*The Gode Wind 3 offshore wind farm, developed by Ørsted and commissioned in March 2025 has 253 MW of installed capacity. Gode Wind 3 is equipped with 23 Siemens Gamesa 11-MW wind turbines. The commissioning of this project precedes that of the Borkum Riffgrund 3 Wind Farm (913-MW), scheduled for 2026.*

ORSTED

# 488.1 TWh

***The estimated electricity production from wind power in the EU of 27 in 2024***

# WIND ENERGY BAROMETER 2025

*A study carried out by EurObserv'ER.*

**One of the European Union's main weapons for combatting climate change and reducing our reliance on fossil energies is wind energy, which is also a driving force behind competitive electricity pricing for Europe's economies. The year's performance was slightly dented by a drop in newly connected capacity. If decommissioned capacity is subtracted from the total, net wind turbine capacity in the European Union to date reached 231.9 GW, having increased by 12.2 GW, including 1.7 GW of offshore capacity. A European regulation was adopted at the end of 2022 that set up a framework for accelerating renewable energy deployment, on the hypothesis that constructing and harnessing renewable energy production facilities are of major public interest. It should make construction permits easier to obtain and relaunch the sector as early as 2025. China's wind energy market has kept its upward momentum with at least 80 GW of capacity connected in 2024.**

**231.9 GW**

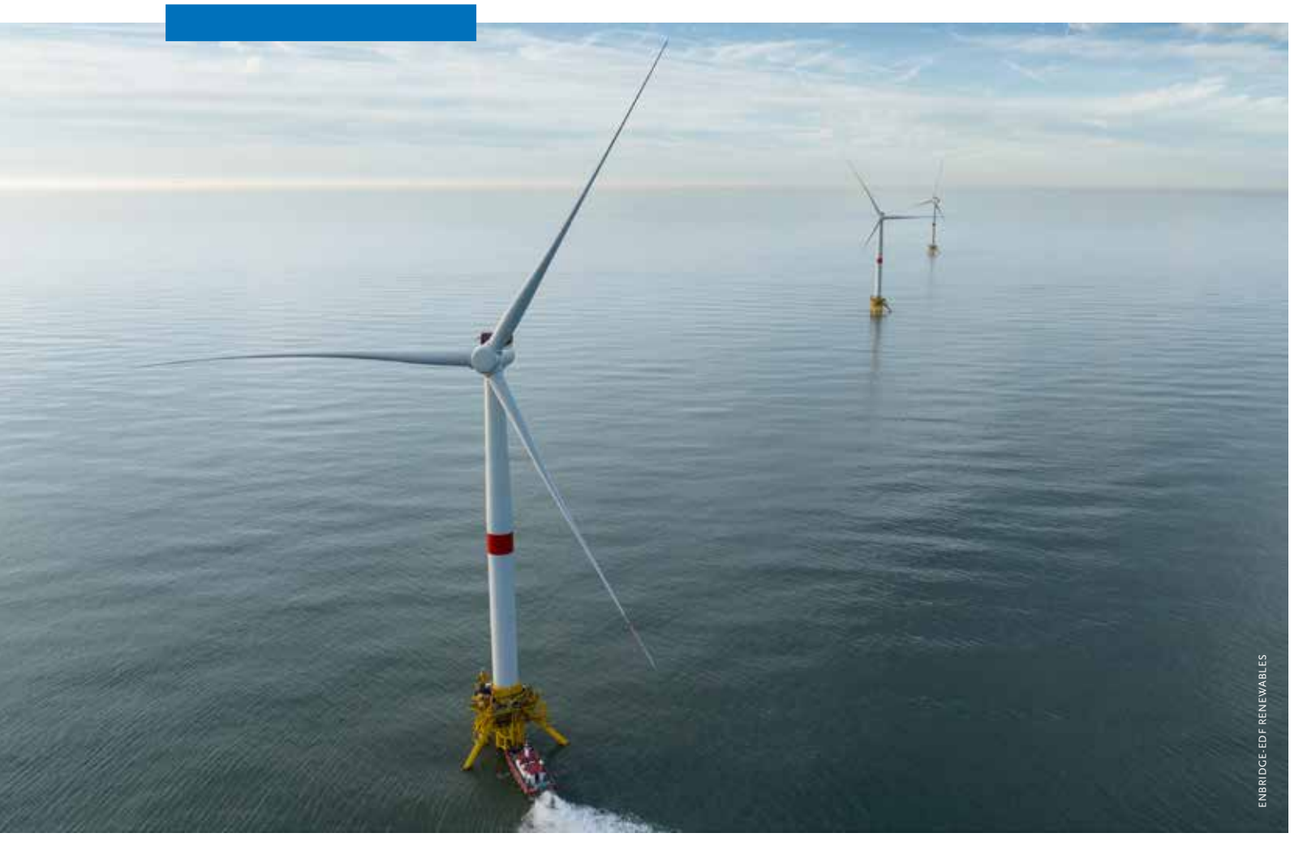
*Wind power capacity installed in the EU of 27 at the end of 2024*

**20.7 GW**

*Wind offshore capacity installed in the EU of 27 at the end of 2024*

The war against climate warming has not let up, despite mounting international tensions, expansionist impulses on the part of major powers to extend their territory and sphere of influence and brutalize trade relations. In this battle, each and every wind turbine, solar panel, and more generally every renewable energy technology deployed, wherever it is installed... in Europe, China, the United States or anywhere else, is a $CO_2$ emissions reduction weapon of benefit to the world's entire population. At the time of writing this barometer, the main organizations tasked with surveying the global wind energy market had yet to give their estimate of the 2024 market. However, provisional data from the six main markets available early in March 2025 (China, Europe, United States, Brazil, India and Canada) shows that as the growth of China's market compensated for weaker activity in Europe and the United States, the global market figure for 2024 should be similar to that of 2023 (116.6 GW). It could even be higher, given that China's market figures could be consolidated upwards and the rest of the world's markets showed positive momentum. In 2023, GWEC (the Global Wind Energy Council) put the year's global newly installed wind turbine capacity at 116.6 GW split between 105.8 GW of onshore and 10.8 GW of offshore capacity. Total capacity in service was put at 1 021 GW (946 GW onshore and 75 GW offshore). EurObserv'ER reckons that global wind turbine capacity should approach and possibly exceed 1 140 GW at the end of 2024.

