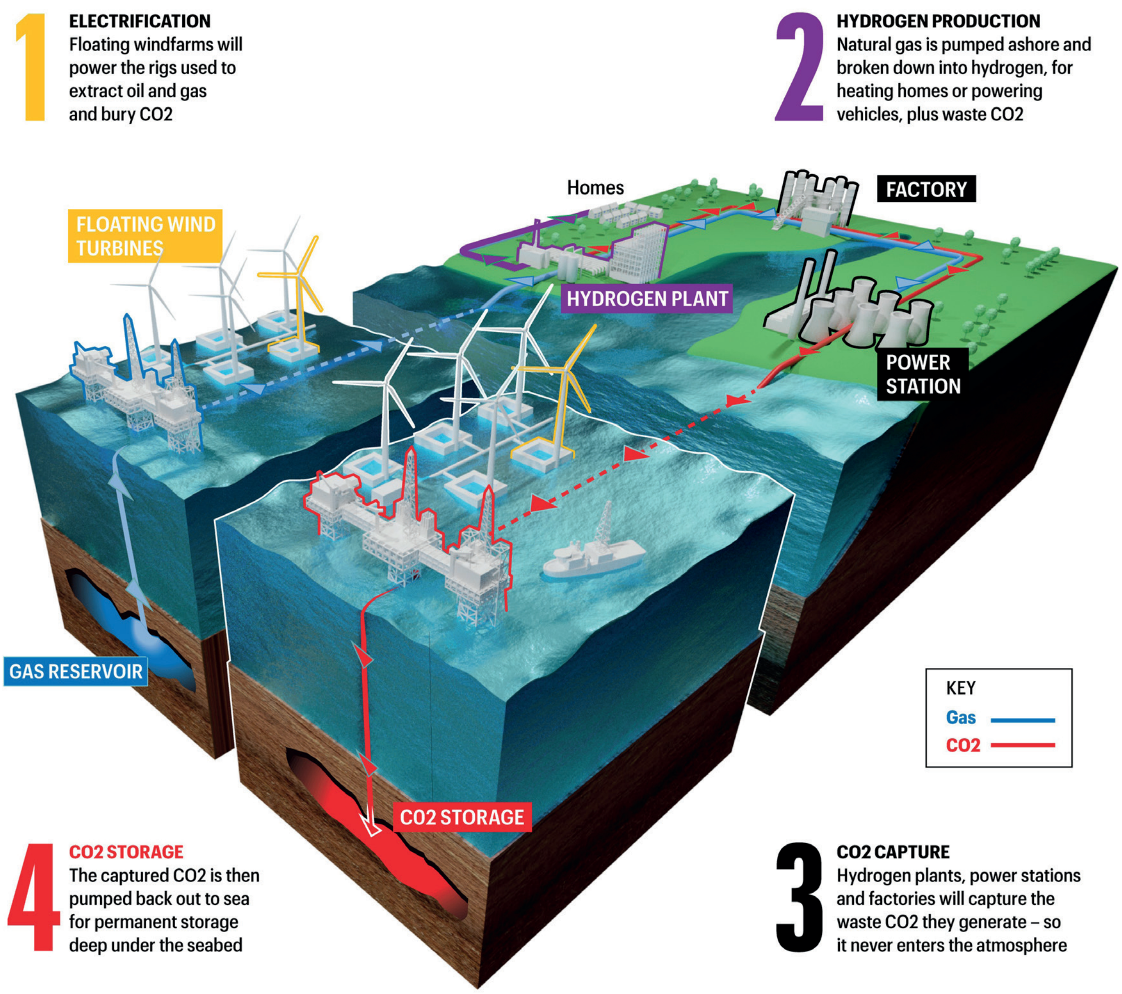
The Deal – our sector's commitment to support the transition to net zero – incorporates essential emissions reductions alongside the development of decarbonisation technologies such as carbon capture, use and storage and hydrogen production. The subsequent expansion of oil and gas companies' ambitions in offshore wind following the ScotWind awards process will further extend the contribution of the sector.

More than half the observed emission reductions in 2021 are the result of operators' actions. This includes operational changes and investment in rationalising energy use which are already having a positive impact. Further such improvements are expected, particularly in improved flaring and venting management. Decommissioning of some high intensity assets has also made a contribution. Finally, there is still the residual effect of the pandemic in the results.

Moving forward, this means that the much-needed increases in production from the basin in 2022 may offset some of the reduction although remaining within the 2025 and 2027 targets. Over the longer term, OEUK modelling suggests that the

Offshore energies

The UK's offshore operators are developing four key new technologies to help the UK achieve carbon neutrality



target of a 50% reduction by 2030 is within reach. Continuous operational improvement will be central to delivering progressive emissions reduction. New investment in exploration and production will also help this process as it displaces older, higher emission resources.

However major capital investment programmes will also be required. Replacing gas or diesel power on platforms with grid electricity requires the repurposing of facilities and new offshore power infrastructure. However, this also presents a great opportunity to deploy floating wind at scale, via the wind lease round: Innovation and Targeted Oil & Gas (INTOG), which will put the UK in leading position in the promising floating wind market.

With both energy and carbon prices at historically high levels the need for low emission hydrocarbon production via the Deal commitments has never been greater. The UK offshore sector is ready and willing to meet this challenge but government actions on grid access, regulatory streamlining and business models are required.

2022 emissions progress and outlook at a glance

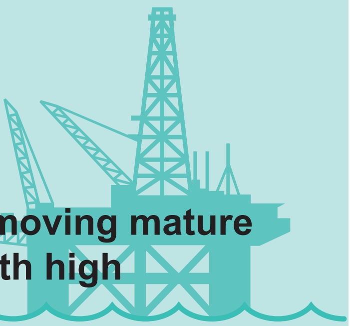
2021 Overall emissions performance

20%

20% down on base year

Emissions from the production of oil and gas were down 20% in 2021.

Five highly intensive installations taken offline



Industry is removing mature installation with high emission.

Emissions intensity 20.81 kg CO_2/boe

UKCS maintains its emission intensity level despite being a mature basin.

2021 methane emissions performance

36%

36% down from base year

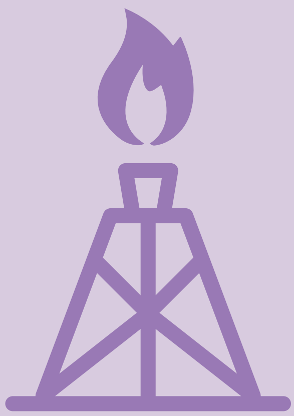
Methane Action Plan has quickened the pace of emissions reduction.

Methane intensity

Basin intensity on track to meet OGCI target.

Flaring and venting down 36%

Industry is continuing to improve its flaring and venting to drive toward zero.



Emissions forecasts

Industry on track to exceed 2025 emissions target

Effort across all operations enable the industry to outperform the trajectory for 2025.

Short term opportunities lie in improved maintenance and reduced deferrals

Operations can be optimised for both production and emission reduction.

Power demand reduction remains driver for 2030 target

Focus on capital projects to deliver 2030 target.

Policy priorities

- Timely grid connections
- INTOG business models
- Electricity market reforms

Essential next steps

Short cycle, operational improvements have mostly been delivered or will be delivered by 2027. Focus and effort now must be placed on enabling capital projects to drive emissions reduction further in the next decade. Industry and government must work together to ensure both energy security and secure domestic production.

Reaching net zero: OEUK scenarios

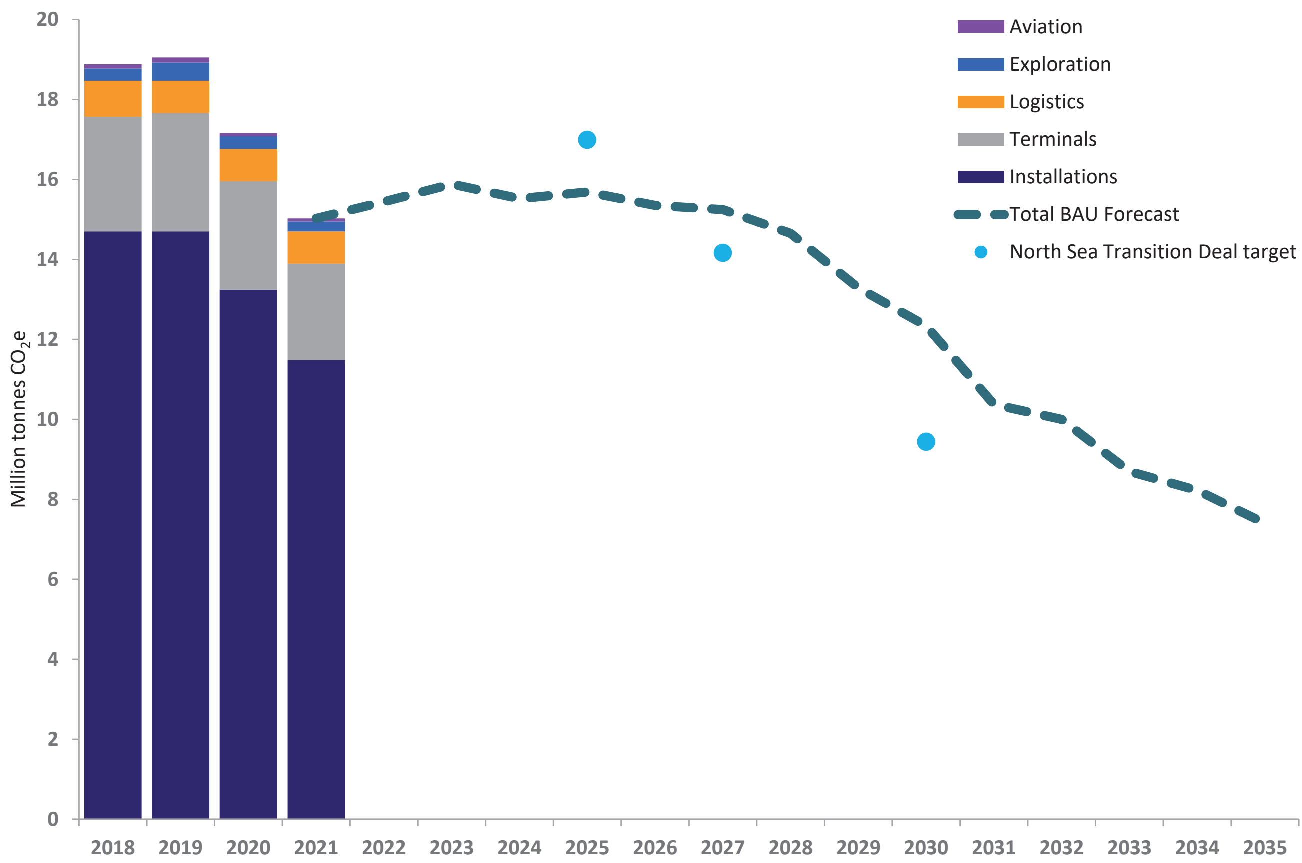
Since the launch of the emissions reduction targets, significant progress has been made by industry. However the future pathway for the sector is uncertain. Therefore, in this report, OEUK has adopted a scenario-based approach to identifying different routes to meet the reduction targets compared with a "business as usual" (BaU) approach (*Figure 1*).

