



Report 2023

# United Kingdom

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**Renewable energy's share of total energy generation hit new highs in 2023. A new annual record was reached with a 47.3% share, which is an increase of 5.3 percentage points from 2022.**

Additionally, a quarterly record of 51.5% was reached. Specifically, wind energy reached a record share of close to 29% of demand. Overall, both U.K. energy production and demand fell in 2023, which has continued to keep prices at a high rate. Particularly, energy production dropped a substantial 9% from 2022, with oil production hitting a record low and a fall in production levels for all fuels except wind and solar.

The renewable energy capacity grew by 2.7 GW in 2023, of which 1.4 GW was wind energy. Offshore wind accounted for 0.8 GW of this, and onshore wind 0.5 GW, which brings the cumulative capacities to 14.7 GW and 15.3 GW respectively. Wind energy contributed significantly to the increase of the U.K.'s renewable energy generation, despite a tumultuous year amid continued economic pressure from rising supply chain

costs and inflation.

In 2023, The U.K. successfully negotiated its participation in the Horizon Europe (HEU) research and innovation funding programme. R&D in the wind sector is focused on accelerating deployment, reducing capacity constraints and growing the U.K. supply chain. Tackling the challenge of grid integration will be vital as the U.K. aims to reach 50 GW of offshore wind by 2030 [1] [2].

## Highlight(s)

- Seagreen was commissioned in October 2023, which is now Scotland's largest offshore wind farm at 1.1 GW, and the world's deepest fixed-bottom site.
- The first turbine was installed at the 3.6 GW Dogger Bank site in October. The wind farm will be fitted with 277 Haliade-X 13 MW turbines and, once complete, will be the largest wind farm in the world.

- Total installed wind surpassed 30 GW. A new wind energy production record of 21.8 GW was set in December.

## Progress and Operational Details

The U.K. has a target of 50 GW of offshore wind to be installed by 2030, while currently, there is no target for onshore wind. The U.K. Govern-

**Table 1. Key National Statistics 2023: UK**

Total (net) installed wind power capacity	30.1 GW
Total offshore capacity	14.7 GW
New wind power capacity installed	1.4GW
Decommissioned capacity (in 2023)	GW
Total electrical energy output from wind	82 TWh
Wind-generated electricity as percent of national electricity demand	28.7%
Average national capacity factor	32.1%
Target	50 GW of OSW by 2030
National wind energy RD&D budget	

ment's main policy mechanism for supporting low-carbon electricity generation, such as wind energy, is the Contracts for Difference (CfD) scheme, an annual project auction round which provides long-term price stability to generators.

Tim Pick, the U.K.'s first offshore wind champion, published the "Independent Report of the Offshore Wind Champion" in March 2023. This report outlined six key areas of opportunity for the U.K. offshore wind industry: site selection and seabed leasing; consenting; grid connections; CfD; ports and supply chain; innovation and skills, and provided recommendations in each area to U.K. Government, policymakers and other stakeholders to support the

future growth of offshore wind in the UK [3].

In September 2023, CfD Allocation Round 5 results were announced which delivered 3.7 GW of capacity, awarding 95 contracts, up from 93 last year. 1.5 GW of capacity was secured by 24 onshore wind projects at a strike price of 52 £/MWh (2012 prices), more than double awarded in Allocation Round 4 [4].

The Crown Estate raised the leasing capacity of Offshore Wind Leasing Round 5 from 4 GW to 4.5 GW in October 2023. This round is for floating offshore wind projects in the Celtic Sea, the first phase of development in this region, and will run in 2024 [5].

## Progress and Operational Details

In Wind energy, both onshore and offshore, accounted for 61% of renewable energy production, and a record 28.7% of electricity production. This was driven by an overall reduction in energy generation. A new quarterly generation record was set for offshore wind in Q4 at 20.9% of total electricity generation. This was driven by new offshore wind capacity, as Seagreen Offshore Wind Farm was fully commissioned. Average load factors for offshore wind were 39.7% and 24.5% for onshore wind, both down from 2022 due to lower wind speeds [1][2].

The U.K.'s wind index estimates that

2023 was approximately 1% less windy at 99.3% of the long-term 1996-2022 average. In particular, from April to June, wind speeds were down each month, resulting in a 9.9% reduction in this period. Despite wind speeds increasing in the latter months of 2023, the overall annual U.K. index remained below the average.

