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# United Kingdom

ORE Catapult's 7MW Levenmouth Demonstration Turbine (source: ORE Catapult).

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**In 2022, UK's renewable energy capacity increased by 3.8GW. Of which, 2.7GW derived from offshore wind, escalating its cumulative capacity of 13.8GW. Furthermore, the British Energy Security Strategy, published in April 2022, outlined a new offshore wind target of 50GW to be installed by 2030, up from 40GW previously.**

## Introduction

In 2022, new records in both wind and solar energy generation produced a total of 134.8TWh from renewable technologies. This achievement marks a 9.6% increase compared to the 121.9TWh produced in 2021. Furthermore, renewable energy accounted for 41.4% of total electricity generated in 2022, representing increase of 1.8 percentage

points compared to the year before. Meanwhile, power generated from both oil and coal hit record-lows. Overall, the total production of electricity in the UK increased slightly in 2022, in comparison to the extraordinary low recorded in 2021. Of the total annual electricity generated, wind energy produced a record 24.2%, driven primarily by the installation of additional capacity. Environmental and socio-economic factors, such as historic high temperatures, as well

as increased prices following the global energy crisis, resulted in a 15% decrease in demand. Levels unprecedented since the early 1970's. Upon adjusting for seasonal and temperature factors, total energy consumption fell by 4.9% for the year. Notably, the transport sector was the only industry where energy consumption did not decline.

In total, renewable energy capacity in 2022 increased by 3.8GW. Of which, 2.7GW derived from offshore wind,

escalating its cumulative capacity of 13.8GW. Onshore wind capacity expanded by 340MW to a total cumulative capacity of 14.8GW. The average rating of new offshore turbines was 8.6MW [1].

Research in the wind sector continues to focus on driving efficiency in O&M through collaboration between industry, academia and the public sector. Tackling the challenge of grid integration will be vital as offshore wind capacity increases to 50GW.

Furthermore, it is vital to develop the local supply chain to maximise the benefit of the sector to the UK economy.

## Highlight(s)

- The British Energy Security Strategy, published in April 2022, outlined a new offshore wind target of 50GW to be installed by 2030, up from 40GW previously.

**Table 1. Key National Statistics 2022: UK**

Total (net) installed wind power capacity*	28.8 GW
Total offshore capacity	13.9 GW
New wind power capacity installed	3.0 GW
Decommissioned capacity (in 2022)	0 GW
Total electrical energy output from wind	80.2 TWh
Wind-generated electricity as percent of national electricity demand	24.6%
Average national capacity factor**	31.8 %
Target	50 GW offshore by 2030
National wind energy RD&D budget	N/A

- Hornsea 2 became fully commissioned in 2022, which at 1.3GW, is now the world's largest operational offshore wind farm.
- 20 projects totalling 27.6 GW were awarded option agreements in the ScotWind leasing round.

## Market Development

### Targets and Policy

The UK Government published the British Energy Security Strategy in April 2022 which outlined a new ambition of installing 50GW of offshore wind energy in UK waters by 2030. Of this 50GW, 5GW is intended to be floating offshore wind, which will be

supported by investments of £160 million (186 million EUR; 207 million USD) in ports and supply chain, and £31 million (36 million EUR; 40 million USD) in R&D. The strategy also highlights the aim to reduce consenting time for projects, which currently stands at four years, down to one year. The increased ambition emphasised in the strategy means that the sector can expect to support 90,000 jobs by the end of the decade [2].

In July 2022, the results of the fourth Contracts for Difference (CfD) scheme were announced. This awarded more project contracts than the previous three auctions combined and will generate a record-breaking additional capacity of almost 11GW. Offshore wind was deemed the most significant tech-

nology, achieving just below 7GW of additional capacity in awarded contracts at the record-low price of £37/MWh (43 EUR; 48 USD) (2012 prices). Additionally, floating offshore wind was included in the scheme for the first time ever [3]. The industry eagerly await the next round soon as the scheme announced in February 2022, that CfD rounds will now be held on an annual basis instead of every 2 years [4].

ScotWind also announced the results of their 2022 leasing round, which allocated almost 10GW of fixed-bottom offshore wind capacity and 17GW of floating offshore wind capacity. This marks the beginning of a potential 27GW of capacity being installed in Scottish waters over the next decade [5].