This section of the report also sets out the likely outcomes for the 2022-25 period, which is common to all scenarios. It then provides a detailed review of the different pathways to meet the 50% reduction target.

Short-term outlook (2022 – 2025)

OEUK analysis and modelling suggest that from 2022 emissions are likely to increase slightly. However emissions will remain below the 2020 figure and are unlikely to return to pre-pandemic levels, sustaining around 15% reductions from the 2018 base year, and therefore meeting the 2025 target. This increase largely results from higher oil and gas production in the first seven months of 2022, with gas supplies boosted by around 29% relative to the same period last year. This represents a rebound from

Figure 1
"Business as usual" emissions forecast
Source: OEUK, NSTA



the Covid-19-related declines of the last two years which have led to more pipeline and LNG imports, raising global emissions. While emissions are forecast to go up next year, the basin is likely to see a period of relatively stable performance out to 2025, since:

- There will be an underlying increase in emission intensity as assets mature.
- Around 8-12 installations are likely to reach cessation of operation, OEUK estimates, which will help to control emissions intensity.
- New fields coming online with a lower emissions intensity will dampen any rise.

Additionally, while also focusing on uptime and improving efficiencies, operators are streamlining turnarounds and shutdowns. While the key drivers for completing planned maintenance on schedule are safety and production efficiency, other benefits accrue such as avoiding process interruptions and the reality that well-maintained equipment will function at optimal energy efficiency. It is therefore reasonable to expect industry efforts to address maintenance backlogs will reduce emissions from unplanned safety-related flaring and venting, plant start-ups and routine power generation.

Outlook to 2030

For the first time, OEUK analysis and modelling provide a scenario-based approach to the emissions reduction targets in the Deal. Consideration has been given to a range of factors such as oil and gas production investment, energy security, decarbonisation enablers and the role of government and policy (*See Table 1*).

Each scenario below meets the 50% reduction target but each pathway presents unique opportunities and barriers to energy security, the 'just transition' and more important our ability and commitment to transition to a net-zero basin by 2050.

Daylight: investment status remains unaltered and all sanctioned and most unsanctioned projects proceed. It is assumed that a reasonable level of decarbonisation enablers and abatement options are triggered.

Sunset: sanctioned developments come online. But it is assumed that these investments and production online today will be the final activities on UKCS. Abatement projects that have been triggered do progress but no new abatement takes place.

Clear blue sky: a full-scale investment scenario sees all unsanctioned production coming online; equally, full abatement options are triggered and all large-scale investments proceed as planned.

Table 1
Key to scenarios and considerations

		Daylight	Clear blue sky	Sunset
Abatement options	Operational improvement	Orange	Green	Red
	Zero routine flaring	Green	Green	Green
	Zero routine venting	Green	Green	Green
	Capital projects	Orange	Green	Red
	Reduction in non safety-critical maintenance backlog	Orange	Green	Red
Current policy levers	A focus on MER	Green	Green	Red
	Flare and vent consent reduction	Green	Green	Green
	Licence to operate is maintained	Orange	Green	Orange
	Climate compatibility	Orange	Green	Red
Investment status	Sanctioned	Green	Green	Green
	Unsanctioned	Orange	Green	Red

- Green: **Timely and full**
- Orange: **Partial and / or delayed**
- Red: **Limited and / or at risk**

Sector reduction targets	2025	2027	2030	2050
Net zero from oil & gas output (deal)	10%	25%	50%	Net zero
Methane Action Plan: Reducing methane emissions	0.2%		50%	

Figure 2
Clear blue sky
Source: OEUK, NSTA

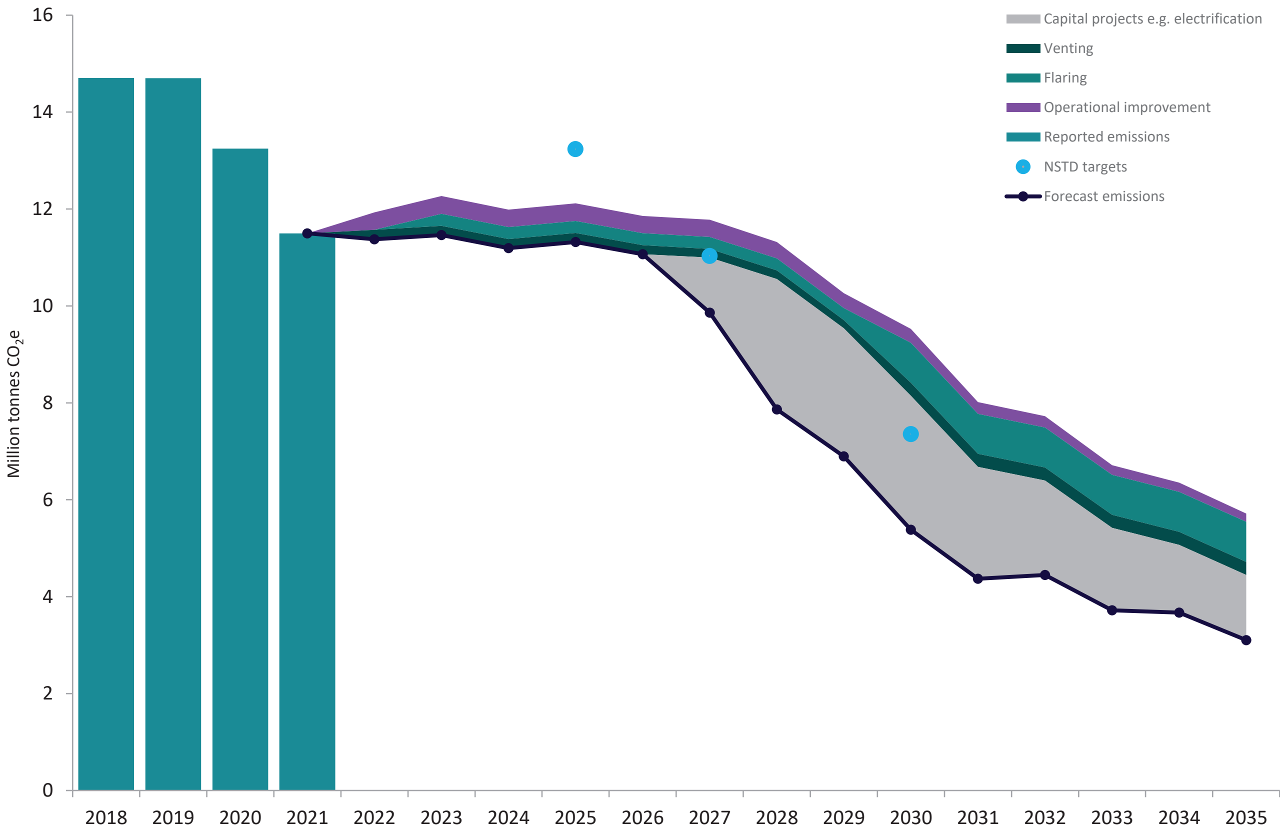


Figure 3
UK production gap v demand: Clear blue sky
Source: OEUK, NSTA, Committee for Climate Change (CCC)