The average rating of new offshore turbines installed was 10.1 MW with the completion of Seagreen, in addition to some turbines installed at Neart na Gaoithe (8 MW turbines) and Dogger Bank A (13 MW turbines).

### Matters Affecting Growth and Work to Remove Barriers

In 2023, Vattenfall halted the development of the Norfolk Boreas offshore wind farm which was awarded a CfD in Allocation Round 4 at a record low strike price of 37.35 £/MWh. The developer cited spiralling supply chain costs and increasing interest rates leading to the project being financially unviable. However, in December, RWE acquired the rights for the Norfolk Offshore Wind Zone, encompassing Norfolk Boreas and Norfolk Vanguard East and West, from Vattenfall for nearly GBP 1 billion. All three projects have been awarded consent and, at 4.2 GW, once complete, will form one of the largest developments worldwide [6][7].

For the first time, CfD Allocation Round 5 failed to attract any bids for eligible offshore wind projects, including floating projects. For many, this was an inevitable result of auction parameters failing to account for the economic reality faced by offshore wind developers. In November, the U.K. Government published updated parameters for Allocation Round 6 which will run in 2024. These include an increase in the administrative strike price of 66% to 73 £/MWh for fixed-bottom wind and 176 £/MWh. (2012 terms) for floating wind, in addition to allocating a separate funding pot for fixed-bot-

tom wind [4][8].

In September 2023, the U.K. Government loosened some restrictions on onshore wind development to allow Local Planning Authorities (LPAs) to allocate new sites for onshore wind projects and better protect new developments from minority dissenters.

## RD&D Activities

### National RD&D Priorities and Budget

- **Negotiations between the EU and UK Government** regarding the U.K.'s participation in the Horizon Europe (HEU) research and innovation funding programme successfully concluded in December 2023. As of the 1st of January 2024, the United Kingdom becomes an associated country to Horizon Europe. The U.K.'s association to Horizon Europe will deepen the EU's relationship with the U.K. in research and innovation [9].
- In March 2023, the **U.K. Government** published the **Offshore Wind Net Zero Investment Roadmap** which details the long-term vision, with an ambition of up to 50 GW offshore wind capacity by 2030 including up to 5 GW of floating offshore wind [10].
- **The Department for Energy Security and Net Zero (DESNZ)** announced the **Floating Offshore Wind Manufacturing Investment Scheme (FLOW-MIS)** in March 2023, with up to a GBP 160 million (EUR 180 million; USD 193 million) grant in funding available to support critical port infrastructure that will enable the delivery of floating offshore wind [11].

## National Research Initiatives and Results

- Published in February 2023, **Vattenfall** announced that a EUR 3 million research project has revealed how seabirds avoid offshore wind farms. Pioneering radar and artificial intelligence technology was used to track birds at the European Offshore Wind Deployment Centre at Aberdeen [12].
- In March 2023, **Frazer-Nash Consultancy** published the **Floating Offshore Wind Levelised Cost of Energy Review for the Department of Energy Security and Net Zero (DESNZ)**. This is a review of technical assumptions and generation costs. The report states that the levelised cost of energy (LCOE) is expected to rapidly decrease, but government policies and legislation will be influencing factors [13].
- With funding from **OFGEM's Strategic Innovation Fund Round 2**, the **Hydrogen Cost Reduction (HyCoRe)** discovery phase project investigated key options for exporting offshore wind power using green hydrogen and linking it to existing gas and electricity networks. The programme has found the development of onshore electrolysis is easier than offshore. However, with cost reductions possible in electrolyzers and pipelines, offshore options may become viable in time. In addition, the project found that hydrogen inter-array systems can be cost competitive for larger wind farms [14].
- In December 2023 an independent report was published by the **Task & Finish Group on Industry Resilience for Critical Minerals**. The report outlines where dependencies and vulnerabilities exist across U.K. industry sectors, and recommendations for how to support U.K. industry

to promote resilience and diversity in its critical mineral supply chains [15].

### Test Facilities and Demonstration Projects

- **Pentland Floating Offshore Wind Farm** has successfully completed all offshore survey campaigns. This marks a significant milestone in the development of this 100 MW project, which will be located off the coast of Caithness in Scotland. When completed, the project will power approximately 70,000 homes in the Highland Local Council Area [16].