*The Provence Grand Large floating offshore wind farm, which went on stream at the end of 2024, is located 17 kilometres off the coast of Fos-sur-Mer, in the Provence-Alpes-Côte d'Azur Region. It has three wind turbines with 25 MW of combined capacity and generates the equivalent of the annual electricity consumption of 45 000 inhabitants.*



ENBRIDGE-EDF RENEWABLES

## CHINA – THE GLOBAL WIND ENERGY MARKET'S POWERHOUSE

China, whose wind energy market is of a size to match its energy needs, is fully committed to combatting climate change, as is the European Union.
NEA (China's National Energy Administration) data released in January 2025, shows that the country's aggregate wind turbine capacity increased by 18% between 2023 and 2024 (by 80 GW) to about 521 GW. This capacity growth is proof of the priority given to renewable energies in its energy strategy to meet the growing demand for electricity and reduce carbon emissions. The government hopes that its carbon emissions will peak before 2030 and that it will achieve carbon neutrality before 2060. Secretary-General Qin Haiyan, of the Wind Energy Professional Committee of the China Renewable Energy Society puts the country's capacity figure even higher, at 88 GW of newly connected capacity in 2024, taking China's total wind turbine capacity to date to about 530 GW... and 2025 promises to be excellent. According to Huachuang Securities statistics, the volume of tenders for Chinese wind energy facilities should hit 123 GW in 2024, which equates to roughly a 91% year-on-year increase, comprising 114.1 GW of onshore capacity (a 109.2% YoY rise) and 8.7 GW of offshore capacity (an 11.3% YoY fall). Qin Haiyan predicts that in 2025, China will install 105–115 GW of new wind turbine capacity.
While solar (33 GW of new large solar farms) and energy storage (11 GW of new stationary batteries) are the United States' stars for 2024, the same cannot be said for wind energy, whose market is plummeting and fell for the fourth year in a row. The American Clean Power Association's Snapshot of Clean Power in 2024 reports that about 4 GW of wind turbine capacity (3 926 MW onshore and 132 MW offshore) was connected in 2024 (compared to 6.4 GW in 2023, 8.9 GW in 2022 and 13.7 GW in 2021), which took the country's combined wind turbine capacity to just under 155 GW (154 609 GW onshore and 174 MW offshore). For the time being, wind energy in installed capacity terms, is still the country's leading clean energy source, put at 313 GW at the end

## Table No. 1

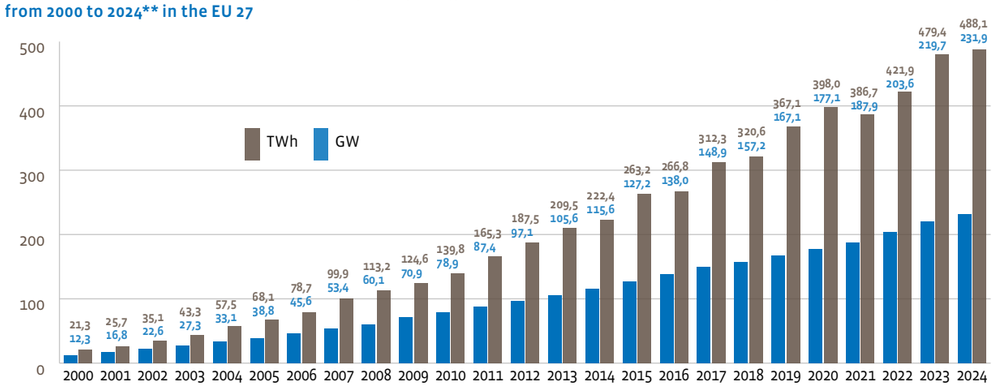
Wind power capacity installed* in the European Union at the end of 2024** (MW)

| | 2023 | Of which Offshore | 2024 | Of which Offshore | Installed in 2024 | Of which Offshore | Decommis-sioned 2024 | Of which Offshore |
|---|---|---|---|---|---|---|---|---|
| Germany | 69 449.0 | 8 473.0 | 72 786.0 | 9 215.0 | 4 052.0 | 742.0 | 715.0 | 0.0 |
| Spain | 30 873.5 | 5.0 | 31 853.3 | 5.0 | 979.8 | 0.0 | 0.0 | 0.0 |
| France | 23 907.0 | 1 483.0 | 24 966.0 | 1 508.0 | 1 158.0 | 25.0 | 99.0 | 0.0 |
| Sweden | 16 224.0 | 193.0 | 17 221.0 | 193.0 | 1 015.0 | 0.0 | 18.0 | 0.0 |
| Italy | 12 307.3 | 31.0 | 12 992.3 | 31.0 | 761.0 | 0.0 | 76.0 | 0.0 |
| Netherlands | 10 734.1 | 3 977.5 | 11 701.0 | 4 748.0 | 1 023.9 | 770.5 | 57.0 | 0.0 |
| Poland | 9 419.0 | 0.0 | 10 139.5 | 0.0 | 720.5 | 0.0 | 0.0 | 0.0 |
| Finland | 6 944.9 | 73.0 | 8 358.4 | 73.0 | 1 413.5 | 0.0 | 0.0 | 0.0 |
| Denmark | 7 273.2 | 2 467.1 | 7 493.8 | 2 641.5 | 238.3 | 176.4 | 17.7 | 2.0 |
| Portugal | 5 538.1 | 25.0 | 5 650.0 | 25.0 | 111.9 | 0.0 | 0.0 | 0.0 |
| Belgium | 5 454.1 | 2 261.8 | 5 591.8 | 2 261.8 | 277.7 | 0.0 | 140.0 | 0.0 |
| Greece | 5 231.7 | 0.0 | 5 366.4 | 0.0 | 134.7 | 0.0 | 0.0 | 0.0 |
| Ireland | 4 739.3 | 25.0 | 4 934.1 | 25.0 | 194.8 | 0.0 | 0.0 | 0.0 |
| Austria | 3 889.0 | 0.0 | 4 028.0 | 0.0 | 159.0 | 0.0 | 20.0 | 0.0 |
| Romania | 3 026.8 | 0.0 | 3 150.0 | 0.0 | 123.2 | 0.0 | 0.0 | 0.0 |
| Lithuania | 1 284.0 | 0.0 | 1 832.0 | 0.0 | 548.0 | 0.0 | 0.0 | 0.0 |
| Croatia | 1 160.2 | 0.0 | 1 237.2 | 0.0 | 77.0 | 0.0 | 0.0 | 0.0 |
| Estonia | 340.0 | 0.0 | 711.0 | 0.0 | 371.0 | 0.0 | 0.0 | 0.0 |
| Bulgaria | 704.3 | 0.0 | 704.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Czechia | 342.5 | 0.0 | 351.6 | 0.0 | 9.1 | 0.0 | 0.0 | 0.0 |
| Hungary | 324.5 | 0.0 | 326.3 | 0.0 | 1.8 | 0.0 | 0.0 | 0.0 |
| Luxembourg | 207.9 | 0.0 | 213.7 | 0.0 | 7.3 | 0.0 | 1.5 | 0.0 |
| Cyprus | 157.5 | 0.0 | 157.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Latvia | 128.3 | 0.0 | 137.0 | 0.0 | 8.7 | 0.0 | 0.0 | 0.0 |
| Slovakia | 4.0 | 0.0 | 4.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Slovenia | 3.3 | 0.0 | 3.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Malta | 0.1 | 0.0 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total EU-27 | 219 667.5 | 19 014.4 | 231 909.5 | 20 726.3 | 13 386.2 | 1 713.9 | 1 144.2 | 2.0 |

