



OFFSHORE WIND INSIGHT

May 2024

Offshore Energies UK

The role of wind in the UK transition

Summary

The UK is in the midst of a major energy transformation, with ambitious plans to build a low carbon energy system that will meet our collective needs to deliver a net-zero future (*Figure 4*). Whereas in the past oil and gas from the North Sea were the primary source of energy, in years to come electricity will dominate the energy mix with wind power being the single biggest source of green electricity.

The UK has been a leading proponent of wind power generation, with roughly 15 GW of installed offshore by the end of 2023 and a similar capacity onshore. The UK has more capacity for offshore wind power generation than any country apart from China (*Figure 1b*).

The UK has set ambitious targets for offshore wind power: 50 GW by 2030, of which 5 GW will be floating. Meanwhile, onshore, capacity is expected to stagnate (*Figure 14*). By 2035 the UK will have invested a further £132bn to reach 65 GW of offshore wind power. Given the scale of the investment, the UK must make the most of the opportunities this presents.

This Insight considers how the UK can best expand offshore wind to meet our targets both in the short and longer term and support wider economic growth. It assesses the supply chain's capabilities and how they might bring about a home-grown energy transition. It also considers the lessons learned from fixed-bottom wind as we seek to maximise the benefits of floating wind generation.

Our conclusions reflect the experience of our 400 member companies across the UK and are based on independent research on supply chain opportunities we have commissioned from Rystad¹.

We conclude the following:

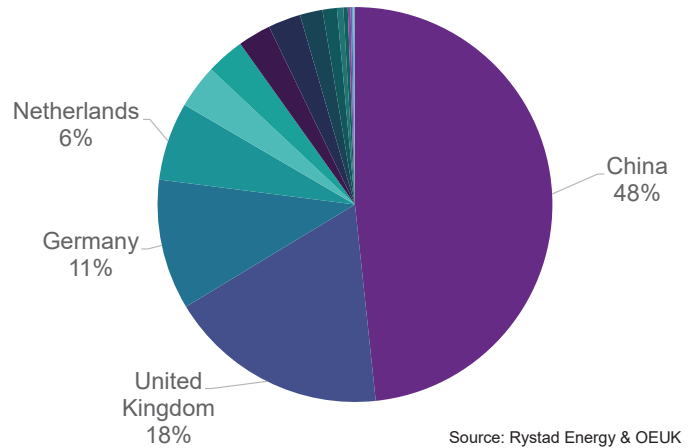
- 1. The UK's ambitions for offshore wind deployment continue to grow, but confidence in the UK's ability to deliver remains uncertain**
- 2. Floating wind could be a game-changer, giving the UK supply chain the chance to develop fresh capabilities as part of wider economic growth**
- 3. Electricity market arrangements in the UK need to change to support an increasingly decentralised generation system**

¹ Rystad Energy's energy supply chain report shows potential prize for the UK | Offshore Energies UK (OEUK)

1. The UK's ambitions for offshore wind deployment continue to grow, but confidence in the UK's ability to deliver remains uncertain

Figure 1

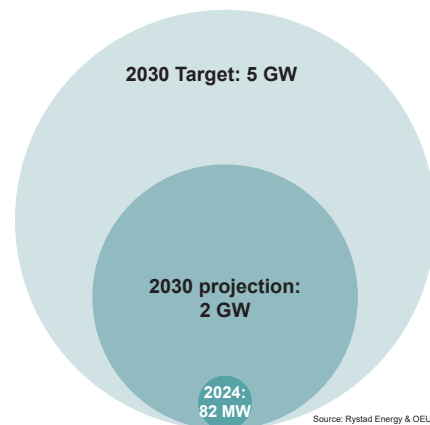
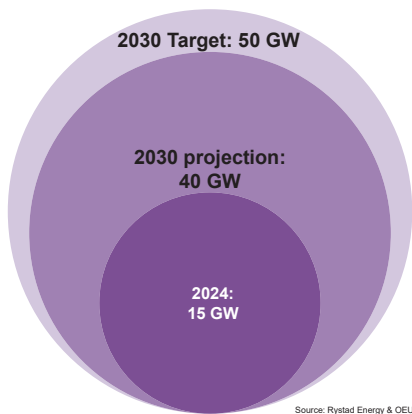
a. Installed offshore wind capacity (end 2024) b. Global installed offshore capacity



UK has 15 GW of installed offshore wind capacity and is the second largest market in the world. Overall, wind power represents around 30% of total UK electricity generation. The fourth quarter of 2023 also saw wind generating more than gas – the first time that has happened.

Figure 2

a. Overall offshore wind progress vs targets b. Floating offshore wind progress vs targets



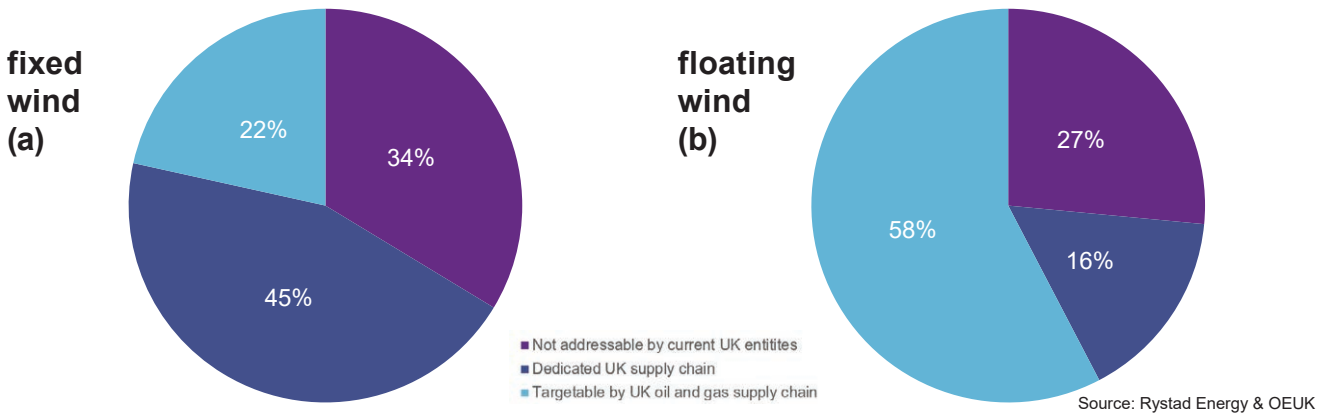
To meet its targets, the UK will have to use all the resources available to it and at an accelerated pace. Delivering the planned capacity under the Innovative & Targeted Oil & Gas (INTOG²) of 5.5 GW by 2030 is critical if the 5-GW target is to pave the way for ScotWind³ (28 GW), Celtic Sea (4.5 GW) and UK leadership in floating wind.