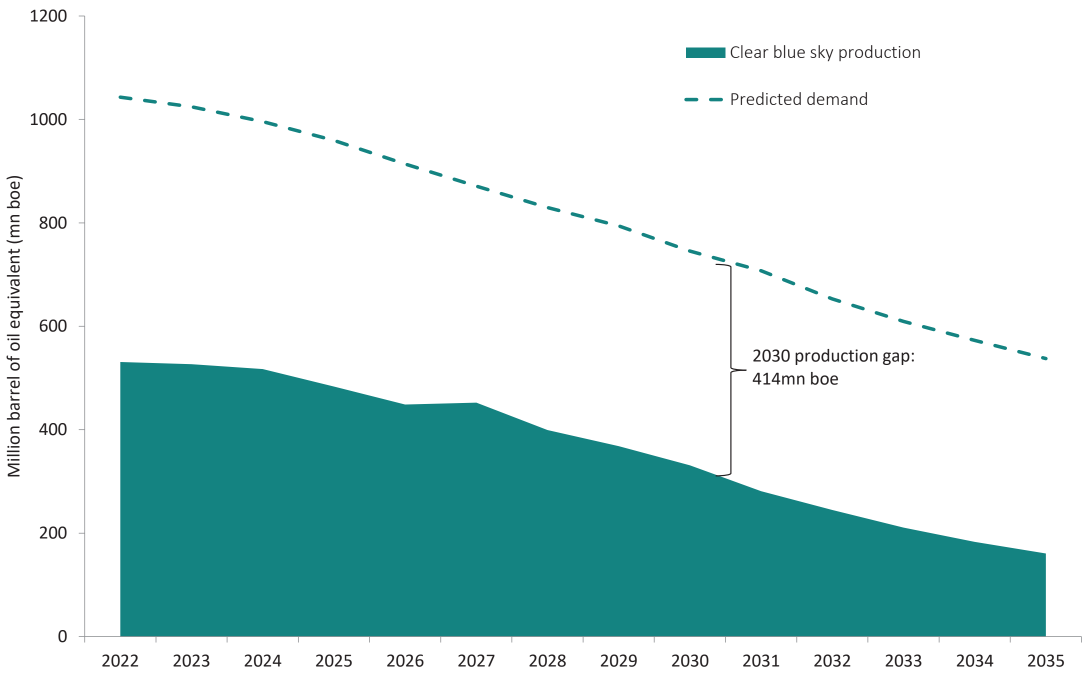


Figure 4
Daylight (central case)
Source: OEUK, NSTA

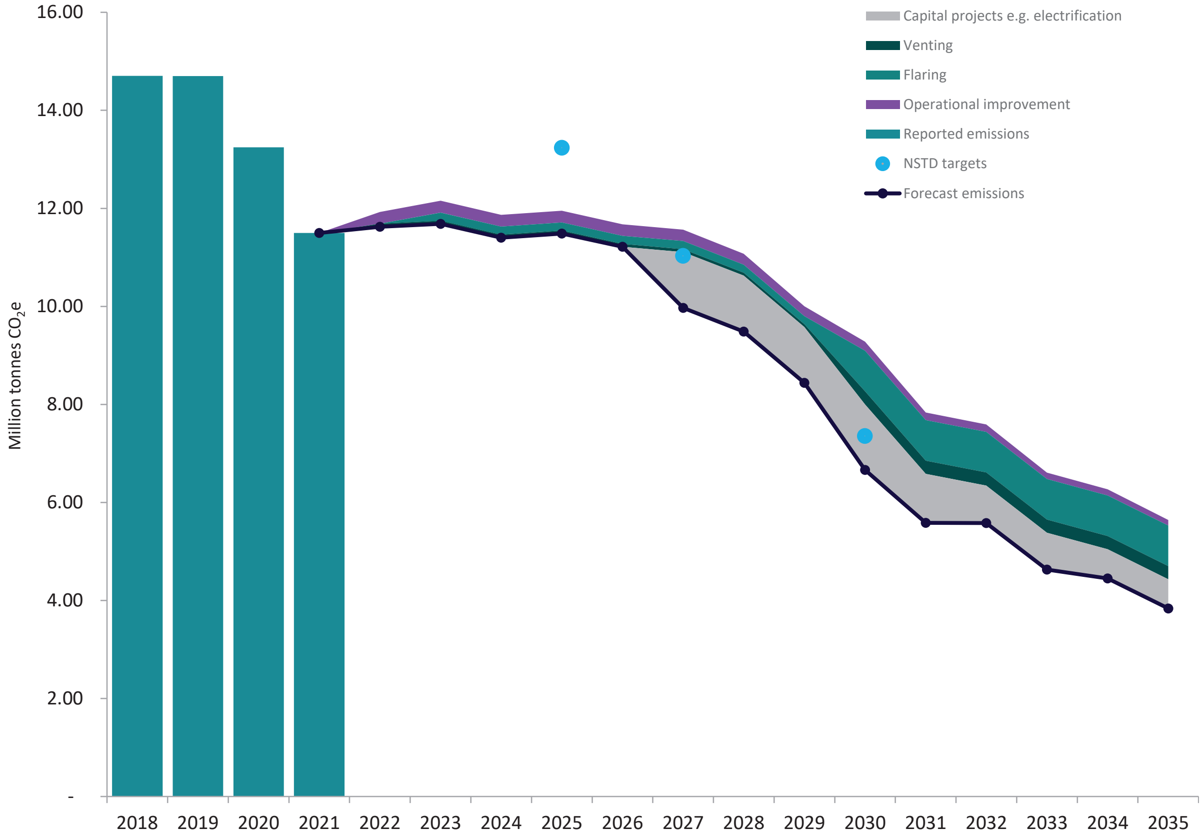


Figure 5
UK production gap v demand: Daylight
Source: OEUK, NSTA, CCC

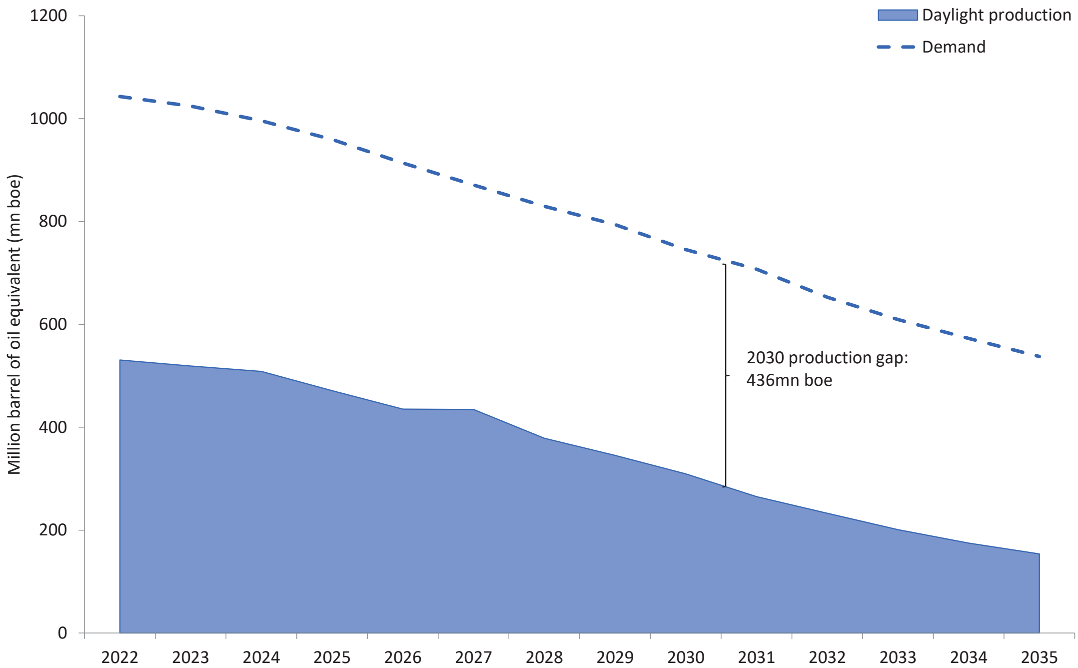


Figure 6
Sunset emissions pathway
Source: OEUK, NSTA

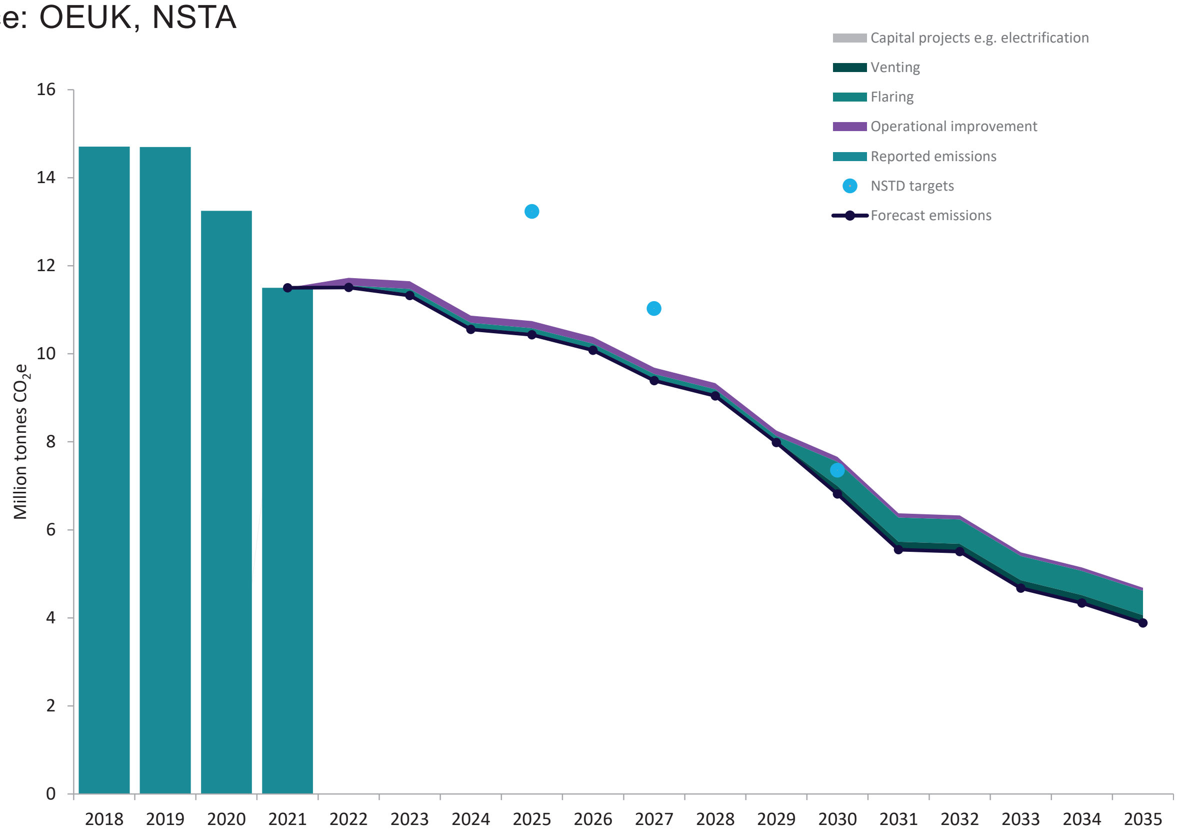


Figure 7
UK production gap v demand: Sunset
Source: OEUK, NSTA, CCC

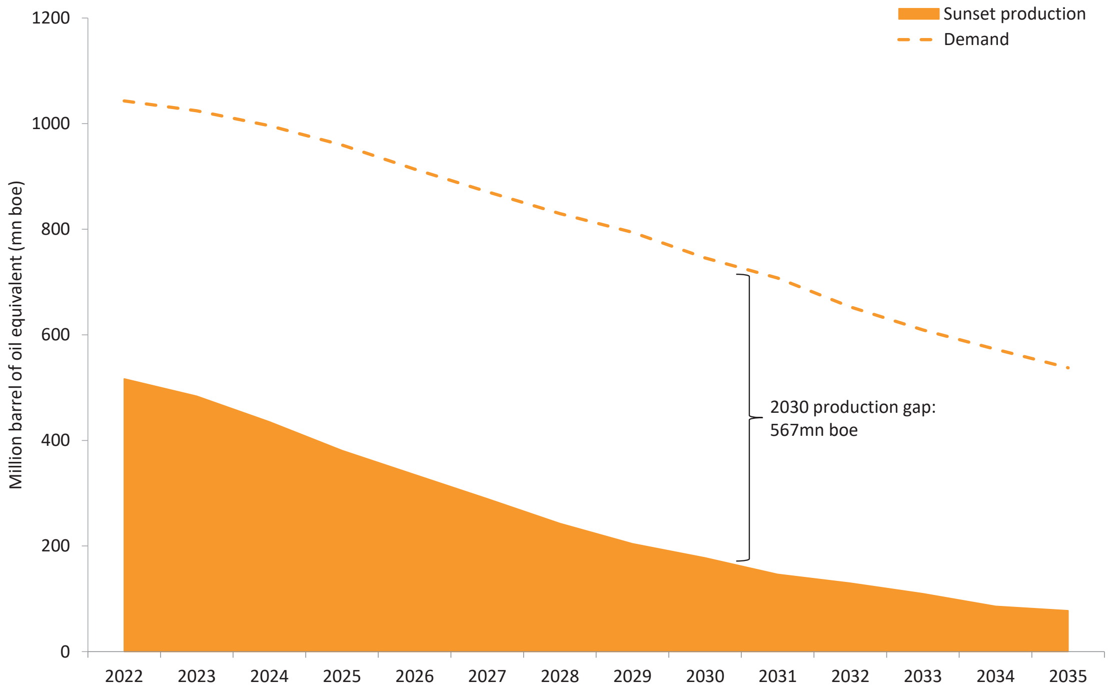


Figure 8
Summary graph of scenarios
Source: OEUK, NSTA

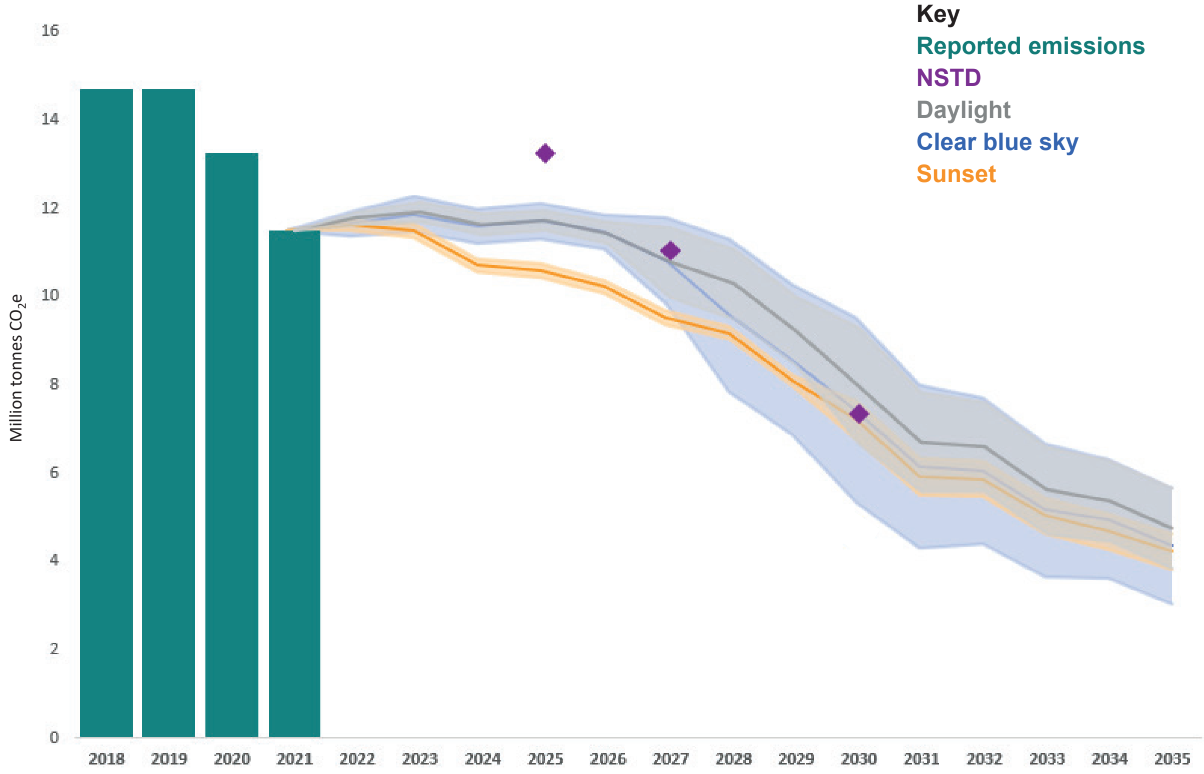
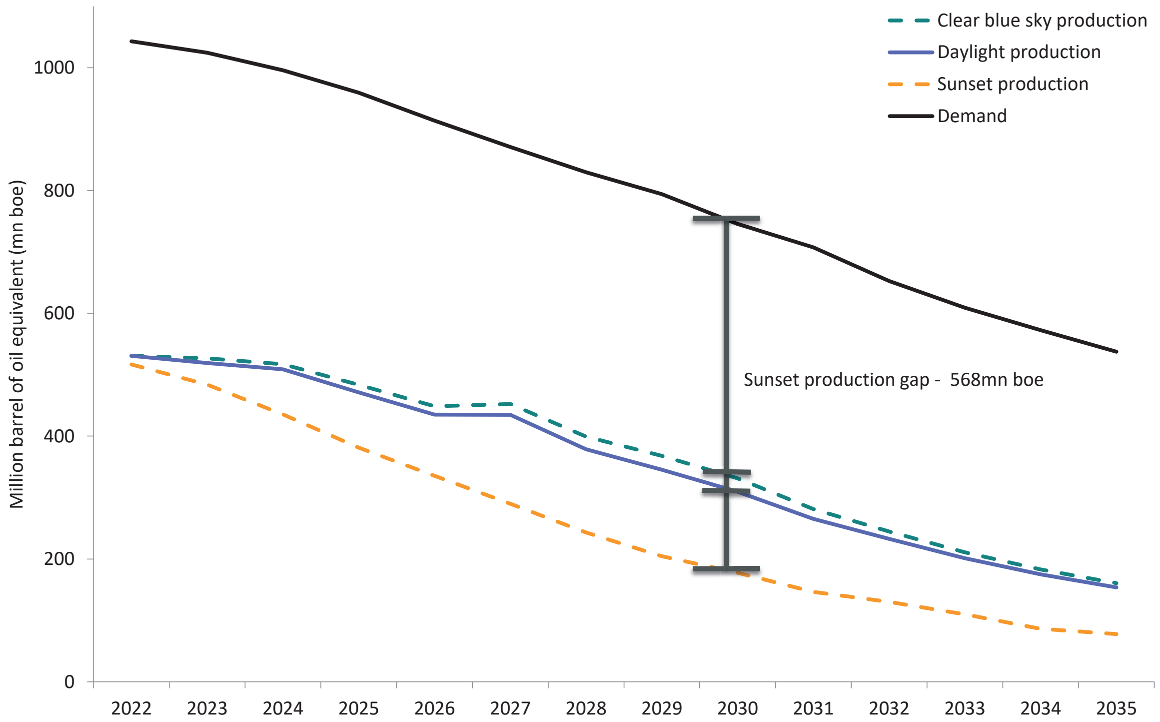


Figure 9
Summary of production vs demand gaps under each scenario
Source: OEUK, NSTA, CCC



OEUK scenarios: conclusions

Under all scenarios the Deal's target for 2025 will be met. In two of the three scenarios, it is possible to realise new investment without exceeding pre-pandemic emissions. Similarly, 2027 targets are likely to be met with additional operator improvements, while working towards eliminating routine flaring and venting for non-safety related reasons by 2030.

Finally, under each scenario, halving emissions by 2030 is possible but will require government enablers to support large scale investment.

Note however that these scenarios have been modelled in light of existing policy and the current political environment. As always with scenarios, these are not predictions but plausible outcomes based on a range of different circumstances.

Clear blue sky

All abatement measures and options are brought into play. Sustained investment allows operators to produce at maximum with significant capital projects, beating the 2030 emissions reduction goal.

There is less deferral of non-essential maintenance, leading to less flaring and venting and lower emissions from plant start-ups. It is also assumed that significant capital investment for abatement projects is triggered and new production comes online from new installations running at maximum efficiency.

Under this scenario, energy security is improved, with around 50% of oil and gas demand continuing to be met by UK production, the other half being imported.

Daylight

Within a daylight or a central case scenario, there is a mix of investments in oil and gas production and abatement options.

Some capital projects could have been modelled to start earlier or later depending on both the macro environment and on government enablers. But these need to be unlocked in the next 12 months. Prompt government action is essential if the full abatement potential is to be achieved.