** Net maximum electrical capacity. ** Estimation.* ***Sources: EurObserv'ER 2025.***

## Graph No. 1

Evolution of wind power capacity installed* (in GW) and gross wind electricity production (in TWh) from 2000 to 2024** in the EU 27




** Net maximum electrical capacity. ** Estimation.* ***Sources : Years 2000-2022 (Eurostat). Year 2023 and 2024 (EurObserv'ER).***

of 2024 (155 GW wind, 130 GW solar and 19 GW of stationary storage). By way of consolation, the first US high-capacity commercial offshore wind farm, the 132-MW South Fork Wind Farm jointly owned by Ørsted and Skyborn Renewables (Global Infrastructure Partners), was connected to the grid during the first quarter of 2024 and equipped with 12 Siemens Gamesa SG 11-200 wind turbines. According to the ACP, the amount of capacity connected was lower than expected because of long waiting times for interconnections and delays in the publication of directives on the tax credit rules, and projects postponed to 2025. The ACP says that at 40 GW the backlog of onshore and offshore projects, 20 GW of which are under construction (15.9 GW onshore and 4.1 GW offshore) is long. As the new administration has declared its antagonism towards wind energy, the situation is likely to become fraught in the years to come. America's new president has signed decrees suspending construction permits for offshore wind projects. While wind energy is in difficulty, America's clean energies industry is looking healthy with 49 GW of additional capacity (33% more than in 2023), and accounts for 93% of the extra electrical capacity installed in the US in 2024.

In 2024, India and Brazil all but matched the United States' performance. Brazil's ANEEL (National Electric Energy Agency), put newly connected wind turbine capacity at 4.3 GW (4.9 GW in 2023), taking the capacity to date to 33.8 GW. However, the 2025 capacity installation figure is expected to be lower (2.3 GW). India's Ministry of New and Renewable Energy (MNRE) reports that 3.4 GW of capacity was connected in 2024 (2.8 GW in 2023), which is a long way behind the 24.5 GW of solar photovoltaic capacity that it connected during the same year.

### A TRANSITIONAL YEAR IN THE EU

Lower activity in the onshore sector and delays in installing new offshore wind farms by Germany and France weakened the European Union's wind energy market in 2024. WindEurope blames grid bottlenecks, persistent problems with permits in many countries and tough financial conditions for the slowdown in wind power development, dashing governments' expectations. Grid capacity restrictions, harbour capacity and vessel shortages are holding back offshore wind power development.

EurObserv'ER puts EU net installed wind capacity, defined as the net maximum capacity in service that can be injected into the grid, at no less than 231.9 GW at the end of 2024 (including 20.7 GW of offshore wind capacity), namely a 12.2-GW YoY increase (including 1.7 GW offshore) (table 1 and graph 1). This performance is lower than between 2022 and 2023 (when it was 16 GW).

The capacity installed during 2024 is higher... estimated by EurObserv'ER at just under 13.4 GW. Decommissioning of at least 1 144.2 MW of capacity in 2024 across the European Union (715 MW by Germany, 140 MW by Belgium, 99 MW by France, 76 MW by Italy, 57 MW by the Netherlands, 20 MW by Austria, 18 MW by Sweden, 17.7 MW by Denmark and 1.5 MW by Luxembourg) provides the explanation for the difference from the additional net capacity figure.

Annual decommissioning capacity figures increase every year as expected. The decommissioning pace will increase sharply in the coming years, which is a blessing in disguise, because some wind farms will benefit from repowering operations. In Germany, a third of the onshore capacity installed in 2024 for instance, can be ascribed to repowering operations. WindEurope, which defends the interests of Europe's wind energy industry, estimates in its annual "Wind Energy in Europe, 2024 Statistics and the outlook for 2025-2030" statistics report, that aggregate decommissioned capacity could reach 22.2 GW in Europe from 2025–2030. Some of the wind turbines dismantled on these sites will be repowered, i.e., totally replaced by new machines. Over the same six-year period, repowering could account for 20.7 GW of capacity in WindEurope's view.





Another trend singled out in the above report is the steady increase in the average unit capacity of wind turbines installed in Europe. In 2024, the figures were 4.6 MW for onshore turbines (4.5 MW in 2023) and 10.1 MW for offshore turbines (9.2 MW in 2023). In 2015, it was only 2.5 MW for onshore turbines and 4.2 MW for offshore turbines and in 2020, just 3.5 MW for onshore turbines and 8.2 MW for offshore turbines. So, the average unit capacity of onshore wind turbines has almost doubled in a decade and more than doubled in the case of offshore turbines. The expected load factor of the onshore wind farms installed in 2024 is 30–45% and for offshore facilities, about 50%.

The WindEurope report points out that the increase in wind capacity in 2024 is taking shape, coupled with another rise in orders arising from tenders and auctions with 36.8 GW awarded in 12 countries (including the UK and Norway) split between onshore and offshore in the ratio 17 GW to 19.9 GW, respectively. That is a 35% YoY improvement on the 2023 volumes (27.3 GW) and an all-time record for a single year. Germany led the field with 19.3 GW, ahead of the UK (6.3 GW) and the Netherlands (4.1 GW). This increase is a direct result of the new European Union regulation to streamline the delivery of construction permits. WindEurope claims that the main obstacle to large-scale wind energy deployment comes from the grids. The association urges the national authorities to invest in the extension, reinforcement or optimization of their transport and distribution grids as soon as possible and abandon the first come, first served principle to manage the grid connection queues as a matter of urgency

### EUROPE'S OFFSHORE SECTOR IS BUSTLING

While construction of many offshore wind farms is underway in European Union waters, fewer wind farms were commissioned in 2024 than in 2023. EurObserv'ER puts officially connected offshore wind capacity in 2024 at 1 713.9 MW (i.e. 12.8% of the total wind capacity installed during 2024), shared by four countries: the Netherlands (770.5 MW), Germany (742 MW), Denmark (176.4 MW) and France (25 MW). This additional capacity, minus the decommissioning of a 2-MW wind turbine by Denmark, takes EU offshore capacity to date to 20 726.3 MW at the end of 2024.

If we zoom in on the detail, Statistics Netherlands states that the Netherlands connected the outstanding 770.5 MW of the Hollandse Kust Zuid turbines. The facility is currently the world's biggest offshore wind farm with 139 Siemens Gamesa SG 11.0-200 DD turbines. The country's next commissioning campaign is scheduled for the end of 2026 and beginning of 2027 on the Hollandse Kust West 1&2 projects (with respective capacities of 756 MW and 760 MW) for which tendering closed at the end of 2022.