² INTOG: 13 projects selected to support green innovation and help decarbonise North Sea | Crown Estate Scotland

³ ScotWind offshore wind leasing delivers major boost to Scotland's net zero aspirations | Crown Estate Scotland

2. Floating wind could be a game-changer, giving the UK supply chain the chance to develop fresh capabilities as part of wider economic growth

Figure 3
UK supply chain capabilities for fixed wind (a) and floating wind (b)



The UK’s energy sector supply chain is well placed to meet many of the needs of floating wind from its existing pool of capabilities. The UK energy supply chain has unique capabilities that floating wind requires: deep marine operations expertise; a strong offshore operations; a good safety and environmental track record; and extensive experience of managing capital projects. These all sit alongside world-class capabilities in subsea systems engineering, subsea electrical systems and cables. Such wind opportunities sit alongside emerging markets in carbon capture and storage and hydrogen where the UK is also looking at wider growth potential. Taken together, this is an opportunity for the UK to build a truly home-grown supply chain. The Industry Growth Plan⁴ estimates the UK will benefit from wind development by as much as £25bn.

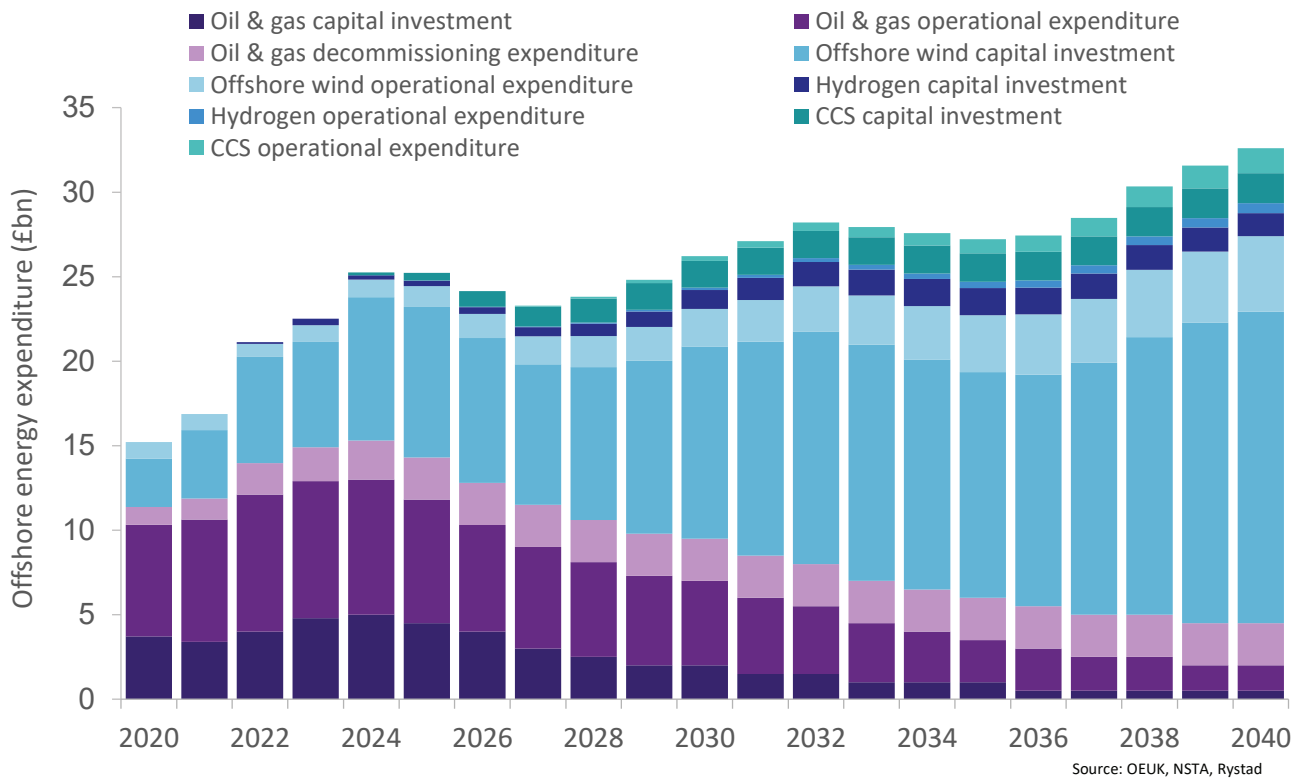


⁴ Offshore Wind Industrial Growth Plan - 2024 (ymaws.com)

3. Electricity market arrangements in the UK need to change to support an increasingly decentralised generation system.

The electricity system is changing rapidly. Wind and solar will become the backbone of UK power supply, with abated gas generation as fall-back. The more wind and solar capacity there is, the harder the market must work to manage intermittency (*Figure 15*). The Review of Electricity Market Arrangements (REMA), first announced in 2022, acknowledges some shortcomings. Contracts for Differences (CfD) need reform and expanding the CCUS infrastructure and hydrogen production will have cost consequences. Market reform should be tailored to open new routes to the flexible market for wind output and exports via interconnectors and hydrogen. In consequence the cost of electricity supply will fall in the longer term.

Figure 4
Evolution of overall UK energy investment



Wind market

Size of the prize

The UK has about 30 GW of installed wind power, split equally between offshore and onshore. This Insight concentrates on the offshore wind power generation market.

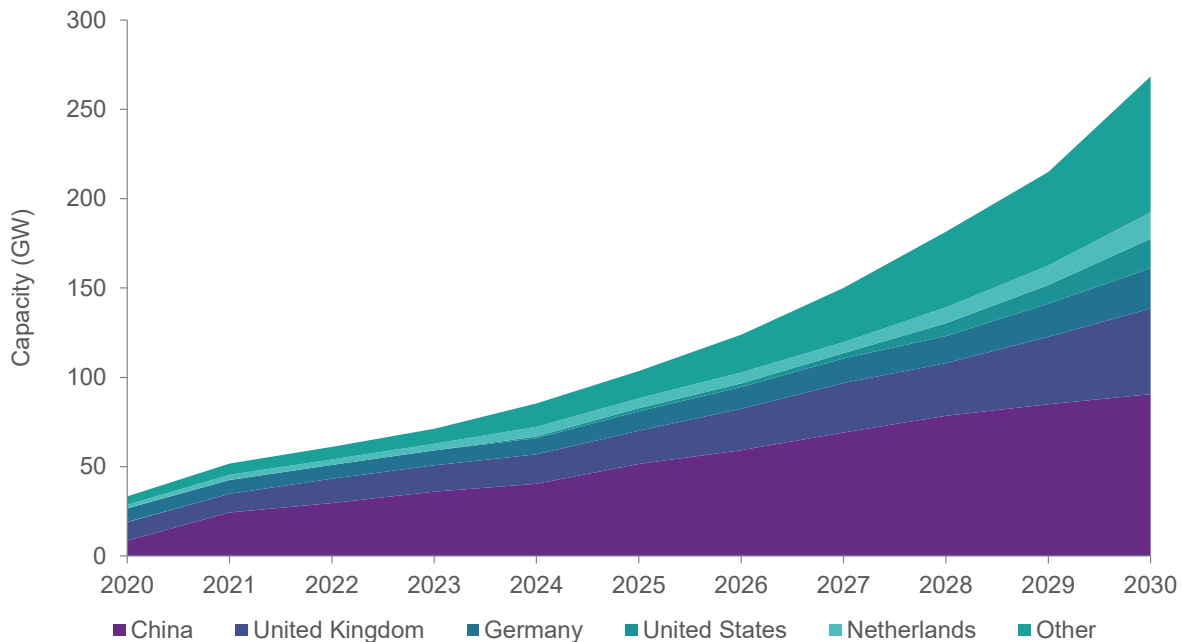
In 2023, one wind farm was fully commissioned, adding over 1 GW to capacity, with 114 turbines installed across the country. It is predicted that two wind farms will be fully commissioned in 2024, adding 450 MW to the system, along with 55 additional turbines.