To conclude the results of the 2022 leasing rounds, Crown Estate Scotland announced the details of the Innovation and Targeted Oil and Gas (INTOG) leasing round. This is expected to be the first round of its kind, aimed at supporting large projects which will provide renewable energy that directly powers existing oil and gas assets, in addition to supporting small-scale innovative offshore wind projects [6].

### Progress and Operational Details

The total renewable energy generated in 2022, experienced a significant growth of 9.5 percentage points, which closely matches the previous record set in 2020. As a result, renewable energy accounted for 41.4% of overall energy production. This growth was primarily driven by the installation of additional capacity, particularly in the offshore wind sector. Consequently, energy generation for wind (both offshore and onshore), as well as solar energy, reached record high levels. Of the total electricity generated by renewables, an immense 59% was produced by both offshore and onshore wind power. Average load factors for offshore wind accounted for 41% while onshore wind generated 27%. Both have increased compared to 2021 figures as a result of higher wind speeds.

Overall, the renewable energy capacity increased by 3.8GW in 2022, expanding the cumulative total to 53.5GW in regard to all renewable technologies. New capacity in offshore wind comprised 2.7GW of this annual addition while the onshore wind sector contributed an additional 0.3GW. The average rating of new offshore turbines installed decreased slightly compared to 2021, to 8.6MW, as the result of a large scale up in rating between 2020 and 2021 [7]. Additionally, the Hornsea 2 became fully commissioned in 2022, which at 1.3GW, is now the world's largest offshore wind farm [8].

### Matters Affecting Growth and Work to Remove Barriers

In January 2022, Crown Estate Scotland announced the outcome of its ScotWind Leasing process. 20 projects with a combined energy capacity of 27.6GW have been awarded option agreements amounting to £755 million (880 million EUR; 981 million USD). These projects account for an expansive seabed area of over 7,000km<sup>2</sup> [9].

In addition, the Floating Offshore Wind Task Force was set up to define the opportunity floating wind presents the UK. The task force engages leading companies developing floating sites, senior representatives from the UK and devolved Governments and key stakeholder organisations such as The Crown Estate and Crown Estate Scotland.

### RD&D Activities

#### National RD&D Priorities and Budget

- **Negotiations between the EU and UK Government** are still taking place regarding the UK's participation in the flagship Horizon Europe (HEU) research and innovation funding programme. The delay has hindered the participation of UK-based organisations in key HEU projects which is potentially damaging to the UK's ongoing technology development in the offshore renewable energy sector. In July 2022, as a result of the delay in finalising the UK's involvement in the programme, the UK Government announced various measures to support those affected. For example by making additional funding available to existing UK research funding schemes [10].
- The **Department for Business, Energy & Industrial Strategy (BEIS) Floating Offshore Wind Demonstration Programme:** In January 2022, Eleven successful projects were selected to receive

£31.6 million (36.8 million EUR; 45 million USD) (matched by industry) by BEIS for the purpose of escalating the generation of clean renewable energy generated in the country [11].

- The **Department for Transport (DfT)** launched **UK SHORE** in March 2022. £206 million (240 million EUR; 267 million USD) of funding is available to accelerate the development of clean maritime technologies. The offshore wind sector has been one of the main beneficiaries, reflecting the industry's leading position in maritime decarbonisation [12].
- **BEIS** announced the **Net Zero Hydrogen Fund (NZHF)**, worth up to £240 million (280 million EUR; 311 million USD) in April 2022. The competition will fund the development and deployment of new low-carbon hydrogen production to de-risk investment and reduce lifetime costs [13].
- The **Offshore Wind Growth Partnership (OWGP)** launched a £2 million (2.3 million EUR; 2.6 million USD) funding call for projects that will address two different priorities: decarbonisation (sponsored by Equinor and Scottish Power Renewables) and improving reliability (sponsored by Equinor and Ocean Winds) [14].
- The **Carbon Trust** launched **Phase II of The Integrator programme.** This is a joint industry programme which aims to maximise the contribution of offshore wind to a low cost, flexible, predictable, and low carbon energy future [15].