AGEE-Stat reports that two German wind farms went on stream at the end of 2024 – Baltic Eagle (476 MW) and God Wind 3 (266 MW) – totalling 742 MW of newly connected capacity... while other wind turbines installed in 2024 await grid connection. The final turbine of the Borkum Riffgrund 3 Wind Farm (959 MW) was installed at the start of 2025. However, the commissioning date

## Table No. 2

Gross electricity production from wind power in the European Union in 2023 and 2024* (TWh)

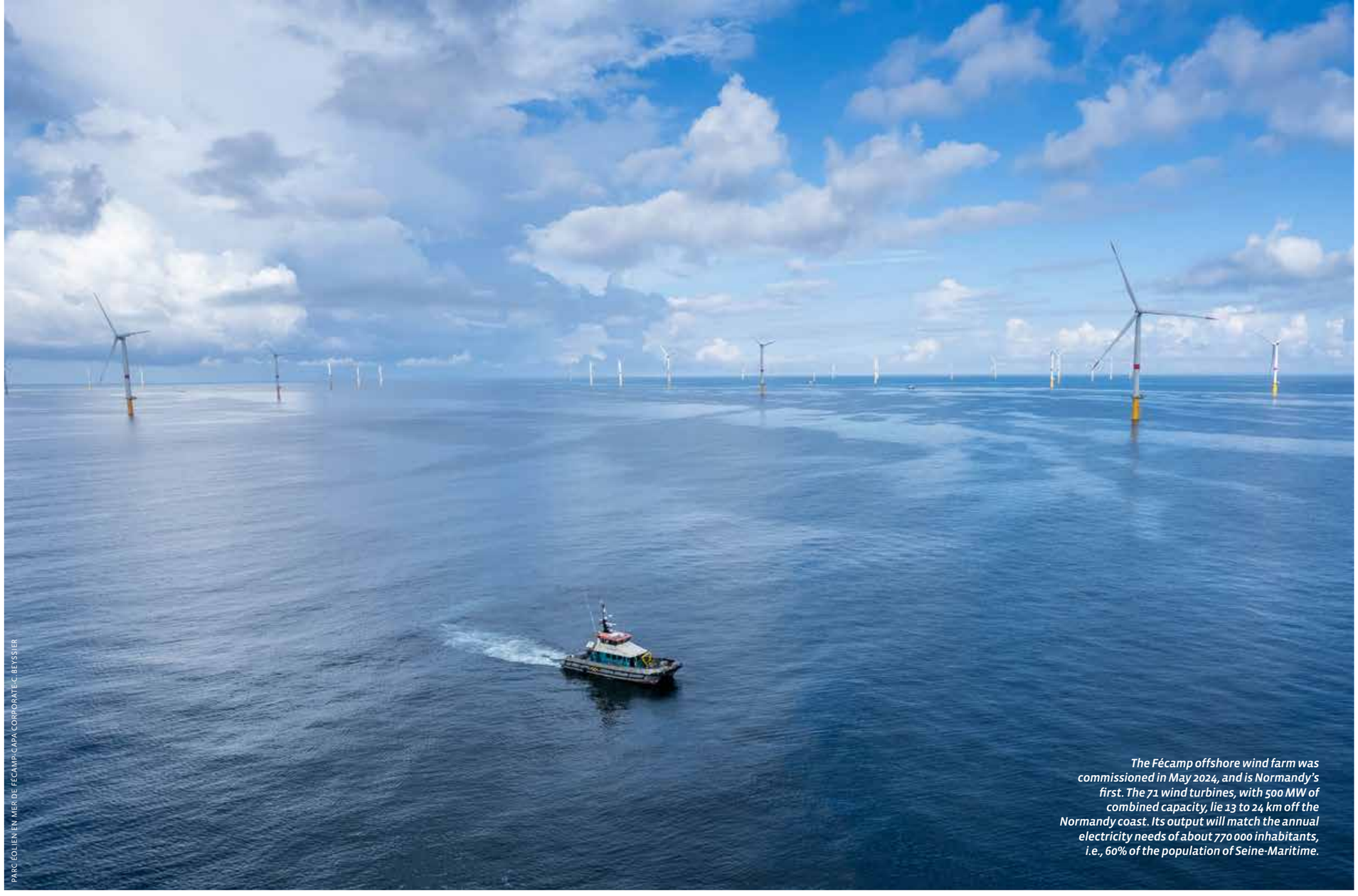
| | 2023 | Of which Offshore | 2024 | Of which Offshore |
|---|---|---|---|---|
| Germany | 141.764 | 23.887 | 138.859 | 26.082 |
| Spain | 64.275 | 0.006 | 62.444 | 0.001 |
| France | 50.479 | 1.914 | 44.853 | 4.015 |
| Sweden | 34.245 | 0.549 | 41.467 | 0.644 |
| Netherlands | 29.525 | 11.712 | 33.368 | 15.488 |
| Poland | 24.176 | 0.000 | 25.498 | 0.000 |
| Italy | 23.640 | 0.054 | 22.317 | 0.051 |
| Finland | 15.043 | 0.243 | 20.648 | 0.258 |
| Denmark | 19.434 | 8.573 | 20.553 | 9.732 |
| Portugal | 13.145 | 0.079 | 14.451 | 0.087 |
| Belgium | 15.444 | 8.040 | 13.302 | 7.196 |
| Greece | 11.022 | 0.000 | 12.136 | 0.000 |
| Ireland | 11.863 | 0.000 | 11.583 | 0.000 |
| Austria | 8.037 | 0.000 | 9.197 | 0.000 |
| Romania | 7.548 | 0.000 | 6.359 | 0.000 |
| Lithuania | 2.536 | 0.000 | 3.491 | 0.000 |
| Croatia | 2.587 | 0.000 | 2.597 | 0.000 |
| Bulgaria | 1.584 | 0.000 | 1.500 | 0.000 |
| Estonia | 0.683 | 0.000 | 1.164 | 0.000 |
| Czechia | 0.702 | 0.000 | 0.705 | 0.000 |
| Hungary | 0.646 | 0.000 | 0.610 | 0.000 |
| Luxembourg | 0.495 | 0.000 | 0.470 | 0.000 |
| Latvia | 0.271 | 0.000 | 0.273 | 0.000 |
| Cyprus | 0.208 | 0.000 | 0.210 | 0.000 |
| Slovenia | 0.006 | 0.000 | 0.006 | 0.000 |
| Slovakia | 0.004 | 0.000 | 0.004 | 0.000 |
| Malta | 0.000 | 0.000 | 0.000 | 0.000 |
| Total EU 27 | 479.363 | 55.056 | 488.064 | 63.553 |

** Estimation.* ***Source : EurObserv'ER 2025.***

has been postponed until early 2026, because of delays in connecting the offshore and onshore grids together. In July 2023, a final investment decision was taken on the EnBW He Dreiht (960-MW) Wind Farm whose construction kicked off in 2024. It is due to start up in 2025. Incidentally, the connection capacities of Borkum Riffgrund 3 and EnBW He Dreiht, are each restricted to 900 MW, which is a little less than the nominal capacity of the wind turbines being installed. The Deutsche Windguard annual report on Germany's offshore wind power confirms that 81 offshore wind turbines, with a total 936 MW of capacity were installed in 2024 but await grid connection. Germany also has 66 turbine-ready foundations, and has another four sites affected by grid connection works that must be completed before a further six wind farms can be built: Nordlicht 1 (1 020 MW), Nordlicht 2 (660 MW), NC3 (420 MW), NC4 (480 MW), Waterkant (296 MW) in the North Sea and Windanker (315 MW) in the Baltic Sea.