Recent challenges such as cost inflation, prolonged consenting timelines and supply-chain pressures make it more uncertain that the targets will be met. Initiatives are under way to address challenges identified in the independent review by Tim Pick⁵ in 2023. However, it will take time to address and 50 GW by 2030 is unlikely without substantial investment. Spending on offshore wind is now at about £7.7bn/yr and projected to rise to £15bn/yr by 2030 and possibly £29bn/yr by 2035.

Global wind market

If the UK can meet its current growth plans, it will remain the biggest offshore wind generator – after China – until 2030 (*Figure 5*). By the end of 2024, the UK will have 18% of the estimated 85 GW of global offshore capacity.

Figure 5:
Global offshore wind development



Source: Rystad Energy & OEUK

⁵ Accelerating deployment of offshore wind farms: UK Offshore Wind Champion recommendations - GOV.UK (www.gov.uk)

Financing the electricity market

The main route to market for wind projects is the contract for difference (CfD), where generators have a 15-year price guarantee shielding them from low prices. Conversely, the government benefits when the wholesale price exceeds the CfD price (*Figure 6b*). The CfD contracts are awarded by auctions in allocation rounds (AR) where generators bid for a fixed-price contract.

The final strike price has fallen steadily over the last seven years, from AR1 to AR4, as project capital costs have fallen (*Figure 6a*) and are approaching prevailing long-run wholesale prices. This is a common feature of deploying “new” technologies: economies of scale and project improvement kick in. However two decades' experience of offshore wind mean that the gains are becoming slimmer and so AR5 failed.

As CfD strike prices have converged towards lower long-term average wholesale market price (*Figure 6b*) the investment signal is becoming fainter, even if CfDs offer protection. The CfD price in AR5 however was too low to attract investment: the costs of capital have soared as interest rates have risen post Covid.

There are also concerns that AR4 projects may struggle to be developed under prevailing arrangements as the CfD scheme does not fully compensate for sector-specific inflation. The government responded with the offer of a higher administrative strike price and larger overall budget for AR6. However, positive though these interventions are, there are concerns that they may be too weak to support construction of the capacity that the 2030 target needs.



CfDs will not necessarily remain the primary funding mechanism over a longer time frame. An alternative route to finance for wind developer is the power purchase agreement (PPA). This might become increasingly popular as PPA prices are expected to exceed CfD rates in the coming years.

Figure 6a
CfD price vs wholesale market price

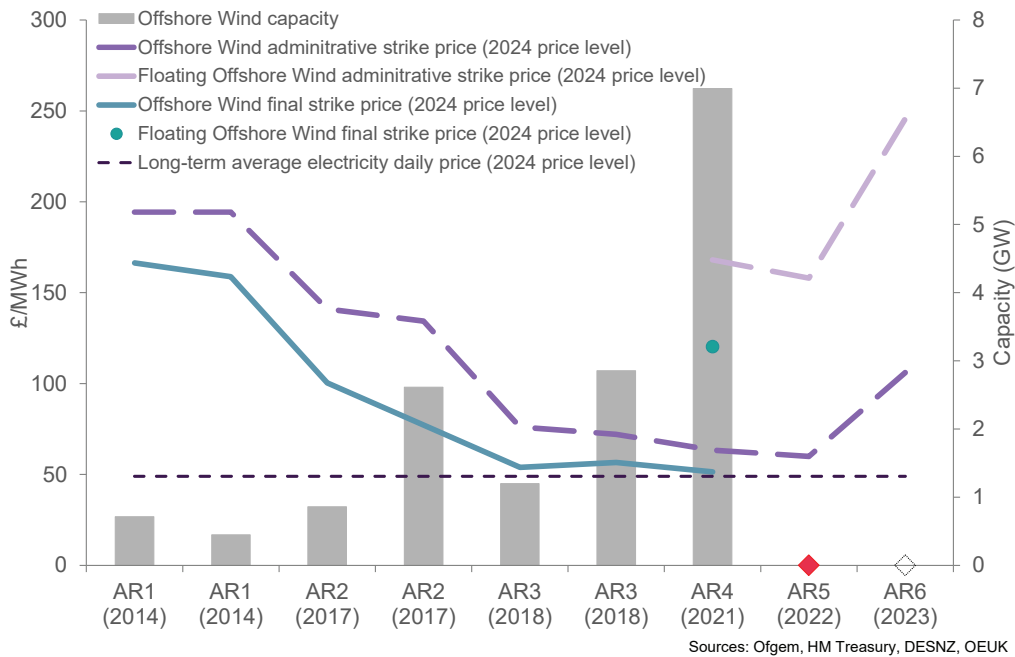
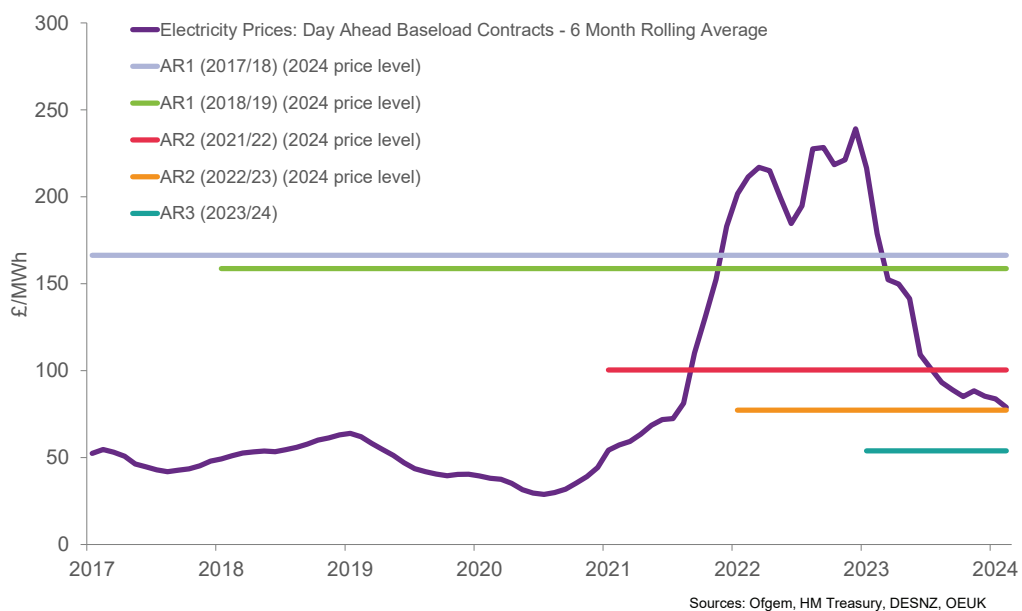