#### National Research Initiatives and Results

- **Hydrogen Innovation Initiative (HII)** - A £6 million (7 million EUR; 7.8 million USD) collaboration over 2 years between the Cata-

pult Network, and a number of others. HII will identify innovation priorities, attract crowd-investment, pilot innovation support for businesses and generate enabling knowledge and capability [16, 17].

- **Offshore Network Transmission Review** – A review led by BEIS, with support from government and industry bodies. It investigates the way that the offshore transmission network is designed and delivered, reviewing barriers to rapid deployment of offshore wind [18].
- **Carbon Trust Floating Wind Joint Industry Project (JIP) – Phase IV** - A report summarising the research undertaken by the Floating Wind JIP to address the technical challenges of moving from fixed-bottom to floating offshore turbines [19].
- **Joule Challenge Phase 2** - A £5 million (5.8 million EUR; 6.5 million USD) programme funded by BEIS through its Net Zero Innovation Portfolio. The project is working towards proving that composite materials can deliver significant performance and lightweighting opportunities which will be essential to addressing the technical challenge of developing the next-generation of wind turbine platforms beyond 20MW [20].
- **Floating Offshore Wind Environmental Interactions Roadmap** – The Floating Offshore Wind Centre of Excellence (FOW CoE) launched a report, delivered in collaboration with Xodus Group, which will guide the floating wind industry in effectively planning for the major roll-out of the technology [21].
- **SusWIND** - Led by The National Composites Centre and delivered in partnership with the Offshore Renewable Energy (ORE) Catapult, the initiative accelerates technology process-

es and material development addressing the recyclability and future development of composite wind turbine blades. The focus is centred on the design of more sustainable blades, as well as reducing the waste streams of blades [22].

### Test Facilities and Demonstration Projects

- The University of Plymouth and ORE Catapult have agreed to establish a new **Collaborative Offshore Renewable Energy Subsea Systems (COSS)** research accelerator. The new facility will be focused on the hydrodynamics of floating offshore structures, offshore engineering and control systems [23].
- ETZ Ltd and ORE Catapult will co-invest and collaborate in a world-leading £9 million (10.5 million EUR; 11.7 million USD) **National Floating Wind Innovation Centre** in Aberdeen. The centre will be dedicated to accelerating the commercialisation of floating offshore wind throughout the UK with the initial focus of generating digital simulations and modelling, then moving on to testing and validation of the key components of floating structures [24].
- A £3 million (3.5 million EUR; 3.9 million USD) **Offshore Wind Robotics Centre**, at ORE Catapult's National Renewable Energy Centre in Blyth, funded by UK Government's Getting Building Fund is set to be the first of its kind dedicated to offshore wind, in the UK. It will enable robotic technology developers to access representative, onshore and offshore test and demonstration environments [25].

### Collaborative Research

- **IEA Wind Task 25: Design and Operation of Power Systems with Large Amounts of Variable Generation** – ORE Catapult worked with the IEA Task 25 consortium in a range of ways in 2022. This included a Task meeting field trip to Finland, to engage with researchers studying the Scandinavian grid infrastructure required to enable a 100% renewable network. The Task 25 Autumn meeting was hosted by Imperial College in London.
- **IEA Wind Task 46: Erosion of Wind Turbine Blades** – Imperial College, Lancaster University, University of Bristol, and ORE Catapult have contributed to Work Packages 2, 3 and 5 in 2022.
- **Carbo4Power**: This collaborative research project funded (€7.8 million) by Horizon in 2020 aims to develop a new generation of lightweight, high strength, multi-functional, digitalised multi-materials for offshore turbine rotor blades. ORE Catapult, and a number of others, are actively contributing to several work packages.

### Impact of Wind Energy

#### Environmental Impact

A combination of rising energy prices and high temperatures in 2022, led to an unprecedented drop in electricity demand, with levels as low as 273TWh, a rate which has not been observed since the 1970s. The last quarter of 2022 marked the most significant change in domestic demand, resulting in a 15% decline in gas demand and 7% for electricity.

As a result of renewable energy accounting for 41.1% of overall electricity production, 2022 is coined the second greenest year on record after 2020. Shares in both offshore and onshore wind have expanded since 2021, with offshore wind increasing

to 33% of overall renewable energy and onshore wind accounting for an additional 26%. Subsequently, the annual average share of wind energy rose to an impressive 59% which constitutes the highest on record of total renewable energy production. Furthermore, peak of 69% was recorded in the fourth quarter of 2022.