The Danish Energy Authority statistics confirm that Denmark's Vesterhav Nord Wind Farm (176.4 MW), equipped with 21 Siemens Gamesa 8.0-167 DD turbines (uprated to 8.4 MW) was installed at the end of 2023, and connected to the grid at the start of 2024.

The entire capacity of France's Fécamp (497 MW) and Saint-Brieuc (497 MW) wind farms was officially recorded in 2023, although installation work on the last wind turbines continued through the first months of 2024. The Fécamp Wind Farm was fully commissioned in May 2024 (the last turbine was installed in April 2024). The 71 Siemens Gamesa (SWT-7.0-154) 7 MW wind turbines lie 13 and 24 km off the Normandy coast and will produce enough to match the annual electricity needs of about 770 000 inhabitants, i.e., 60% of the population of Seine-Maritime. Full commissioning of the Saint-Brieuc Wind Farm was completed on 28 May 2024. Only the Provence Grand Large (25 MW) floating offshore wind farm project, which generated its first electrons at the very end of the year was officially included in the 2024 accounts. The turbines of the Golfe du Lion (30-MW) floating wind farm should be installed during the summer of 2025 and commissioned at the end of the year. The same goes for the Eolmed (30-MW) Wind Farm at Gruissan. Another three French offshore wind farms whose foundations have been laid are under construction. If all goes well, the offshore wind farm off the islands of Yeu and Noirmoutier (488 MW) should come on stream at the end of 2025. The Courseulles-sur-Mer (448-MW) Wind Farm off the Normandy coast has been delayed slightly by difficulties drilling the wind turbine foundations, its commissioning could be postponed to 2026. The Dieppe-Le Tréport (496 MW) Wind Farm should also be commissioned in 2026.



PARC ÉOLIEN EN MER DE FÉCAMP-CAPA CORPORATE-C. BEYSSIER

*The Fécamp offshore wind farm was commissioned in May 2024, and is Normandy's first. The 71 wind turbines, with 500 MW of combined capacity, lie 13 to 24 km off the Normandy coast. Its output will match the annual electricity needs of about 770 000 inhabitants, i.e., 60% of the population of Seine-Maritime.*

## SIGHTS SET ON 500 TWH

Wind power's main achievement in 2023 was to overtake European Union-wide gas-fired power plant output for the first time. In 2024, wind energy will consolidate its place as the No. 2 electricity producer sector behind nuclear power. According to the preliminary data from the Ember think tank published at the end of January 2025, output from the EU's gas-fired power plants is set to decline (and more to the point, for the fifth year running). It is expected to have fallen by about 5.6% between 2023 and 2024.

First available official estimates indicate that EU gross wind power output increased slightly, by about 1.8% YoY to 488.1 TWh (from 479.4 TWh in 2023). This weak growth can be blamed on generally poorer wind conditions across the European Union, despite the increase in installed capacity. Wind deficits were recorded in particular in France, Belgium, Germany, Italy and Spain, offset by stronger winds in Northern Europe.

Offshore wind power output increased faster (by 15.4% YoY) to 63.6 TWh. This improvement can be ascribed to better wind conditions in the North Sea and also the fast pace of offshore wind farm commissioning in the second half of 2023 (Hollandse Kust Noord 5, Hollandse Kust Zuid, Arcadis Ost 1 and Vesterhav Syd) and early 2024 (Vesterhav Nord).

Looking at the detail, some ten countries, including the top three wind power producers (Germany, Spain and France) logged falling output between 2023 and 2024. With 11.1% and 13.9% falls between them, France and Belgium were amongst the most badly affected countries. As for the other major producers, Italy registered a 5.6% fall in wind power output. Germany (2%) and Spain (2.8%) reported smaller falls. In contrast, significant increases were chalked up by Lithuania (37.7%), Estonia (70.4%), Finland (37.3%), Sweden (21.1%), the Netherlands (13%) and Austria (14.4%).

## *NEWS FROM AROUND THE MAIN EUROPEAN MARKETS*

### RECORD VOLUMES TENDERED IN GERMANY

Germany was the unchallenged European wind power market leader in 2024. AGEE-Stat confirms the installation of at least 4 052 MW of capacity during the course of the year, divided between 3 310 MW for onshore and 742 MW for offshore. When decommissioned capacity is subtracted (715 MW in 2024), the country's total capacity resolves to 72 786 MW (including 9 215 MW offshore). While connected capacity was higher than the previous year (3.8 GW), the connection of two new offshore wind farms (see above) is responsible, as the amount of onshore capacity connected slipped a little on the previous year's total (3.3 GW compared to 3.6 GW). WindEurope puts part of this slippage down to logistics issues. The construction of some wind farms was effectively delayed by the partial closure of the A27 motorway, a vital link for routing wind turbine blades entering the port of Cuxhaven in north-west Germany.

Yet, the 2024 publication of the results of a new set of tenders for a combined capacity of about twenty GW (11 GW onshore and 8 GW offshore) gives a firm basis to the political will to accelerate wind power development. Four tenders for a declared capacity of 12 GW were launched in 2024 by the Federal Network Agency for onshore wind power projects (with respective final bidding dates of February, May, August and November), via a guaranteed floating feed-in premium. The first two were undersubscribed and the last two oversubscribed. In the end, a volume of 11 GW was allocated. The maximum admissible value for the four was set at 7.35 euro cents per kWh with an average attributed value of 7.34 euro cents per kWh for the first, 7.33 euro cents per kWh for the second and third and 7.15 euro cents per kWh for the last tender. The Federal Network Agency (Bundesnetzagentur) also organized two offshore tenders. The first, presented in June 2024, covered the N-11.2 and N-11.3 locations for combined capacity of 2.5 GW. During the tendering process, several bidders presented 0 euro cent per MWh offers. Hence, no financing for production was requested. A dynamic tendering procedure had to be launched to separate the bidders most willing to pay for operating the sites. At the end of the day, the auction for site N-11.2 was won by Total Energies for the sum of 1 305 million euros per MW. EnBW won the right to run the second site N-13.3, through its 1 065 million euros per MW bid. These amounts will be paid during the operating period. The second tender was launched in August 2024 and covered three pre-investigated 3 sites (N-9.1, N-9.2 and N-9.3) for combined capacity of 5.5 GW. RWE won the first two and Luxcara the third. However, the amounts paid by the successful bidders have not been disclosed.