Figure 6b
CfD price and capacity award evolution



UK wind targets and beyond

The UK has enough projects in the pipeline to meet its 50 GW by 2030 target (of which 5 GW is floating) but they are moving too slowly. The current timeline between lease and operation is around 10 years (Tim Pick report⁶), twice the ideal period. At today's rate, the UK may reach 40 GW with only 2 GW floating by 2030 (Figure 7). It might not reach 50 GW until 2032 and only deliver 5 GW of floating by 2033. The outcome of AR6 and then AR7 could push these dates even further back. Annual consents will need to double and then be sustained at record rates and there will also have to be significant advances in grid capacity. Finally, the delay to the Scottish Sector Marine Planning and National Energy System Operator Holistic Network Design do not augur well for the 2030 targets.

Figure 7a
Forecast cumulative capacity for offshore wind

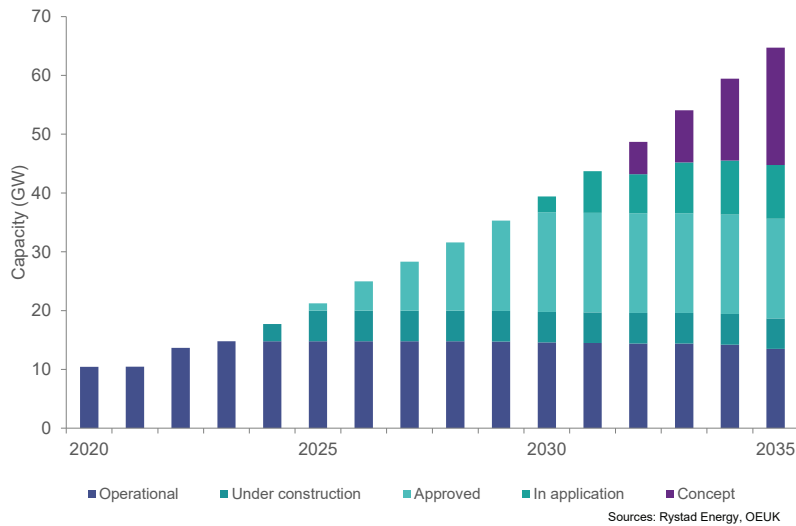
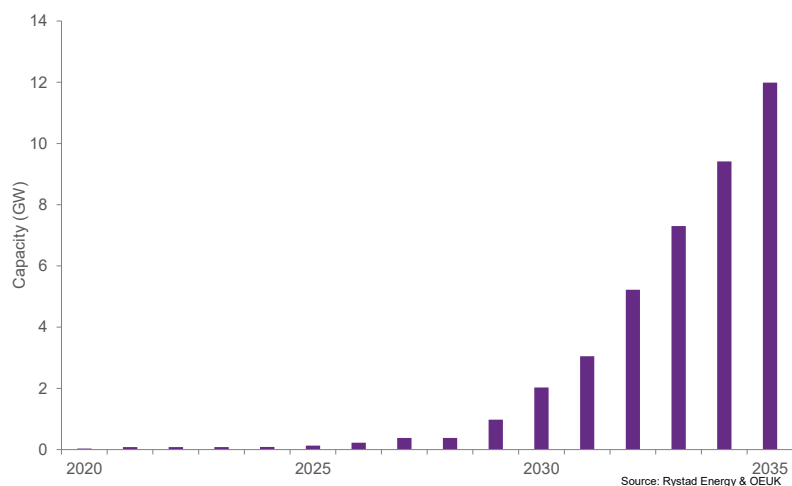


Figure 7b
Forecast cumulative capacity for floating wind



⁶ Seizing our opportunities: independent report of the Offshore Wind Champion (publishing.service.gov.uk)

Looking ahead: floating wind

In the coming years, the growth of fixed wind investment is expected to level off (*Figure 9*). Floating wind is still an emerging technology with most of the world's installed capacity composed of demonstrators. However, floating wind has four times the potential of fixed wind as it can access vast areas of the oceans where conventional wind farms cannot be deployed. Floating wind is expected to grow fast in the UK and abroad in the next decade (*Figure 8*). Moving further offshore provides access to more stable wind conditions and increases the capacity factor for utilisation of installed capacity above 50%. Floating wind is expected to have a lower environmental impact and have less coexistence issues with industries that depend on access to the sea. Bigger turbines also mean fewer turbines for the same energy output, helping to cut costs.

Figure 8
Capacity evolution fixed and floating wind.