Additionally, this scenario takes a conservative view on production coming online from new development. Opportunities for abatement become progressively more expensive once the short-cycle improvements have been made.

Sunset

As the name suggests this scenario is the opposite of Clear Blue Sky. No further investment in oil and gas production proceeds and only sanctioned production goes ahead. Equally as opportunities for new production stagnate, investment into abatement projects is curtailed with only the already activated improvements continuing.

Under this scenario the UK becomes even more reliant on imports, so global emissions are higher and the licence to operate on the UKCS is not maintained. Energy security is sacrificed and imports equivalent to 568mn barrels of oil are needed by 2030: three quarters of UK demand.

Role of government enablers

The industry is already making significant progress, through platform modifications, reducing flaring and venting and abatement technologies. These are part of the Deal, but according to the Climate Change Committee's recent progress report[1], the government must act no later than Q2 2023 to facilitate larger scale abatements. Clear guidance on offshore wind planning and timely grid connection for oil and gas platform electrification are essential, if the UK is to meet the 2030 reduction target. OEUK therefore urges the government to:

- Trigger enablers to make decarbonisation at scale possible while the industry increases production to meet energy security and reduce overall emissions. Domestic production has lower carbon intensity than imports.

- Double the rate of platform electrification relative to offshore windfarm deployment in order to achieve decarbonisation at scale. Platform electrification will decarbonise hydrocarbon production and bring forward additional wind farms. This acceleration will put the UK in a leadership position in the fast-growing global wind farm market.

- Enable timely access to the onshore power grid, streamlining the regulatory framework.

- Devise business models that reward offshore wind operators and oil and gas producers for sharing new infrastructure.

- Reduce the timeline between planning and development. Delays in the approvals process could dent supply-chain confidence. Any overlap with ScotWind developments would also inflate costs. INTOG is a first step to electrification, but it must be followed by the right government policy if it is to unlock all opportunities.

In that regard, OEUK is leading a floating wind supply chain mapping effort as part of NSTD deliverables and a report will be published toward the end of the year.

OEUK is also preparing a response to a government consultation on electricity market reform (REMA) which it sees as critical to the future of the UK offshore energy system.

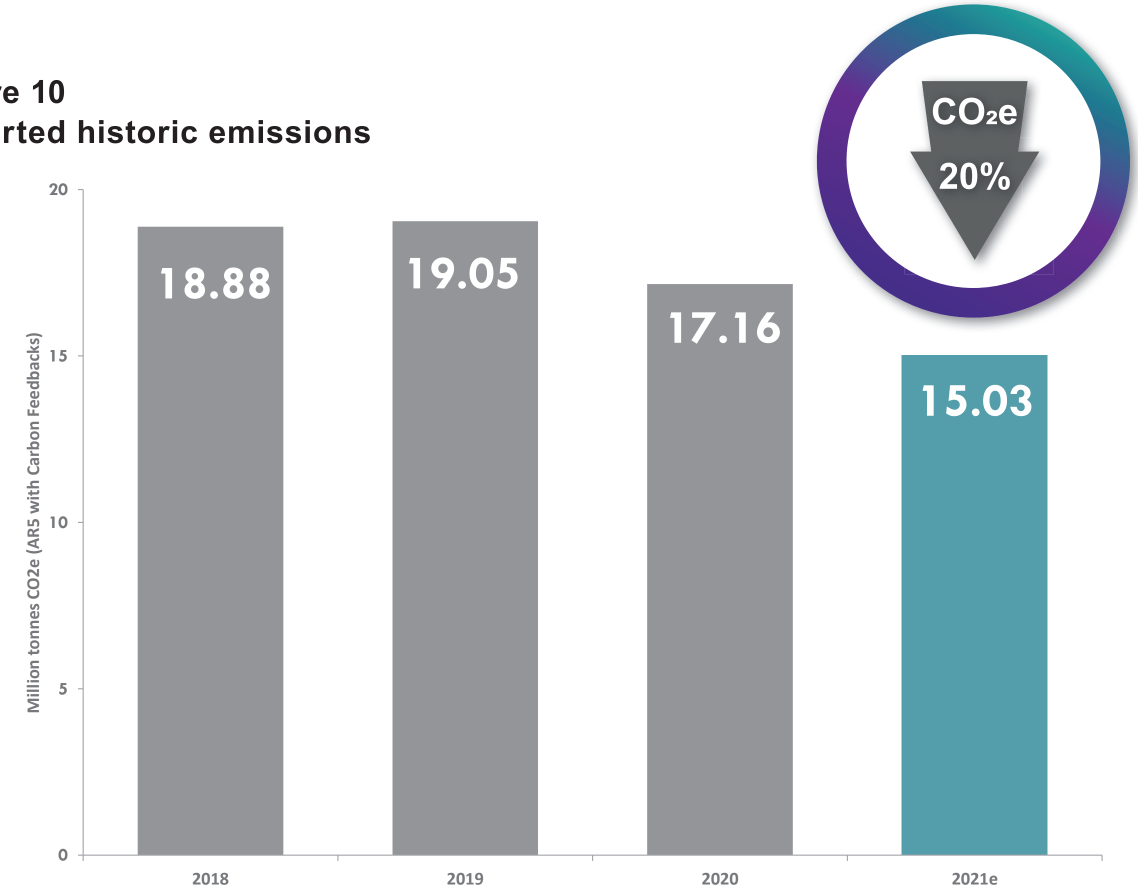
Progress against reduction objectives: 2021 overview

Overall, emissions in 2021 from the production of oil and gas on the UKCS saw a 20% reduction compared with the 2018 base year, falling from 18.8mn tonnes CO_2e in 2018 to 15.03mn tonnes CO_2e[2]. This represents a fall of around 12% on 2020. This means in 2021, oil and gas production emissions contributed around 3.5% of total UK national declared commitments[3].

This is the second consecutive year in which industry has reduced emissions since committing to a net-zero basin by 2050 and halving emissions from oil and gas production by 2030. The remainder

[1]. CCC Progress Report; page 520. https://www.theccc.org.uk/wp-content/uploads/2022/06/Progress-in-reducing-emissions-2022-Report-to-Parliament.pdf
[2]. CO_2 equivalents are calculated using Global Warming Potentials of AR5 with Carbon Feedbacks. Further details are provided in the Annex.
[3]. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1064923/2021-provisional-emissions-statistics-report.pdf

Figure 10
Reported historic emissions



of this report looks in detail at the sector's progress and the breakdown of emissions, with case studies. Further information regarding the methodology is available in the Appendix.

Assessment of 2021 emissions

Last year, OEUK predicted that 2021 emissions were likely to be similar to 2020, as the second year of Covid-19 and deferred maintenance activity such as the Forties Pipeline System cut output.

However, OEUK analysis suggests that around half of the 12% reduction was due to operator interventions. As a result of action taken, installations are running more efficiently, taking advantage of maintenance and planned shutdowns. Additionally, five installations with an average carbon intensity of 55 kg/boe were taken offline permanently in 2021.

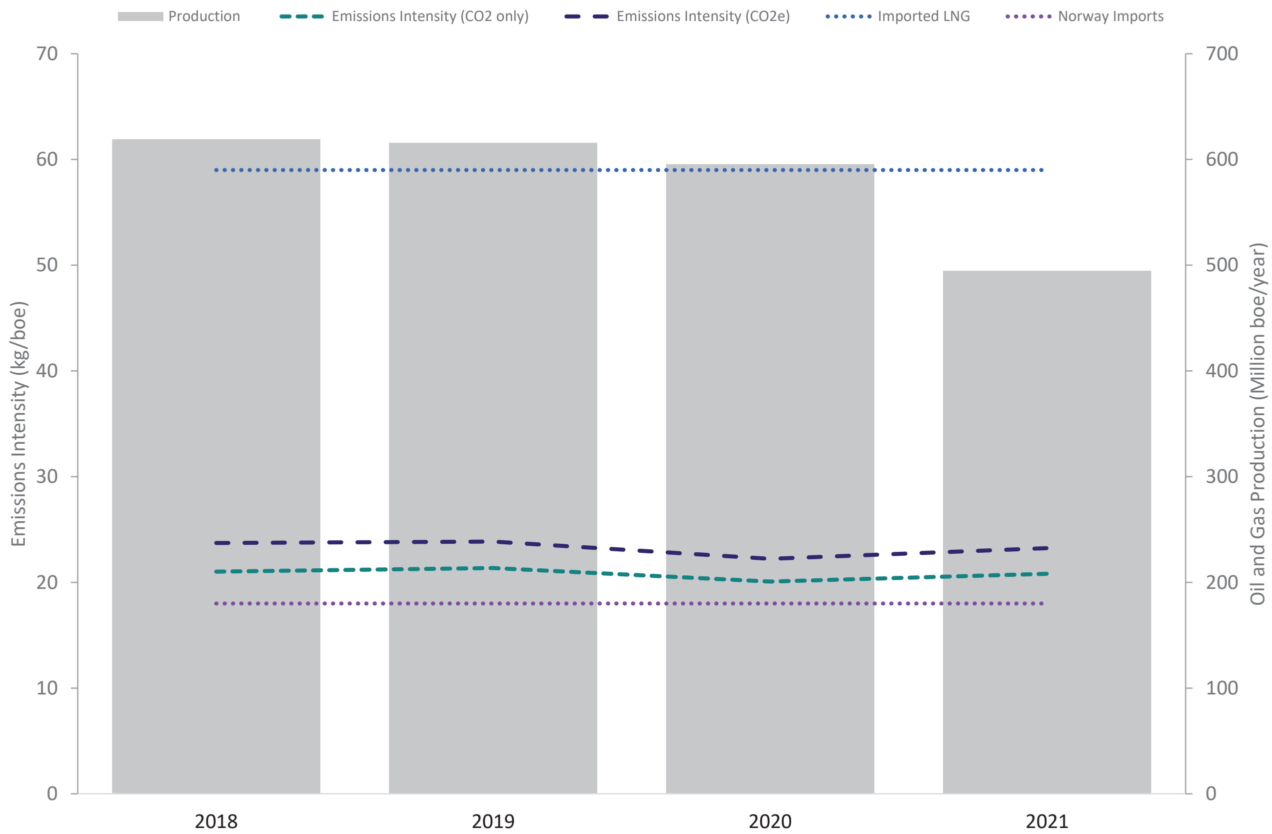
The other half can be attributed to production declines and the second year of record low drilling levels on the basin.