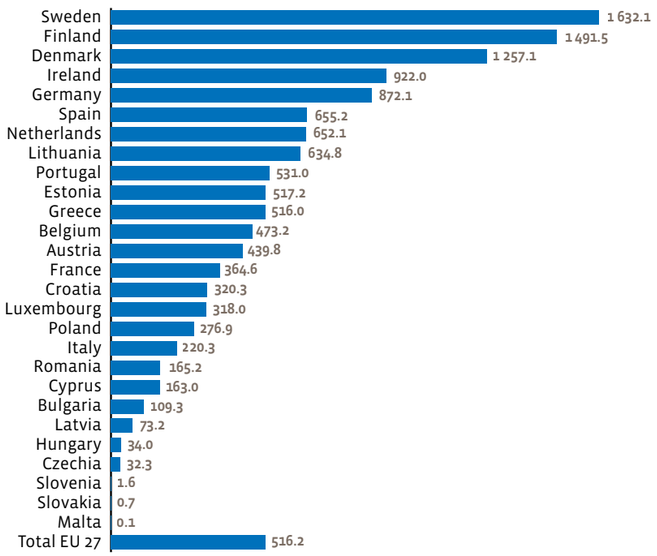
### FRANCE HAS THE EUROPEAN FLOATING WIND POWER LEADERSHIP IN ITS SIGHTS

According to the Service des données et études statistiques (SDES), France added 1 158 MW of capacity in 2024 including 25 MW offshore. If we subtract decommissioned capacity, France had 24 966 MW of capacity at the end of 2024 including 1 508 MW offshore and so moved to third place in the European Union rankings behind Germany and Spain.

While France has jumped into the offshore wind power segment with both feet, with a fine run of offshore wind farm connections – Saint-Nazaire, Fécamp, Saint-Brieuc and Provence Grand Large, it hopes to lead the European floating wind power segment. By the end of the year, it should have three floating wind farms with combined capacity of 85.2 MW in service and has confirmed the construction of two commercial-size projects with combined capacity of 500 MW. At the very end of 2024, the French Government selected the two successful bidders for the Narbonnaise 1 and Golfe de Fos 1 (AO 6) floating wind farms, each with 250 MW of capacity. The Narbonnaise 1 project was clinched by the Ocean Winds and Eolien en Mer Participation JV. The site will be located more than 25 km off the coastline between Agde (Herault) and Port la Nouvelle (Aude). The company Eoliennes Méditerranée Grand Large, which has EDF Renewables and Maple Power as shareholders, was awarded the Golfe de Fos 1 project. This zone is

## Graph No. 2

Wind power capacity per 1 000 inhabitants in the EU in 2024* (kW/1 000 inhab.)

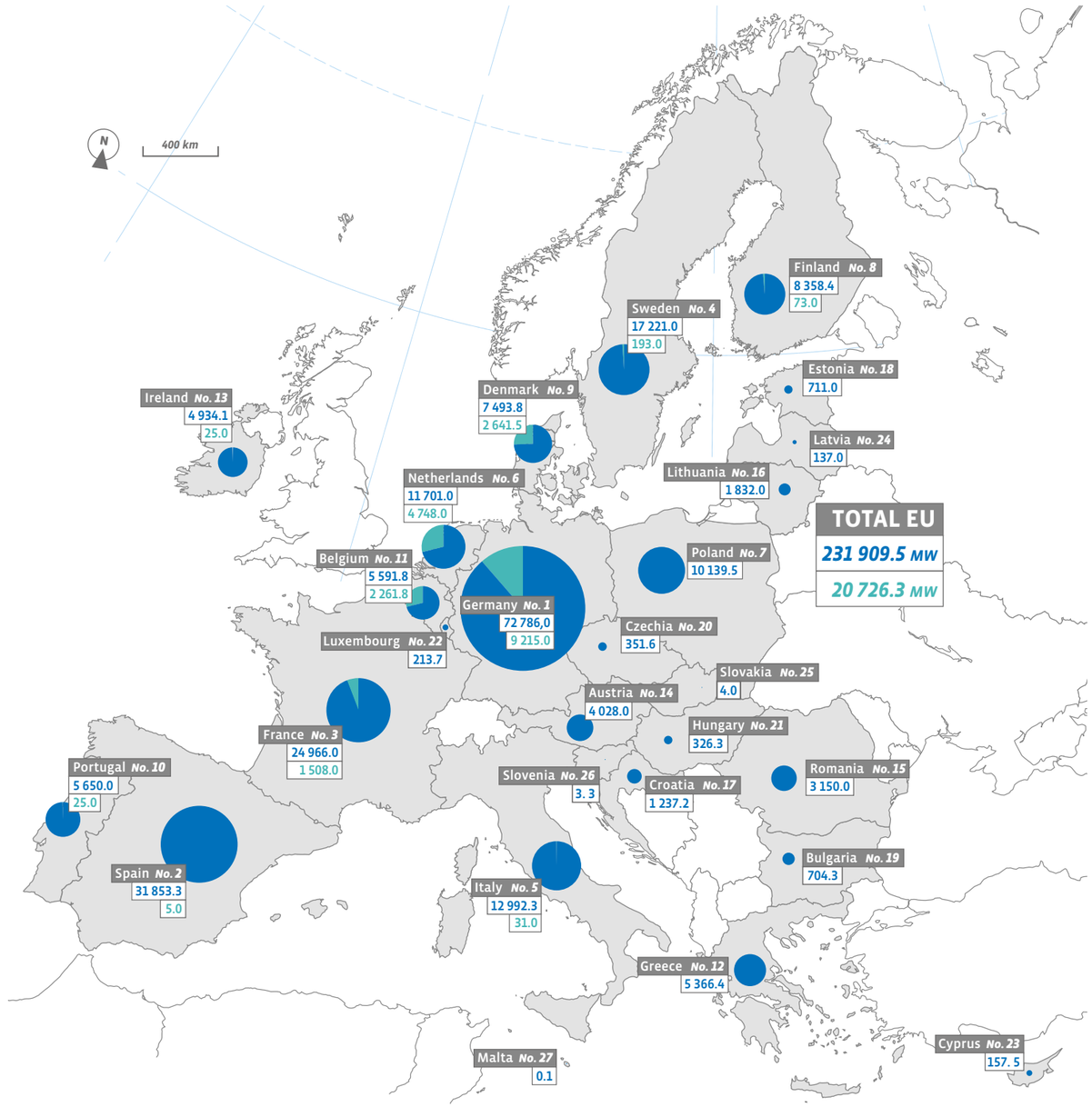



** Estimation.* ***Source: EurObserv'ER 2025***





Wind power capacity installed* in the European Union at the end of 2024** (MW)




**Key**

231 909.5 Total wind power capacity* (onshore and offshore) at the end of 2024** (in MW)