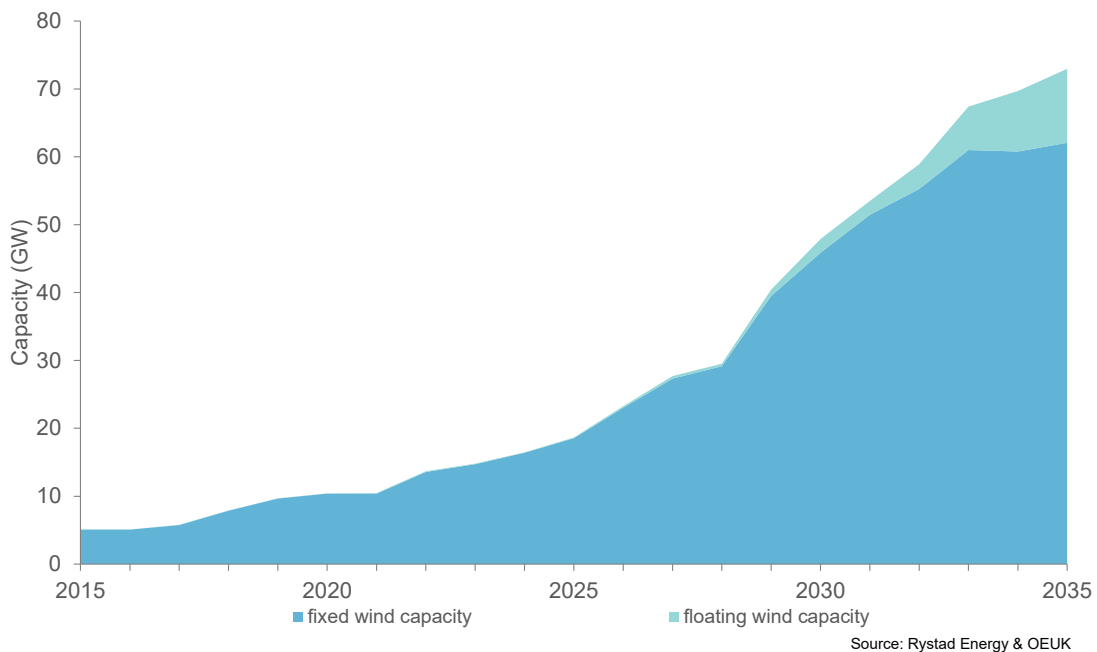
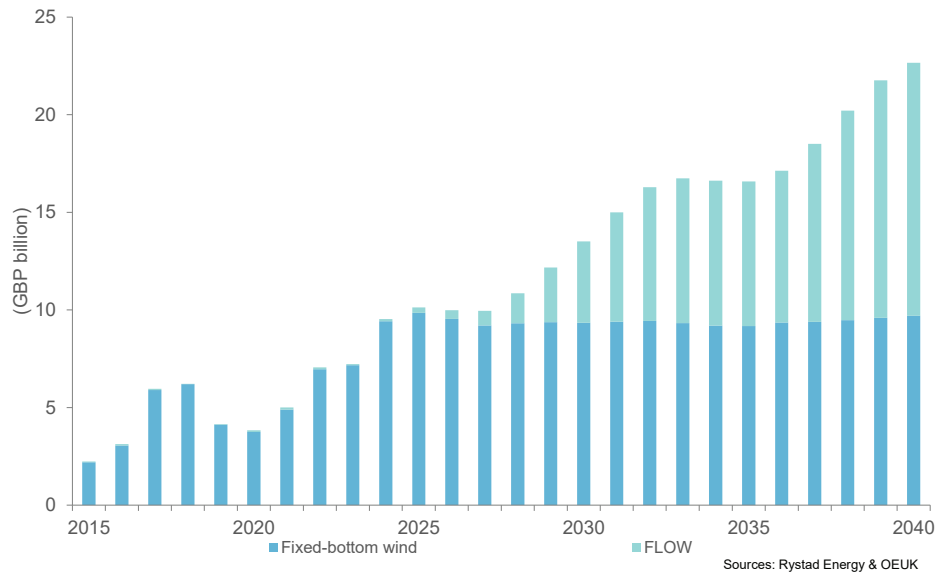


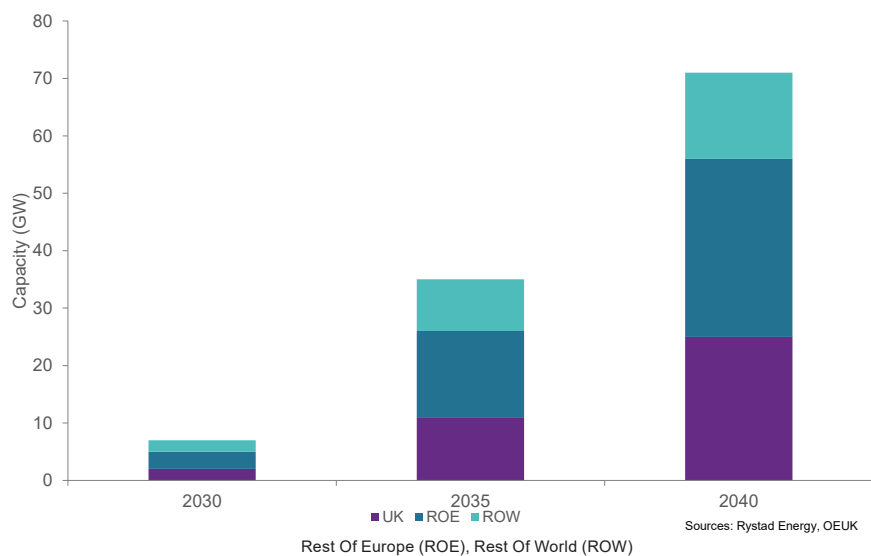
Figure 9
Yearly investment in fixed and floating wind.



The current levelised cost of electricity (LCOE) for floating wind is higher than it is for fixed (*Figure 6a*). However, with the right investment, the cost of floating wind is expected to follow the same cost reduction curve as fixed wind. The UK is well placed to take first mover advantage in the floating wind market (*Figure 10*).

The licence round for INTOG⁷ is a critical stepping stone to develop the floating wind technology and enable ScotWind and Celtic Sea to flourish. It will primarily rely on the installation of floating wind turbines against an accelerated timetable. The INTOG round must succeed if the 5-GW target is to be met.

Figure 10
Floating wind market evolution and UK market share.



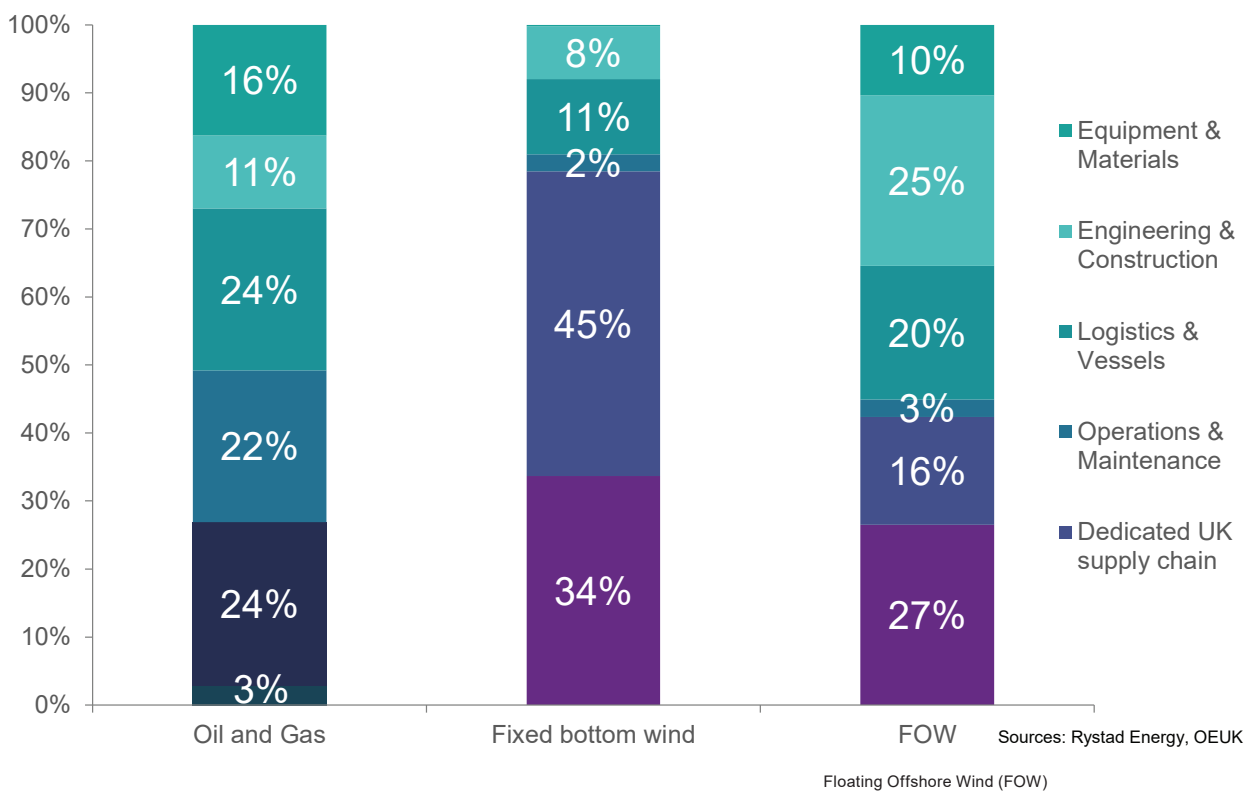
⁷ <https://www.crownstatescotland.com/sites/default/files/2023-08/intog-summary-document-feb-22.pdf>