Reducing basin emissions as quickly as possible is a priority for operators. It is both an environmental necessity and an opportunity to improve production efficiency and, in many cases, to lower costs. Meeting emissions reduction targets is a fundamental element of the Deal.

Carbon intensity

Overall carbon intensity in 2021 (expressed as total production divided by total carbon emissions) rose from 20.07 kg CO_2/boe to 20.81 kg CO_2/boe compared with 2020 lows but it remains below the intensity of the base year, 2018; and below the 2014-19 average of around 23 kg CO_2/boe. This reduction trend is unusual for a mature basin where third-party analysis suggests

Figure 11
UK emissions intensity compared with imports
Source: OEUK, NSTA



emissions intensity should increase. As the age of an installation increases operators must be able to steady intensity and balance production. For assets that will be operating after 2030, technology to reduce and eliminate routine flaring as quickly as possible will not only lower the carbon intensity of the asset's production but also allow the operator to recoup the Emission Trading Scheme costs.

As shown in Figure 11, gas imports from Norway with its hydroelectricity generation often have lower carbon intensity. However, imported LNG has a disproportionately higher level of intensity of around 56 kg CO_2e/boe because of liquefaction and shipping[4]. As the basin matures, the emissions intensity of production will increase, if operators do not intervene. Industry and government need to work together to drive down intensity through higher energy efficiency and lower flaring.

Abating installations emissions

When OEUK launched the emissions reduction targets in *Roadmap 2035 (2019)* it said three fundamental drivers would accelerate emissions reduction:

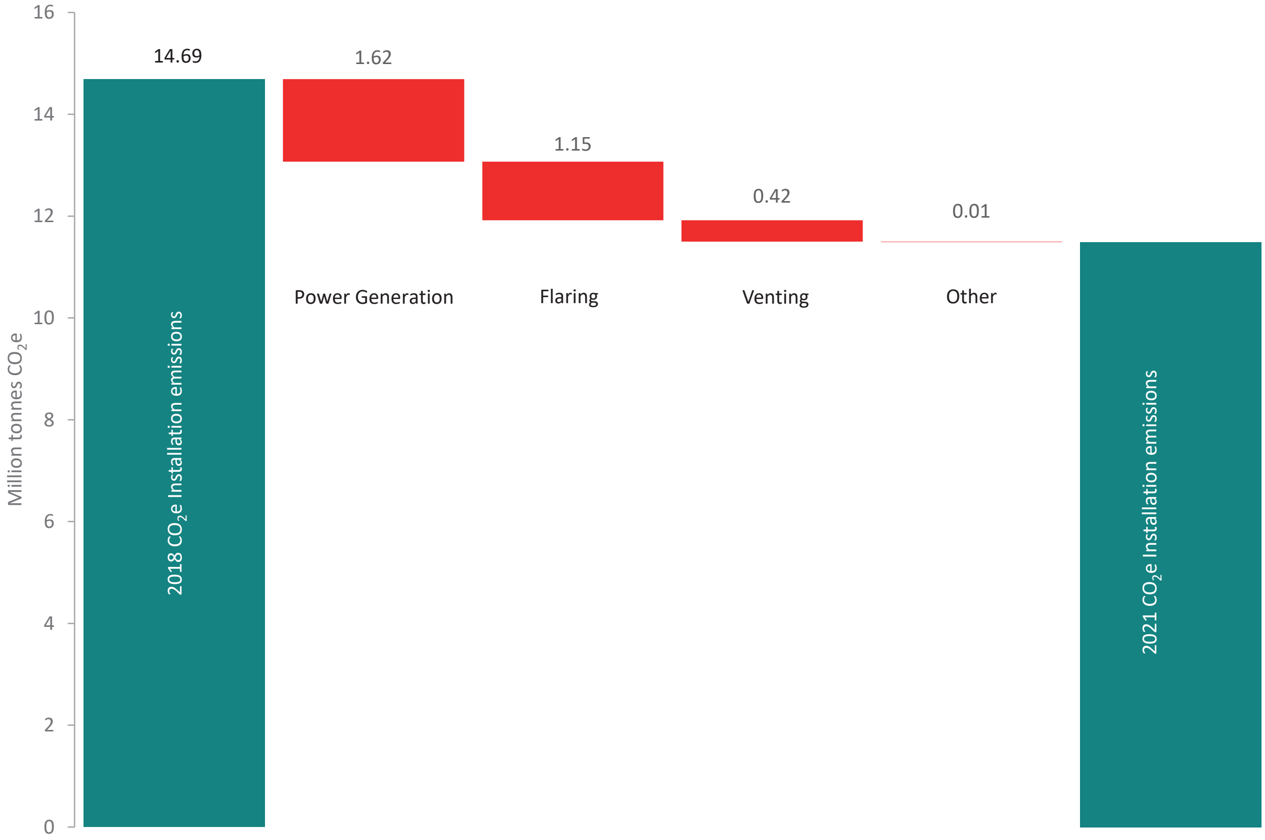
1. Operational improvements (incremental);

2. Reduced flaring and venting (operational);

3. Step-change action i.e., capital investments.

[4]. North Sea Transition Authority (NSTA): North Sea gas has lower carbon footprint than imported LNG - 2020 - News - News & publications (nstauthority.co.uk)

Figure 12
Installation emissions reduction by source

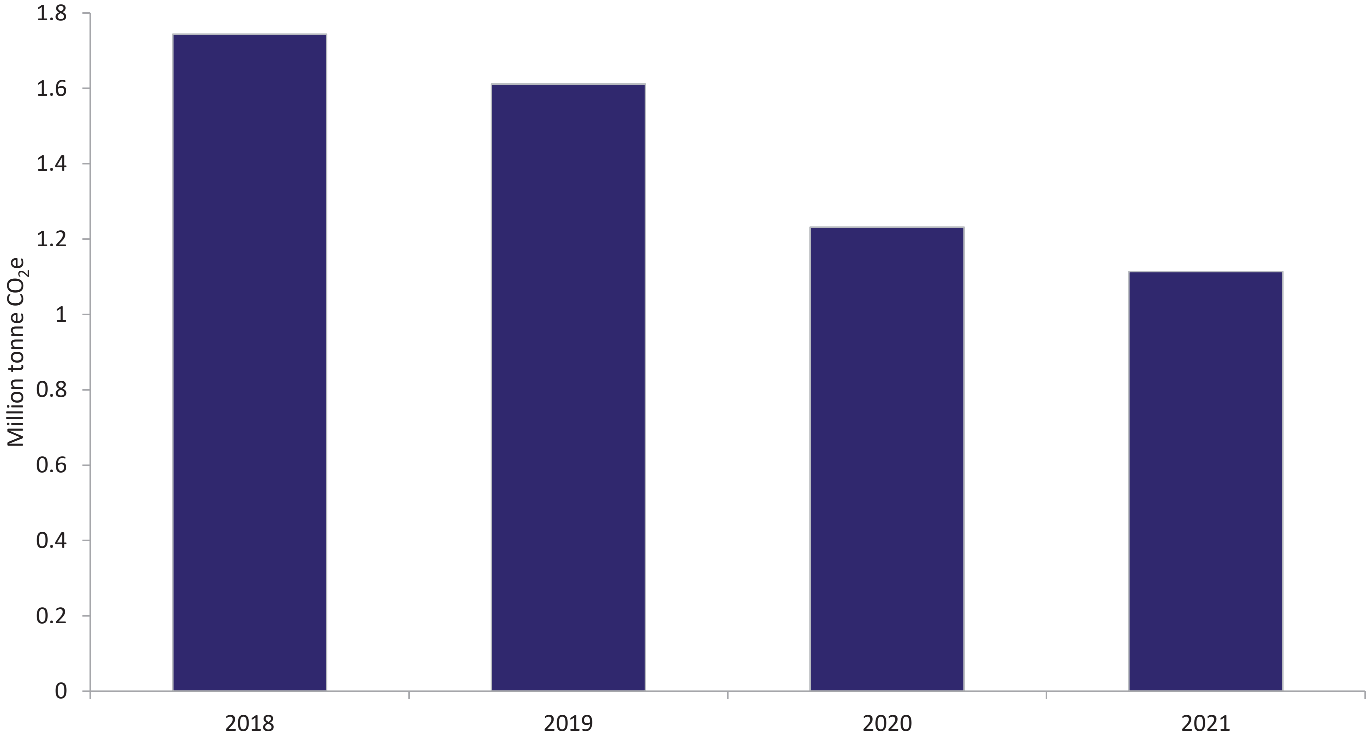


In 2021, operator emissions data coupled with real examples (*see case studies*) showed that operational improvements and reduced flaring and venting cut emissions faster than otherwise would have been the case. 2021 also saw the launch of the Methane Action Plan (MAP) and the NSTA's Stewardship Expectation 11. Operators are already working hard finalising MAPs. OEUK will report on the progress in the 2023 report.

In 2021, CO_2e emissions from offshore flaring and venting combined were down by 36% from the 2018 base year and by 19% from 2020. Operators are re-engineering installations by minimising purge flow vent systems and maximising gas recovery systems, for example. Actions taken before 2021 are bearing fruit now, with some projects returning positive net present value. Under the MAP, routine flaring and venting for non-safety-related reasons are being reduced, if not eliminated outright.
Actions taken by operators in the last few years, capitalising on planned shutdowns, cut emissions in 2021 from power generation by 1.62mn tonnes CO_2e compared with the 2018 base year. Operators are running assets differently: for example, running single turbine engines and increasing their focus on maintenance and reliability (*see Harbour Energies case study*).