20 726.3 of which offshore wind power capacity at the end of 2024 (in MW)

**Net maximum electrical capacity. **Estimate.* ***Source: EurObserv'ER 2025.***

more than 25 km off the Fos-sur-Mer coast (Bouches-du-Rhône). Each 250-MW wind farm will produce enough electricity for 450 000 consumers. The purchase tariff agreed for Narbonnaise 1 is € 92.70/MWh and that of Golfe de Fos 1 is € 85.90/MWh. The Ministry for Industry and Energy communiqué issued on 27 December, declares that this decision is a further step towards achieving 18 GW of offshore wind power in service by 2035 and 45 GW by 2050. The allocation of these two Mediterranean Sea projects raises the combined capacity of projects in service, under construction or being developed along the French coastlines to almost 5.3 GW. Three months earlier, following the CRE ruling of 19 September 2024, Eolink, the France Atlantique project lead, submitted the winning proposal. It is a demonstration project that comprises a 5-MW floating wind turbine – a single aerogenerator with a four-mast pyramid structure. The demonstrator will be installed on the SEM-REV sea testing site off the Croisic coast (Loire-Atlantique) and is due to be commissioned in Q2 of 2026. The project will benefit from an eight-year purchase obligation contract, with an initial Feed-in tariff of € 170/MWh (when the contract comes into force). It will be the biggest floating wind turbine installed off the French Atlantic coast and will produce about 14 GWh per annum, which should cover the electricity consumption of about 6 500 individuals.

### THE NETHERLANDS AIMS FOR 21 GW OFFSHORE BY 2032

The Netherlands was once again the most active EU country in the offshore wind power segment. According to Statistics Netherlands, 770.5 MW of capacity was connected in 2024, taking the country's offshore wind capacity to 4 748 MW, i.e., just over 40% of the country's installed wind capacity. The country has thereby consolidated its second place ranking behind Germany for wind capacity and widened its lead over Denmark. The Hollandse Kust (West) VI and Hollandse Kust (West) VII projects will be the next offshore wind farms to be connected to the grid in 2026 and 2027. The relevant project tenders were launched in 2022. In February 2024, another tender was launched for the offshore wind farm sites named IJmuiden Ver Alpha and Beta (2 GW each) with commissioning due in 2029. Incidentally, in 2022, the Dutch government designated three new zones (Nederwiek, Lagelander and Doordewind) and confirmed two previously designated North Sea zones (to the north of IJmuiden Ver and the south of Hollandse Kust West) for the development of offshore wind farms with combined capacity of 10.7 GW. In April 2024, the Dutch government refined its offshore wind power roadmap indicating that the capacity figure of 21 GW will be reached by the end of 2032, a year later than planned, to allow for grid connection delays and supply chain pressures. More precisely, the scheduled start-up of the 2-GW wind farm built on the Doordewind I site was changed from 2031 to Q4 of 2032. The Nederwiek Noord II Wind Farm start up due in 2030, has been postponed to Q2 of 2032.

The year 2024 marks a milestone for the Netherlands, as for the first time, renewable electricity output (non normalized) accounted for the majority of its electricity consumption. Statistics Netherlands put the RES share at 52.1% in 2024 (compared to 49.9% in 2023). Wind energy in 2024 accounted for 28% of its total electricity output (15% onshore and

## Table No. 3

Examples of European wind farm developpers and operators in 2024

| | Country | Wind capacity operated in 2024* |
|---|---|---|
| Iberdrola | Spain | 20 747 MW onshore<br>2 373 MW offshore |
| Enel | Italy | 15 739 MW (3 771 MW in Europe) |
| EDP renewables | Portugal | 12 879 MW onshore (4 872 MW in Europe)<br>660 MW offshore** (660 MW in Europe) |
| ENGIE | France | Capacity installed: 15 924 MW<br>onshore (6 971 MW in Europe) and 1 906 MW<br>offshore (1 906 MW in Europe) |
| Orsted | Denmark | 3 676 MW onshore (461 MW in Europe)<br>9 443 MW offshore (8 366 MW in Europe) |
| RWE | Germany | 9 994 MW onshore (4 143 MW in Europe)<br>5 775 MW offshore (5 775 MW in Europe) |
| ACCIONA | Spain | 10 411 MW (5 109 MW in Europe) |
| EDF renewables | France | 8 373 MW*** |
| Vattenfall | Sweden | 1 978 MW onshore<br>4 454 MW offshore |
| TotalEnergies | France | 6 GW onshore (1,8 GW in Europe)<br>1,7 GW offshore (1,1 GW in Europe) |

** Global activities. ** Not including the 2,344 MW of offshore wind assets held in 2024 by Ocean Winds, a joint-venture owned equally by Engie and EDP Renewables. *** 2023 data net capacity*
***Source: EurObserv'ER 2025 based on diverse sources (2024 annual reports, corporate websites).***

*In September 2023, Germany's Karstädt-Waterloo Wind Farm, underwent a repowering operation which reduced the number of wind turbines from 20 to 7. As a result, the wind farm's energy output has increased fourfold, and its total capacity has been raised to 43.4 MW from the previous 26 MW.*

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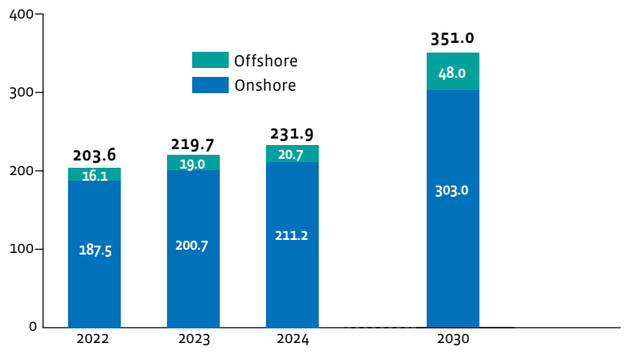
13% offshore) up from 25.5% in 2023 (15.4% onshore and 10% offshore), ahead of solar photovoltaic at 18.2% (16.9% in 2023) and biomass at 5.7% (6.6% in 2023). Gross wind power output has risen sharply, just like installed capacity... by 13% between 2023 and 2024 to 33.4 TWh including 15.5 TWh offshore.