Supply-chain challenges and opportunities

The race to the bottom induced by the CfD process coupled with recent inflation has squeezed margins and put pressure on supply-chain finances. Hence, despite ambitious targets across the world, investment in the supply chain is lagging behind. Initiatives are taking place to support the UK supply chain (Suitable Industry Reward, Green Industry Growth Accelerator, Floating Offshore Wind Manufacturing Investment Scheme (FlowMIS)⁸ but an ambitious and cohesive approach is required.

The existing UK supply chain is much better positioned to capture a sizeable market share in floating wind than it has been for fixed. Furthermore, the existing UK expertise in subsea engineering and technology, deep water operations (including health, safety and the environment) and floating structures should help position the UK as a leader in the floating wind market.

Figure 11
UK supply chain capability can address fixed and floating wind.



⁸ Floating Offshore Wind Manufacturing Investment Scheme: clarification questions with responses (updated 14 June 2023) - GOV.UK (www.gov.uk)

However, lessons should be learned from the fixed-bottom deployment and emphasis should be placed on supporting local supply-chain resources in the UK. A lack of final investment decisions (FID) reflects the lack of a signal to invest in the supply chain. Only a small portion of the project pipeline has reached FID, the developer landscape is fragmented, technologies are undecided, for floating wind, all of which impedes investment in the supply chain. For companies in the supply chain to have the necessary certainty of demand, government support is needed.

While the supply chain has the capacity for the floating wind market, the UK cannot grow at scale without pursuing key sectors which it is well equipped to address:

1. Engineering, fabrication and construction of offshore foundations and structures (using UK ports)
2. Expansion of manufacturing of major equipment and materials (mooring and anchors, subsea systems including cables)
3. Installation, operations, and maintenance of offshore assets (including anchor-handling vessels and offshore construction vessels).

To survive, the UK supply chain must be competitive, for example, by improving efficiency and productivity through automation and advanced manufacturing⁹.



⁹ Rystad Energy's energy supply chain report shows potential prize for the UK | Offshore Energies UK (OEUK)

GB electricity market regulation

The energy system is changing with an increased share of intermittent decentralised renewable power generation creating a much more dynamic market (*Figure 14*). The need to adapt has been recognised in Ofgem's Review of Electricity Markets.

The existing electricity market arrangements were designed for a very different market from today's. It was designed for incremental increases on both the supply and demand side, based on concentrated generation and static locations of demand.

On the supply side, large, centralised generators have been added to the grid over the last three decades as coal fired power generation has been replaced by gas and older nuclear plants have gradually come off the grid. This is all now evolving rapidly with the emergence of decentralised, intermittent renewable sources such as wind and solar. The market share of those sources is only expected to increase to meet UK target and net zero objectives, with emerging renewable technology such as tidal, wave and geothermal offering alternative generation profiles.

Although electricity demand has been declining over the last decade, decarbonisation efforts are expected to reverse the decline through electrification of heating and transport. To accommodate this, the national grid will require upgrade costing £54bn by 2030 according to National Grid Electricity System Operator. This is equivalent to squeezing the last 30 years' investments into six years: a challenge for both manpower and finance.

REMA is expected to conclude in 2025. It has considered a range of possible market modifications and these options have been progressively narrowed down via a structured process (*Figure 12*). The most controversial proposal remaining on the table is the adoption of zonal pricing which would see Great Britain split into a number of separate zones, with the intent of sending wholesale market participants both locational investment and operational signals. The reform is intended to reduce congestion and curtailment. It will also deliver price reductions for customers in zones where there is much generation, trying to match demand and supply more efficiently. However, this may push up the generator's cost of capital and potentially jeopardise projects like ScotWind which are far from where the power is consumed.

Furthermore, the option assumes the ability to relocate supply and demand which will be challenging to achieve in the short term. Locating generators close to consumers is not going to be cheap, whichever way round the move happens.

The CfD has been very effective at bringing new technology to market but it has squeezed the supply chain to the point where it can hardly reinvest. The introduction of the Sustainable Industry Reward (SIR) is welcome relief for the UK supply chain. SIR should be co-ordinated with GIGA and FlowMIS to help facilitate growth of a UK based supply chain. There is also a case for further CfD reform to encourage the creation of energy hubs. This would facilitate co-location with other renewable sources, including hydrogen generation, to reduce the environmental footprint, optimise resource use and create a more holistic energy system approach.

In the long-run and as we are getting closer to net zero, the government would aspire to reduce the scale of its market intervention. However, renewable energy projects typically with a large upfront capital cost, exposed to a volatile electricity market, still need some derisking.