Additional cultural changes in the way assets are run has also encouraged cuts. Offshore and onshore employees are sharing the responsibility for cutting emissions, where it is no longer a task an environmental team can solve alone (*see bp case study*).

Figure 13
Historic methane emissions (mn tonnes CO_2e)



Methane reduction progress

Anthropogenic methane is the biggest source of greenhouse gas emissions after CO_2, and 34 times more potent (*refer to Annex for global warming potential factors*). However, methane also has a shorter atmospheric lifespan than CO_2. This means reducing methane emissions from the basin can have an immediate impact on the global temperature increase, provided that the reductions are sustained.

In June 2021, OEUK published the MAP, a key deliverable under the Deal to halve reductions by 2030. This was followed by the publication of the OEUK Methane Guideline which supports asset specific methane action plans.

The sector is committed to meeting the World Bank 'Zero Routine Flaring by 2030' initiative, accelerating compliance wherever possible. As part of this initiative, operators validate and measure methane emissions in line with international standards and reporting principles. OEUK has also joined the Methane Guiding Principles and is working on the 'methane by source' workflow which is to be delivered early next year.

Additionally, individual operators on the UKCS will strive to meet their methane intensity target to under 0.20%, with some member companies signing up to Oil ans Gas Climate Initiative's "aiming for zero" methane emissions from oil and gas operations by 2030.

Overview of methane data

Most of the industry's absolute methane emissions, around 83%, comes from offshore installations. Nine-tenths of the rest come from processing oil and gas at the terminals.

Flaring and venting are controlled processes to dispose of gas. They are essential for emergency and safety purposes, and in situations where it may not be feasible for the gas to be used, exported or re-injected.

Over the last four years, the sector has seen a 36% decrease in methane emissions from the base year to 2021. Some of this is due to the retirement of older assets coming offline and lower production.

However, operators of terminals and installations are already integrating emissions reduction solutions into their operational decision-making. During 2021, operators took advantage of planned shutdowns as well as employee engagement to implement solutions that will lead to permanent methane reductions including:

- reducing the time from cold flaring to flaring;
- managing methane slip (uncombusted methane), via effective control systems; and
- replacing leaking valve systems and improving seals.

It should be noted, under the MAP, industry has committed to developing robust quantification of methane, applying best practice guidelines. Recognising the degree of uncertainty around methane quantification, OEUK will look to reassess the methane performance in 2023-4.

Case study

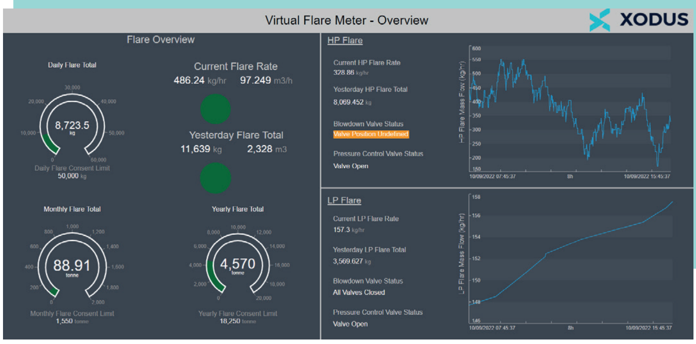
XODUS

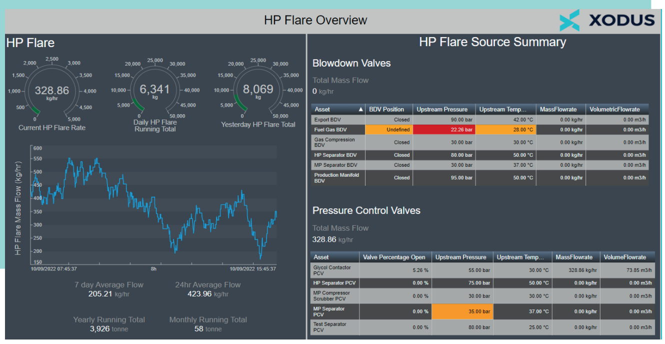
Problem: Asset had significant issues with their HP flare metering; at times of high flaring, it would cut out or breakdown completely.

Solution: Xodus developed and deployed a virtual meter which continuously monitored and recorded flaring. This resulted in increased visibility of the real-time flaring, enabling day to day optimisation, and identification of bad actors leading to a significant reduction in person-hours required to calculate and submit mismeasurement reports.

This was accepted by the UK regulator (BEIS) as a reliable alternative method for reporting of flaring emissions.

Example Dashboards





Case study

Harbour Energy

Reducing emissions through plant optimisations and fuel reduction

The opportunity

Greater Britannia Area commenced production in 1998 with a design of two gas turbine compressors to process the asset's peak gas production.

Since gas production is now off peak, an opportunity exists for the asset to reduce emissions by operating on single gas turbine compression. This has been achieved through implementing a series of reliability improvements, thereby allowing production efficiency to be maintained. The reduction in emissions is significant due to GBA being a long-life asset.

The challenge

On GBA, there are two 32-MW gas turbine-driven export compression trains. At the start of operations from the Britannia field, the original design was for two compressors to be operating at 2 x 50% of the gas capacity but, as gas rates dropped, they were subsequently being run at 2 x 100% of the gas capacity. This required the gas compressors to operate in parallel, with significant recycle and fuel gas consumption occurring.

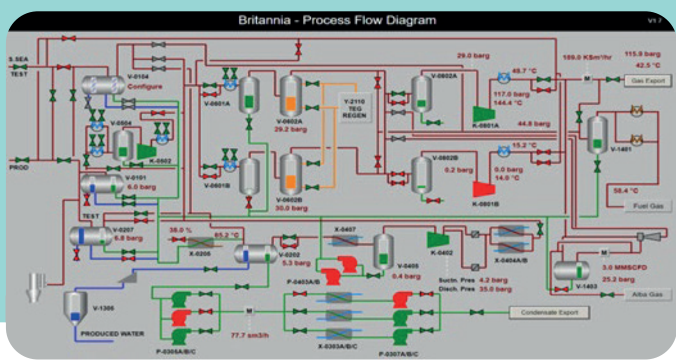
With the drive to lower emissions, and after careful review of the many years of reliability improvements, the hub team decided in 2020 to move GBA to be a single export compressor operation. This has significantly reduced emissions from the asset, with little or no impact to production efficiency. This is a great result for Harbour Energy as it seeks to achieve Net-Zero greenhouse gas emissions for Scope 1 and Scope 2 emissions by 2035.

The benefits

- Saving emissions of 72,000 tonnes of CO_2e per year - equivalent to taking ~30,000 cars off UK roads.

- Saving on maintenance costs and outages.

- Protecting the life of obsolete gas turbine engines through to cessation of production.



Case study

Driving emissions reduction through offshore engagement removed 1,430 tonnes of CO_2 equivalent on bp's Glen Lyon floating, production, storage, offload (FPSO) vessel, west of Shetland.

The Glen Lyon was designed to require three gas turbines to generate electrical power for the FPSO. During a period of maintenance where a compressor train was offline for several weeks, the offshore team challenged if the third gas turbine was necessary. A risk review was completed and determined power generation could be safely achieved with just two turbines.

Once the planning and checks were completed, the third turbine was switched off and the FPSO ran on two turbines for three weeks, leading to a saving of 1,430 tones of CO_2 equivalent during this period alone.

Through effective offshore engagement and a strong emissions reduction strategy, the offshore team now understands how electrical demand correlates to carbon emissions and has been able to demonstrate that even small changes can lead to significant reductions.

They are now considering opportunities to extend the use of two turbines instead of three to further reduce operational emissions on the FPSO.

Case study

TotalEnergies' Dunbar platform produces fluid from several fields and exports them to the Alwyn platform for processing. Power and controls are provided by Alwyn. The flare system requires purging to sweep the headers to prevent a flammable mixture from forming. This is primarily done with gas from the wells, with nitrogen back-up. Purging also routes gas to the flare tip to maintain ignition.

Historically, purge rates were higher than the minimum, as the flare tip is susceptible to blow out in high winds. This was identified as a key area for greenhouse gas and particularly methane reduction (safety flaring and venting).

Recently, damaged pilots were re-instated during a shutdown to improve flare ignition. This is expected to allow long-term reduction in purge rates and reduce cold flaring events and durations. This change is still being evaluated but expected savings are around 3,000 tonnes CO_2e/year (about a tenth of Dunbar's total emissions).

Case study

Energy storage and renewable energy integration

Verlume is reshaping traditional systems of energy production and storage by decarbonising operations, reducing its carbon footprint, and maximising efficiency. The company's flagship product is Halo, a unique seabed battery energy storage system, which is designed to reduce operational emissions and facilitate the use of renewable energy by providing a reliable, uninterrupted power supply to end-use applications.

Verlume is involved in a collaborative project to combine Halo with Mocean Energy's Blue X wave energy converter (WEC), to provide an integrated system for powering and communicating with subsea production systems, residential ROVs and AUVs, sensors/monitoring equipment.

Two studies were conducted to explore the potential emission and cost reductions by powering the subsea infrastructure with the complete WEC/energy management and storage system.

Study 1: Umbilical failure

Tieback: 10-km subsea tieback with two wells as the base case.