Despite the economy's continuous recovery from the COVID-19 pandemic, the rate of greenhouse gas emissions decreased by 2.2% from compared to 2021. This drop in emissions was largely driven by a significant 16% decrease in CO<sub>2</sub> emissions from the residential sector amidst warmer temperatures in 2022 [26].

### Economic Benefits and Industry Development

In 2021, the turnover in the UK low carbon and renewable energy economy (LCREE) was estimated to be £54.4 billion (61.6 billion EUR; 67.5 billion USD). Of which, the wind sector was responsible for £6.5 billion (7.6 billion EUR; 8.4 billion USD), which constitutes an increase of 1.5% from 2020.

Regarding employment, the number of full-time employees (full-time equivalent) in the wind sector experienced a decline by an estimated 4.9% from 2021. Yet, onshore wind gained an estimated 300 additional employees in the same period. In terms of export market value, the offshore wind sector outweighed the onshore wind sector with a total market value of £2.98 billion (3.8 billion EUR; 3.8 billion USD), compared to £107 million (125 million EUR; 139 million USD) for the onshore wind sector. Figures for 2022 will not be published until the end of 2023 [27].

### Next Term

Round 5 of the Contracts for Difference (CfD) application window is currently open, allowing potential candidates to submit their bid proposals and results expected to be

announced in the summer of 2023.

The first steams of energy from Dogger Bank A is expected in mid-2023. Dogger Bank will be the largest windfarm in the world, with 3.6 GW capacity generated from three phases.

The UK Government suggested lifting the de facto ban on onshore wind in 2022, but now appears to be keeping the restrictions in place, hampering onshore wind development.

### References

[1] Department for Business, Energy & Industrial Strategy (2022) Energy Trends: UK Renewables. Download from: [Energy Trends: Energy Trends: UK renewables - GOV.UK \(www.gov.uk\)](https://www.gov.uk/government/publications/energy-trends-uk-renewables)

[2] UK Government (2022) British Energy Security Strategy. Download from: [British energy security strategy - GOV.UK \(www.gov.uk\)](https://www.gov.uk/government/publications/british-energy-security-strategy)

[3] Contracts for Difference (CfD) (2022) Government publishes Allocation Round 4 results. Download from: [Government publishes Allocation Round 4 results \(cfdallocation-round.uk\)](https://www.gov.uk/government/news/government-publishes-allocation-round-4-results)

[4] Contracts for Difference (CfD) (2022) Allocation Round 5 draft timeline published. Download from: [Allocation Round 5 draft timeline published | Contracts for difference CfD \(cfdallocationround.uk\)](https://www.cfdallocationround.uk)

[5] Crown Estate Scotland (2022) ScotWind leasing round. Download from: <https://www.crownestatescotland.com/scotlands-property/offshore-wind/scotwind-leasing-round>

[6] Crown Estate Scotland (2022) New leasing opportunity unveiled to boost innovation and help decarbonise the North Sea. Download from: [New leasing opportunity unveiled to boost innovation and help decarbonise North Sea - News - Crown Estate Scotland](https://www.crownestatescotland.com/news/new-leasing-opportunity-unveiled-to-boost-innovation-and-help-decarbonise-north-sea)

[7] Wind Europe (2023) Wind energy in Europe: 2022 Statistics and the outlook for 2023-2027. Download from: [Wind energy in Europe: 2022 Statistics and the outlook for 2023-2027 | WindEurope](https://www.windeurope.org/publications/wind-energy-in-europe-2022-statistics-and-the-outlook-for-2023-2027)

[8] Orsted (2022) Hornsea 2, the world's largest windfarm, enters full operation. Download from: [Hornsea 2 enters full operation \(hornseaprojects.co.uk\)](https://www.hornseaprojects.co.uk)

[9] Crown Estate Scotland (2022) ScotWind offshore wind leasing delivers major boost to Scotland's net zero aspirations. Download from <https://www.crownestatescotland.com/news/scotwind-offshore-wind-leasing-delivers-major-boost-to-scotlands-net-zero-aspirations>

[10] House of Commons Library (2022) The UK and EU programmes: participation delayed. Download from: [The UK and EU programmes: participation delayed - House of Commons Library \(parliament.uk\)](https://www.parliament.uk/research-briefings/crbs2022-0011)