Figure 12
DESNZ REMA options table¹⁰

Wholesale market - location	National pricing	Zonal pricing	Nodal pricing	Local imbalance pricing			
Wholesale market - tech	Unified market		Split by characteristic				
Wholesale market – balancing	National		Local then national				
Wholesale market – price formation	Pay-as-clear		Pay-as-bid				
Wholesale market – dispatch	Self-dispatch		Central dispatch				
Mass low carbon power	Existing CfD	CfD with more price exposure	Deemed generation CfD	Supplier obligation	Revenue cap and floor	Dutch subsidy	Equiv. firm power auction
Flexibility	Optimised CM	CM with flex enhancements	Supplier obligation (inc. CPS)		Revenue cap and floor	Dutch subsidy	
Capacity adequacy		Capacity payment	Centralised reliability option	Decentralised reliability option	Targeted tender	Strategic reserve	
Operability	BAU	BAU+ (previous sub-options refined)	Local markets	Changes to CfD/CM design	Co-optimisation		

Key

Preferred proposal at 2 nd consultation	Options taken forward to next stage of assessment	Refer to Appendix 4
Previously discounted following 1 st consultation	Propose to discount at 2 nd consultation	Discounted as the main mechanism for supporting investment but continuing to explore the role of suppliers more broadly

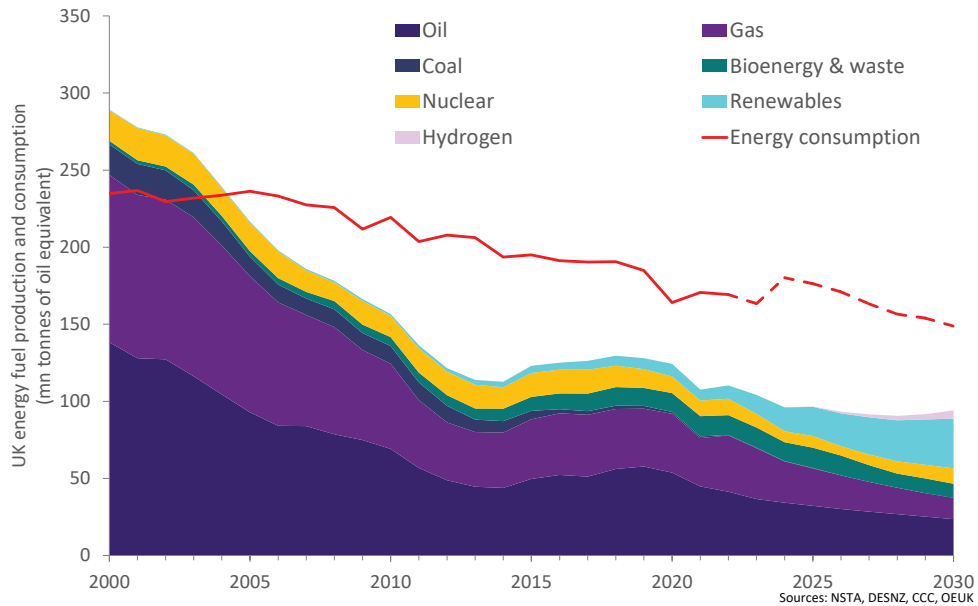
Source: DESNZ

¹⁰ Review of electricity market arrangements (REMA): second consultation - GOV.UK (www.gov.uk)

Energy system transformation

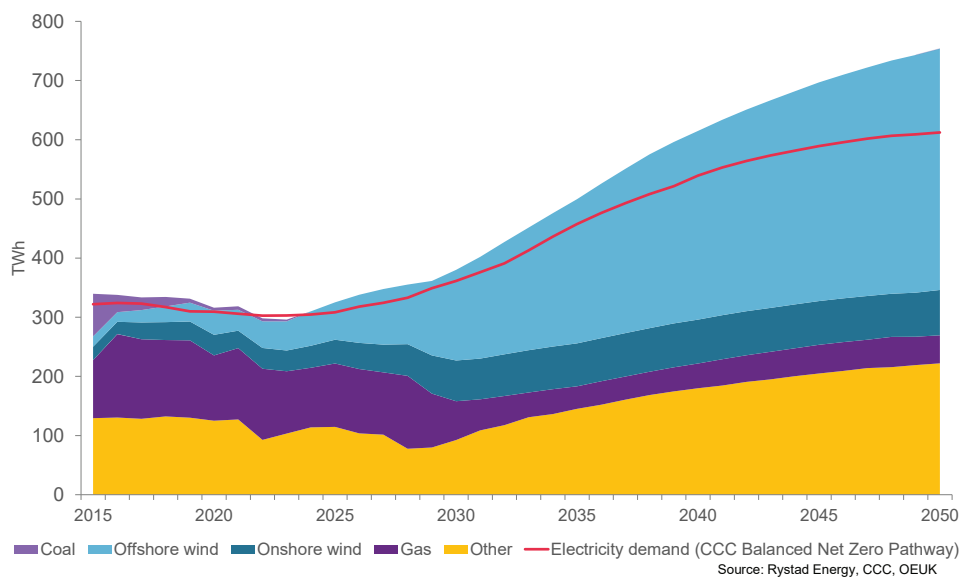
The UK energy mix is changing with an increase share coming from renewable. However, the UK remains a net energy importer for the foreseeable future (*Figure 13*). These imports include oil, gas but electricity often meets a tenth of total GB power demand.

Figure 13
Overall UK energy generation vs. demand.



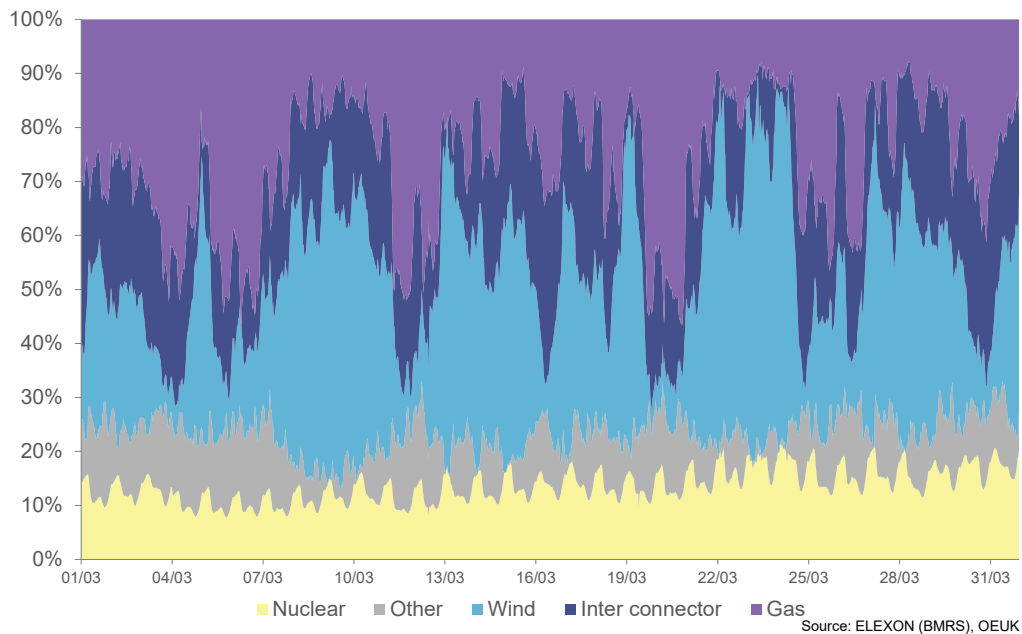
As has been described – highly distributed, intermittent energy sources such as wind and solar are expected to dominate the electricity generation by 2030 (*Figure 14*).

Figure 14
Electricity generation evolution by source.