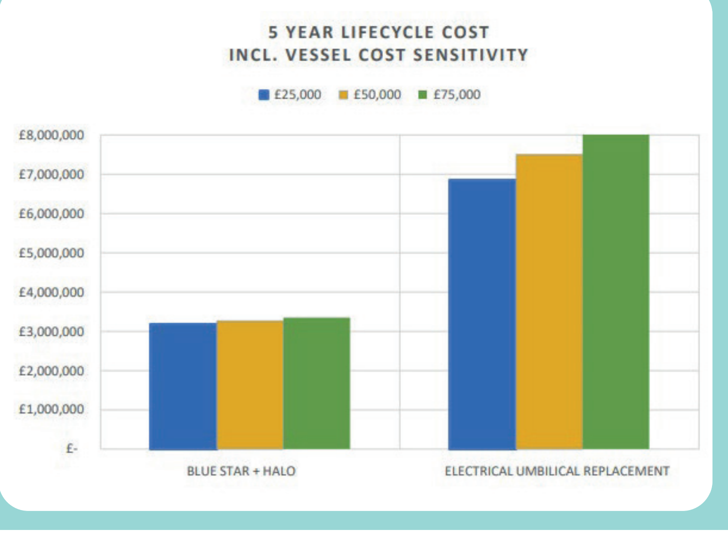
Assumption: There had been an electrical failure in the umbilical, resulting in loss of power to the subsea system. The wells had been in operation for a number of years.

A full lifecycle analysis established the cost and associated emissions of bringing the wells back online for the remainder of their life through the use of the WEC/energy storage system, as well as the alternative of using a replacement electrical umbilical which would re-establish power to the well site.

The results are significant for the use of the complete system, which can be installed more quickly and also provide over 2 kW more power than required.

Cost saving: More than 50%, about £4mn.

CO_2 reductions: 90%, the equivalent of removing 200 cars from UK roads for a year.



Study 2: Extended tieback with existing pipelines

Tieback: 100-km subsea tieback with two injection wells.

Assumption: An existing pipeline was available for use and electro-hydraulic Christmas trees were in operation. The chemical injection would mainly be for start-up and shut down.

A key point demonstrated through this study is that the cost of the WEC and energy storage solution is independent of tieback distance, contributing to significant cost savings for umbilicals over long distances.

Cost saving: More than 80%, about £94mn.

CO_2 reductions: 92%, the equivalent of removing 2000 cars from UK roads for a year. The lead time would also be greatly reduced when using the complete system over the umbilical, decreasing from 24 months to 12 months.

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The ever-growing role of the supply chain

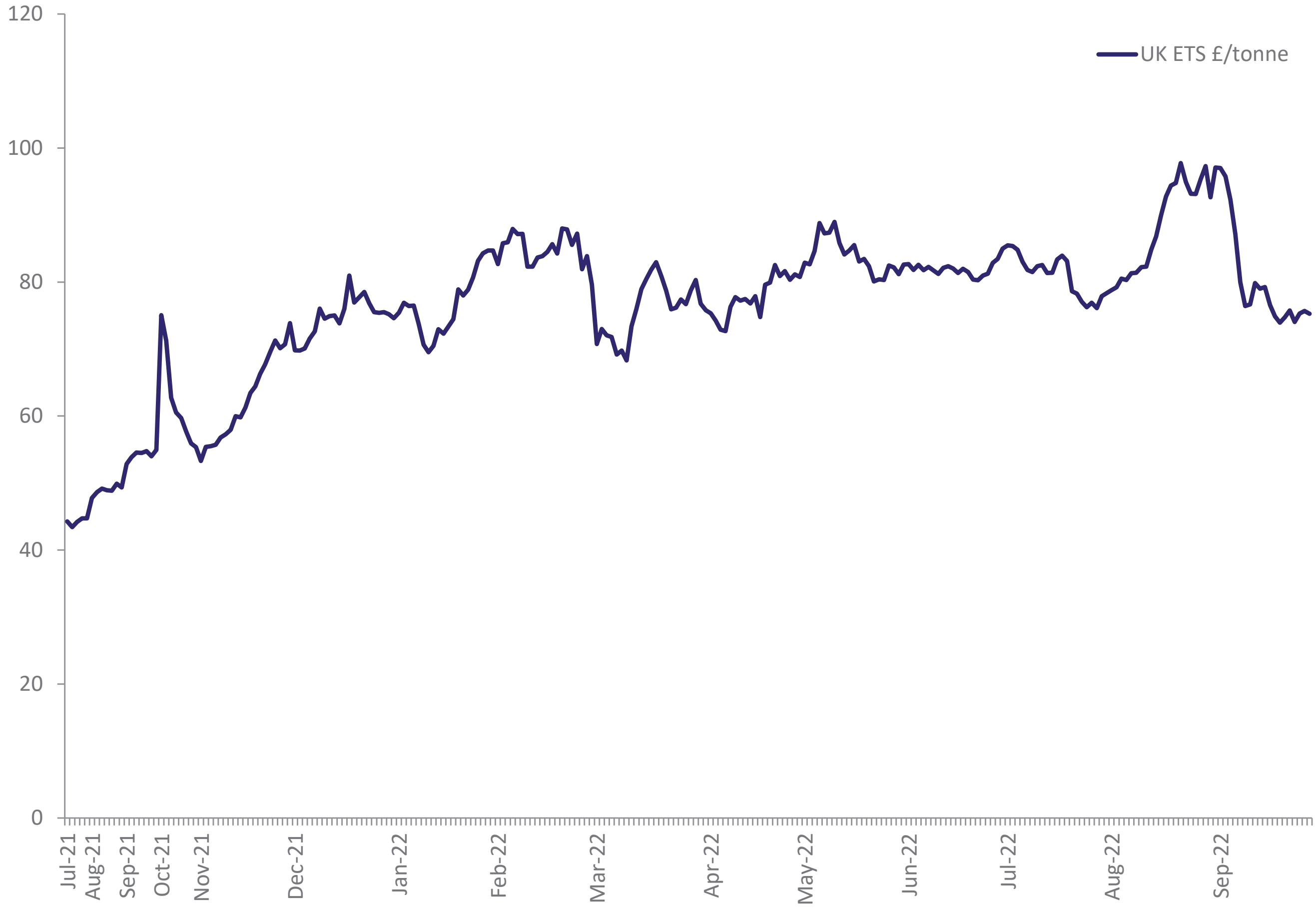
This report devotes more focus to installations and terminal emissions which contribute around 90% of emissions. However, reductions in these areas tend to lead to smaller emissions from the supply chain, which is looking at innovative technologies, revised engineering methods and collaboration in order to lower emissions.

To date, industry has cut its emissions by executing operational improvements and running a plant more efficiently. However, these gains have by now mostly been extracted.

So from now on, reducing emissions will entail overcoming engineering challenges. But this also presents an opportunity to the supply chain and operators. As the focus on emissions performance has grown, so too have expectations concerning a company's environmental, social and governance (ESG) performance.

To this end, the supply chain has a role in servicing the offshore assets with technologies and value offering that cut emissions. Over the last few years, our supply chain membership's value offering has grown to service all parts of the oil and gas lifecycle. Operating safe and reliable assets will continue to be a key focal point of the industry but emission reduction technologies are growing in importance.

Figure 14
UK ETS historic prices
Source: ICIS, OEUK



UK Emissions Trading Scheme

Carbon pricing will continue to be the central tool to incentivise emission reduction in the oil and gas sector and the wider economy. UK ETS prices have remained at relatively elevated levels during 2021-22, a little higher than the EU scheme of which it was once a part (*see Figure 14*). This provides a strong signal to operators and the wider economy with increased focus on the role of ETS on individual balance sheets.

OEUK remains supportive of the ETS although there is a continued need to prevent carbon leakage – shifting industrial activity abroad where emissions regulations are much laxer. Extension of the scheme to other greenhouse gases and methane in particular appear premature, especially as industry is already taking strong action in this regard.

Appendix

Reporting historic emissions methodology
The below methodology sets out OEUK's preferred method for gathering and collating data which encompasses the totality of greenhouse gas (GHG) emissions from the upstream oil and gas sector, including those emitted from offshore oil and gas installations, onshore terminals processing oil and gas, offshore shipping supporting UK oil and gas production (logistics and drilling rigs) and aviation (helicopter journeys). The targets cover the full scope of GHGs: CO_2, CH4, nitrous oxide, hydrofluorocarbons, perfluorocarbons and sulphur hexafluoride gases.

For the purposes of evaluating the upstream oil and gas production industry as an entity, OEUK 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 and partially available for aviation flights.

OEUK continues to work with stakeholders to agree metrics for emissions reporting. However, with a view to compare like for like, this year sees industry's emissions move to IPCC AR5 with Carbon Feedbacks applying a 100-year time horizon[5] using 34 tonnes CO_2e/tonne CH_4 and 298 tonnes CO_2e/tonne N2O. As HFCs, PFCs and SF6s contribute negligible emissions, data is limited. In discussions, member and external stakeholder estimates have been applied.

Table 2
Global warming potentials and conversions

Assessment report	Greenhouse gas	Global warming potential 20-year	Global warming potential 100-year
AR4[6]	CO_2	1	1
	CH_4	72	25
	N_2O	289	298
AR5[7]	CO_2	1	1
	CH_4	84	28
	N_2O	264	265
AR5 with Carbon Feedbacks	CO_2	1	1
	CH_4	86	34
	N_2O	268	298

[5]. https://www.ipcc.ch/report/ar5/syr/
[6]. https://archive.ipcc.ch/publications_and_data/ar4/wg1/en/ch2s2-10-2.html
[7]. https://www.ipcc.ch/assessment-report/ar5/

Table 3
Sources and nature of emissions

	EU ETS	EEMS	National Inventory	NAEI	Stakeholder Estimates
Installations	CO_2 (Verified)	CO_2 Supplemented CH_4 N_2O			HFC PFC's SF6
Terminals			CO_2 CH_4 N_2O		HFC PFC's SF6
Logistics				CO_2 CH_4 N_2O	HFC PFC's SF6
Exploration		CO_2 CH_4 N_2O			HFC PFC's SF6
Aviation	CO_2				CH_4 N_2O HFC PFC's SF6

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