## 26.9 BILLION EUROS OF INVESTMENT IN 2024 IN THE EU

The wind energy sector requires heavy investments. According to WindEurope estimates provided in its annual statistics report, 33 billion euros were invested in wind farms across Europe and financed 19.9 GW of capacity. The 2016 investment record for funding onshore wind energy was broken when 24.7 billion euros were invested in 17.3 GW of capacity, and 7.9 billion euros were devoted to funding 2.6 GW of offshore capacity. The European Union concentrated most of the investments, about 19 billion euros in onshore (13.1 GW of new onshore projects) and devoted a total of 7.9 billion euros to offshore projects. Three German wind farms (Nordseecluster A&B and Windanker) and a Dutch wind farm (Oranjewind) will absorb the funding for the 2.6 GW offshore capacity figure. Oranjewind, sited about 53 kilometres off the IJmuiden coast will have 795 MW of installed capacity and 760 MW of grid connection capacity. Wind turbine installation works should start early in 2027, and commissioning should be fully completed by the end of the same year.
WindEurope points out that the annual investment volume in offshore wind power may vary wildly from one year to the next because the size of these projects often runs to the GW scale, and because very few final investment decisions are made on such projects in any year.
WindEurope indicates that the sector has to deal with many issues that affect investment levels, such as rising costs, long-winded authorization procedures, not particularly well-designed auction mechanisms and competition in the global supply chain. Furthermore, the sector plans to take up the supply chain challenge by reaffirming its intention to invest at least 11 billion euros to expand its nacelle, blade, pylon, foundation, cable, substation and other grid component manufacturing facilities significantly, as well as port infrastructures and vessels for offshore wind power.
The financial position of Europe's wind turbine manufacturers, that are active international market players, is improving even though the geopolitical context is becoming increasingly uncertain – a situation marked by the strong resurgence of nationalism and protectionism, with an impact on trade and logistics flows. Vestas, in its annual report, states that the group's financial progress in 2024 was made possible by prioritizing value over volumes, with a focus on quality, be it on onshore, offshore or its services. The group also strengthened its position in the offshore segment primarily through the first deliveries of the V236-15 MW in 2025, Vestas' brand new generation of offshore turbines. According to the group's annual report, most of the offshore wind turbine order book, for 7.5 GW in 2024 (compared to 4.3 GW in 2023), was for the V236. Germany's He Dreiht and Poland's Baltic Power projects are the first two projects to be equipped with this machine and will take deliveries in 2025 and 2026. The onshore wind turbine order book has stabilized at 11.5 GW (11.7 GW in 2023). The group's revenue increased from 15.4 bn euros in 2023 to 17.3 bn euros in 2024, the onshore wind power share rose from 10.7 to 11.8 bn euros, and the offshore wind power share rose from 1.1 to 1.8 bn euros, while the services share rose from 3.6 to 3.7 bn euros. The group's profitability increased with a 4.3% EBIT margin compared to 1.5% in 2023. EBIT (Earnings Before Interest and Taxes) measures the economic performance of an enterprise prior to the levying of financial charges and corporation tax. The group forecasts 2025 revenues of 18–29 billion euros and a 4.3% EBIT. It views the global outlook for wind power as positive with annual growth rates (excluding China) of 7–9% for the onshore and 20–25% for the offshore segments through to 2030.
Following the buyout of the minority shareholders' shares in 2023, Siemens Gamesa is now fully integrated into the Siemens Energy group. At the end of the transaction, Siemens Energy will have invested a total of 4.05 bn euros to acquire all the shares it did not previously hold. The world leader continues to work on restructuring its wind power activity and predicts a return to breakeven point in this segment by 2026. This restructuring follows quality issues that emerged in the onshore business in the previous financial year. The group has declared that over the last financial year it significantly improved its productivity relating to capacity build-up in its offshore business. It is currently working on extending its French blade manufacturing facility at Le Havre, one of France's biggest renewable energy industrial projects, which will absorb about 200 million euros of investment. The extension work should be completed in 2026, with increased production capacity. This extension will enable the manufacturer to produce 115 meter-long blades to equip its 236 meter rotors such as its new SG 14-236 DD model, a wind turbine with 14 MW of nominal capacity capable of delivering up to 15 MW with its Power Boost function. According to the Wemake consultancy, and based on a count made in November 2024, this machine is already a commercial success with more than 8 GW of firm orders and over 11 GW if conditional orders and those announced by developers as preferred turbines are added. Economies of scale will be fully realized thanks to its large order volumes for a limited number of models.

## Graph No. 3

**EurObserv'ER projection of the evolution of wind power net capacity in the EU 27 (in GW)**




*Note: Data is rounded to the nearest decimal.* ***Source: EurObserv'ER 2024***

## THE 2030 SCENARIO IS LOOKING CLEARER

Capacity projections to 2030 in the European Union are becoming clearer in the light of wind power project development times. WindEurope forecasts an installation figure of about 140 GW across the European Union (187 GW in Europe) over the five-year period from 2025, i.e., an average of 23 GW per annum. Of this total, 81% of the European Union's new installations will be in the onshore segment (75% across Europe). This capacity should at best raise the European Union's wind capacity to 351 GW by 2030, which falls somewhat short of the 425 GW target that WindEurope claims would enable the 42.5% renewable energy target to be achieved by 2030.
Europe's wind power sector will be able to count on the European Commission's new competitivity and decarbonization plan to accompany this development, through the Clean Industrial Deal officially launched on 25 February 2025. The agreement presents a raft of measures that aim to stimulate each step of European industrial production prioritizing the clean energies sector. One of the main elements of this Clean Industrial Deal, is the provision of affordable energy as a pillar of industrial competitivity. The European Commission adopted the Action Plan for Affordable Energy to expedite the deployment of clean energies and accelerate electrification, enhance the internal energy market using physical interconnections, use energy more efficiently and reduce reliance on imported fossil fuels, to reduce the energy bill of industries, enterprises and households, while advancing the transition to a low-carbon economy. The European Commission claims that the Clean Industrial Deal will mobilize over 100 billion euros to support clean manufacturing in the EU. Specifically, it will aim to adopt a new framework to fast-track the approval of State aid to deploy renewable energies, decarbonize industry and guarantee adequate clean technology production capacity. It plans to create an Industrial Decarbonization Bank that will draw on funding available from the Innovation Fund, additional revenue from the emission trading system (EU ETS) as well as the revised InvestEU, to increase financial guarantee amounts to underpin investments in clean technology deployment, clean mobility and waste reduction. The deal also aims to ensure that the EU's industry is economically sound and resilient, to deal with global competition and geopolitical uncertainties, through a set of trade defence measures, and it also aims to simplify and strengthen the Carbon Border Adjustment Mechanism (CBAM), the EU tool to put a fair price on the carbon emitted during the production of carbon intensive goods. □

*Sources: BA and AGEE-Stat (Germany), Ministry for the Ecological Transition and the Demographic challenge (Spain), SDES (France), RTE (France), Terna (Italy), Statistics Netherland, ENS (Denmark), ARE (Poland), DGEG (Portugal), SPF Economie (Belgium), CRES (Greece), EIRGRID (Ireland), Statistics Austria, Statistics Finland, Statistics Sweden, Hops (Croatia), Litgrid (Lithuania), Ministry of Industry and Trade (Czechia), MAVIR (Hungary), STATEC (Luxembourg), INSSEE (Romania), Elering (Estonia), AST (Latvia), NSO (Malta), WindEurope.*

***The next barometer will cover photovoltaics.***

*Funded by the* European Commission

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