[11] Department for Business, Energy & Industrial Strategy (2022) £60 million boost for floating offshore wind. Download from <https://www.gov.uk/government/news/60-million-boost-for-floating-offshore-wind>

[12] Department for Transport (2022) DfT launches UK SHORE to take maritime 'back to the future' with green investment. Download from <https://www.gov.uk/government/news/dft-launches-uk-shore-to-take-maritime-back-to-the-future-with-green-investment>

[13] Department for Business, Energy & Industrial Strategy (2022) Net Zero Hydrogen Fund strand 1 and strand 2. Download from <https://www.gov.uk/government/publications/net-zero-hydrogen-fund-strand-1-and-strand-2>

[14] Offshore Wind Growth Partnership (2022) Innovation Grants November 2022. Download from <https://owgp.org.uk/about/grant-funding/>

- [15] Carbon Trust (2022) The Integrator. Download from <https://www.carbontrust.com/our-work-and-impact/impact-stories/the-integrator>
- [16] Catapult Network (2022) Hydrogen - How Will We Decarbonise the Most Challenging Areas of the UK Economy? Download from <https://catapult.org.uk/how-will-we-decarbonise-the-most-challenging-areas-of-the-uk-economy/>
- [17] Maritime UK (2022) Hydrogen Innovation Initiative (HII). Download from <https://www.maritimeuk.org/priorities/innovation/funding-opportunities/hydrogen-innovation-initiative-hii/>
- [18] UK Government (2022) Offshore Transmission Network Review. Download from <https://www.gov.uk/government/groups/offshore-transmission-network-review>
- [19] Carbon Trust (2022) Floating Wind Joint Industry Programme – Phase IV Summary Report. Download from <https://www.carbontrust.com/our-work-and-impact/guides-reports-and-tools/floating-wind-joint-industry-programme-phase-iv>
- [20] Offshore Renewable Energy (ORE) Catapult (2021) Composite materials set to enable the next generation of wind turbines with Joule Challenge project launch. Download from <https://ore.catapult.org.uk/press-releases/joule-challenge-phase-2-programme-launched-composite-materials-offshore-wind-beis/>
- [21] Offshore Renewable Energy (ORE) Catapult (2022) New report provides roadmap for future interactions between floating offshore wind and the wider marine environment. Download from <https://ore.catapult.org.uk/press-releases/environmental-interactions-roadmap/>
- [22] National Composites Centre (2021) Accelerating sustainable composite materials and technology for wind turbine blades. Download from <https://www.nccuk.com/what-we-do/sustainability/suswind/>
- [23] Offshore Renewable Energy (ORE) Catapult (2022) Cutting edge research facility aims to accelerate the development of offshore renewable innovations. Download from <https://ore.catapult.org.uk/press-releases/ore-catapult-university-plymouth-cutting-edge-research-facility-aims-to-accelerate-the-development-of-offshore-renewable-innovations/>
- [24] Offshore Renewable Energy (ORE) Catapult (2022) ETZ Ltd and ORE Catapult to Collaborate on Development of World Leading National Floating Wind Innovation Centre. Download from <https://ore.catapult.org.uk/press-releases/national-floating-wind-innovation-centre/>
- [25] Offshore Renewable Energy (ORE) Catapult (2022) Major Blyth projects break ground in boost to UK offshore wind. Download from <https://ore.catapult.org.uk/press-releases/major-blyth-projects-break-ground-boost-uk-offshore-wind/>
- [26] Department for Energy Security and Net Zero (2023) 2022 UK Provisional Greenhouse Gas Emissions. Download from: [2022\\_UK\\_greenhouse\\_gas\\_emissions\\_provisional\\_figures\\_statistical\\_summary.pdf](https://www.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/114444/2022_UK_greenhouse_gas_emissions_provisional_figures_statistical_summary.pdf) ([publishing.service.gov.uk](https://www.publishing.service.gov.uk))
- [27] Office for National Statistics (2023) Low carbon and renewable energy economy estimates. Download from: [Low carbon and renewable energy economy estimates - Office for National Statistics \(ons.gov.uk\)](https://www.ons.gov.uk/economy/green-economy/low-carbon-and-renewable-energy-economy-estimates)