### Collaborative Research

- ORE Catapult has produced a grid development report for the **Industrial Technology Research Institute (ITRI)** of Taiwan titled “Overview of U.K. regulations and grid development for renewable energy growth”. The report has screened the U.K. Government’s regulations for renewable energy and analysed the driving mechanisms of this series of regulations. Recommendations have been provided that aim to summarise the gains and losses from prior experiences in the U.K., with the intention to demonstrate how to achieve sustainable development of renewable energy in Taiwan.
- The United Kingdom is a member of several IEA Wind Tasks and has been actively participating in Task 25 (Design and Operation of Energy Systems with Large Amounts of Variable Generation) and Task 46 (Erosion of Wind Turbine Blades) this year.
- **Carbo4Power:** The primary aim of the Carbo4Power project is to develop a generation of lightweight, high strength, multi-functional, digitalised multi-materials for offshore turbine rotor blades that will increase their operation-

al performance and durability while reducing the cost of energy production, maintenance, and their environmental impact. ORE Catapult has supported the development of novel erosion-resistant coating materials as potential leading-edge protection products. Additionally, it investigated the role of advanced rain erosion test parameters by rain erosion testing, performed proof-of-concept studies to develop a functionally graded fibre-adhesive carrier, and led the validation activities for a demonstrator wind turbine blade that features several material and manufacturing concepts as developed within the project.

- ORE Catapult and **GE Vernova Wind** signed a four-year extension to their existing research collaboration agreement. The programme scope has been broadened outside of the previous Stay Ashore (reliability, value-add, robotics) topics to include next generations turbines, sustainability, and floating wind. ORE Catapult and GE Vernova have a common goal to reduce cost, improve reliability and sustainability for the industry through innovation and collaboration.

### Impact of Wind Energy

#### Environmental Impact

The U.K. energy production dropped to its lowest level since 1948, with generation from fossil fuels hitting a record low. Wind energy, on the other hand, accounted for a record 28.7% of total electricity production. Shares of both offshore and onshore wind increased from 2022, with offshore wind increasing to 37% of total renewable energy generation and onshore wind at 24%. Overall, the annual average share of wind energy grew to 61% of total renewable energy generation, the highest on record [2].

The increasing share of renewable

energy is resulting in greenhouse gas emissions falling, with a reduction of 5.4% from 2022, in part due to lower gas use in electricity generation and high energy prices leading to reduced demand. In the period from 1990 to 2023, greenhouse gas emissions fell by 52.7%. This long-term reduction is mainly attributed to the decrease of emissions from electricity supply as a result of the shift away from using coal for electricity generation towards gas, and more latterly renewables [18].

### Economic Benefits and Industry Development

Turnover in the U.K. Low Carbon and Renewable Energy Economy (LCREE) was estimated to be GBP 69.4 billion in 2022. The wind sector accounted for GBP 19 billion of this, an increase of 60% from 2021 [19].

The current offshore wind energy workforce is 32,257, up 4% from 2022. This is made up of 17,394 direct jobs and 14,863 indirect jobs. Women make up 20.6% of the current workforce, up 1.3% since 2022, and signifies an average growth in the number of women in the sector of 1.25% per year.

Employees from ethnic minority backgrounds make up 7% of the current workforce, an increase of 3.8% from 2022. The Offshore Wind Industry Council (OWIC) estimates a future workforce of 104,401 will be required by 2030 to facilitate the desired buildout of offshore wind. This will involve attracting and retaining an additional 10,000 workers per year through to 2030 [20].

The value of the export market for wind energy is weighted towards offshore wind at GBP 2.4 billion compared to GBP 191 million for onshore wind. Figures for 2023 will not be published until 2025.

## Next Term

The application window for the sixth Contracts for Difference Allocation Round is currently open with results expected to be announced in Summer 2024. A record GBP 800 million budget has been allocated to fixed-bottom offshore wind alongside the increase in the administrative strike price. However, other auction parameters have raised concerns over the amount of capacity that can be awarded [21].

The U.K.'s offshore wind capacity is set to grow in 2024, with Dogger Bank A (1.2 GW), Neart na Gaoithe (0.4 GW), and Moray West (0.8 GW) all likely to be commissioned [22].

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