The increasing share of intermittent renewables will require yet greater flexibility from gas powered generation (fitted with CCS) to help balance supply and demand throughout the day (Figure 15). Additional sources of flexible, dispatchable power will emerge as time and investments allow. These include hydrogen and its derivatives, pumped hydro, large battery storage and alternative renewable fuel sources.

Figure 15
Intermittent demand and intermittent generation are compensated by flexible gas generation.



Over the next decade as the installed capacity of offshore wind grows at pace, there will increasingly be periods where there is excess wind power. During such periods, hydrogen electrolysis will offer an alternative route to market for wind farms needing to shed load efficiently. A hybrid approach with an electricity network that is supported by a hydrogen network could also address issues relating to congestion and curtailment. Exciting opportunities are presented through the gradual repurposing of the gas network for CO₂ and hydrogen transportation allowing bilateral flows between GB and the continent. Further information is available via National Gas on their proposals for Project Union¹¹.

Thanks to its hydrocarbon resources, the UK was an energy exporter until early 2000. It can regain this position of energy powerhouse based on its vast renewable energy resources and by pivoting its world class supply chain in those growing sectors.

¹¹ Hydrogen Focus Area | National Gas

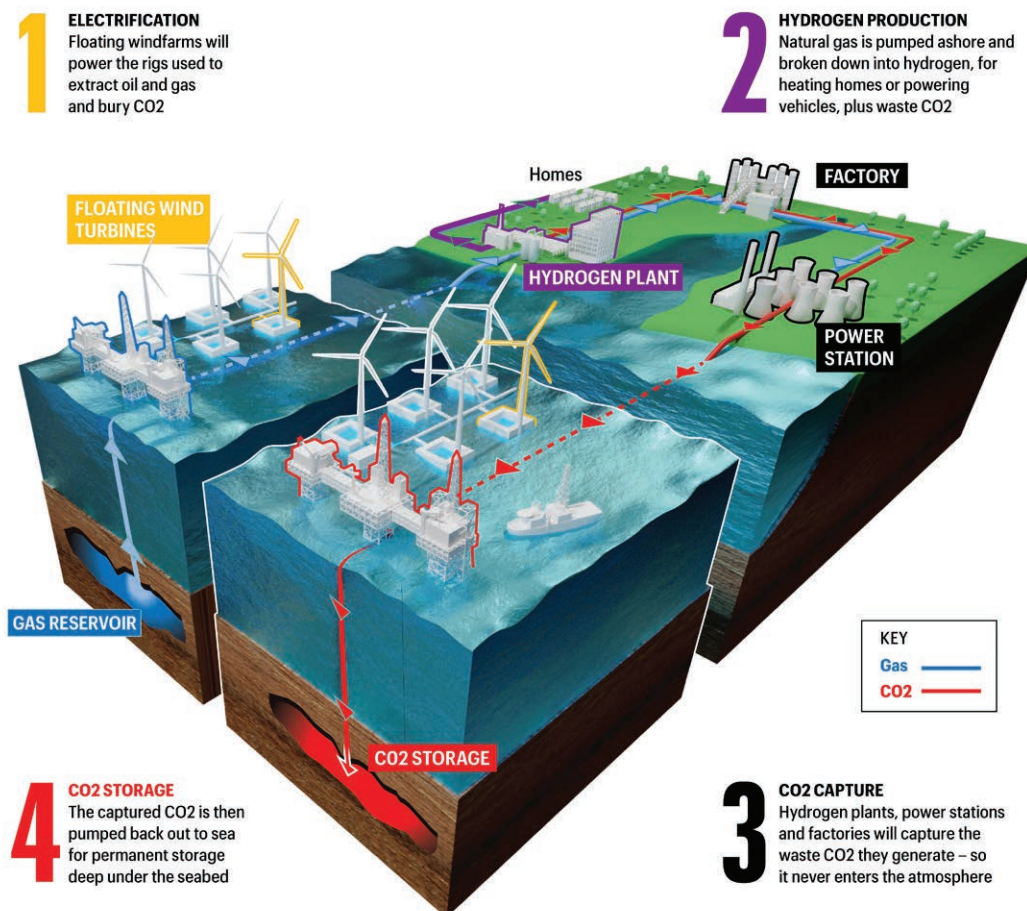
Our focus areas since 2023

Offshore Energies UK has just completed its second year under revised Articles of Association, which incorporated the extension of its remit into energies beyond oil and gas. The consultation on extending OEUK’s scope took almost a year as it needed careful deliberation and consultation with members. The extension of our membership to companies in the renewable and low-carbon technology space reflects the evolving interests and increasing diversification of the oil and gas supply chain and operator companies, with many of our members already active in these areas.

This includes HyNet North West, Acorn Hydrogen & CCS, Equinor’s Dogger Bank wind farm, West Anglesey Tidal Energy Project, Hywind Scotland, Drax Zero Carbon Humber Projects, OGCi Climate Investments and Net Zero Teesside.

Offshore Energies UK’s members continue to produce the oil and gas the UK needs to support its energy security, its industry, its jobs and the economy whilst also being key to delivering the energy transition.

As the voice of industry, OEUK proudly champions the integrating offshore energy industry, putting across facts and evidence which demonstrate the need for oil, gas, wind, hydrogen and carbon capture to be developed together to meet the UK’s energy needs. Working together with our members, we continue to engage and inform stakeholder understanding of what an integrated offshore energy future means – not only for this industry but for the UK economy and for society as a whole.





Enjoy the benefits of membership

OEUK has over 400 members, from oil and gas operators to the offshore energy supply chain and across the lifecycle from production to decommission. We represent an integrating offshore energy industry which provides cleaner fuel, power and products safely to everyone in the UK.

Raise your profile

- Social media welcome on our social platforms. We have over 55,000 followers on LinkedIn alone!
- Share your news on our website.
- Promote your case studies.
- Be in one of our member highlights.



Join forums & workgroups

- Discuss key issues of the industry that draw your interest.
- Over 14 forums to join in on.
- Take pride in contributing to better future working methods within the energy supply chain.



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- Our quarterly Offshore Energies magazine delivered to your office.
- Enjoy member exclusive reports and insights, written in-house by our experts.
- Speak to our market intelligence experts for unique market insights.



Target your networking

- Network with peers that are interested in the same subject.
- Showcase your expertise and business to others in the industry.
- Enhance your business' capabilities by making valuable connections.



Lead the industry

- Contribute to award-winning good practice guidelines.
- Nominate a senior leader to OEUK's Advisory Council.
- Get involved with external key stakeholders of the wider energy industry.



Attend our events

- Gain access to member-exclusive events.
- 35% discount on tickets at any OEUK event.
- Member-exclusive exhibition rates.
- Speaking opportunities relevant to your field of interest.



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 Offshore Energies 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.

Join us today and help strengthen the UK offshore energy industry and your business.

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