Report 2022

European Commission and WindEurope

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In 2022, 16 GW of new wind capacity was installed, constituting a 40% increase compared to 2021 installations. Despite challenges affecting the economic environment and supply chain, this was a record year for installations in the EU.

The level of new deployment in 2023 is expected to be similar to 2022. After 2023, the momentum is expected to increase even further, averaging 20 GW of new capacity annually over the next five years. However, a more significant escalation in installations is essential to reach the EU energy and climate goals.

The electrification of industry, transport, and construction sectors creates demand for additional renewable power capacity. Government-backed revenue stabilisation mechanisms are still the preferred support scheme for the industry, but corporate renewable PPAs continue to play a growing role in financing wind energy projects.

The European Commission supports wind energy research and development via Horizon Europe, the EU research and innovation framework programme and its predecessors, Horizon 2020, and Framework

Table 1. Key National Statistics 2022: EU-27

Total (net) installed wind power capacity	204 GW
Total offshore capacity	18 GW
New wind power capacity installed	16 GW
Decommissioned capacity (in 2022)	0.5 GW
Total electrical energy output from wind	412 TWh
Wind-generated electricity as percent of national electricity demand	16%
Average national capacity factor	23% onshore / 35% offshore
Target	42.5% RES in final energy demand by 2030
National wind energy R&D budget	N/A

Programme 7 (FP7). In 2022, 67.7 million EUR (71.3 million USD) were invested in new research and development for wind energy-related projects.

Highlight(s)

- Installations totalled a record 16 GW in the EU-27 in 2022, up by 40% compared to 2021.
- Installed wind power capacity in the EU now stands at 204 GW, of which 188 GW are onshore and 16 GW are offshore.
- 87% of new installations were onshore, with Germany leading the way with 2.7 GW.

Market Development

Targets and Policy

The Russian invasion of Ukraine highlighted Europe's dependency on Russian fossil fuel imports and transformed the narrative on energy policy. In response, the European Commission issued the so-called REPowerEU Plan, which aims to reduce dependence on Russian fossil fuel imports. One initiative aims to streamline permitting processes with the purpose of fast-tracking renewable energy deployment.

In March 2023, the European Parliament and Council reached a consensus on an amendment regarding the Renewable Energy Directive. Their agreement sets a new ambitious target where renewable energy must account for a 42.5% share of energy demand. This marks a significant increase from the initial goal of 32%.

In addition to the REPowerEU Plan, the EU agreed to emergency measures that fast-track permitting for renewables in December 2022. Significantly, the agreement from Member States that renewables are of overriding public interest. This should allow Member States to fast-track permitting of renewables while ensuring a good working balance with other societal interests, such as biodiversity protection. The emergency measures will remain in place until the revised Renewable Energy Directive is transposed into national legislation.

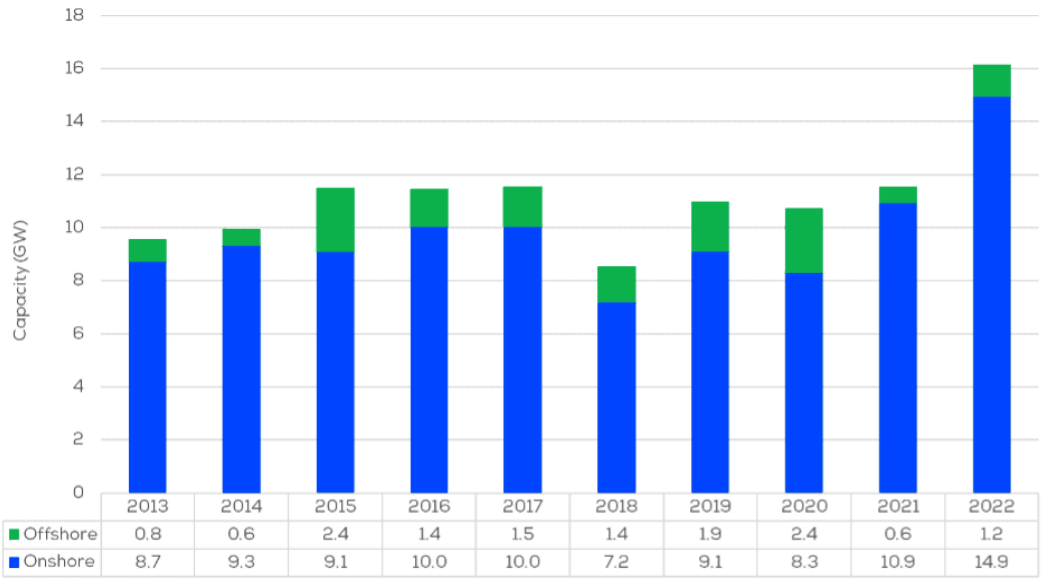
National Governments have accordingly increased their targets for wind energy deployment. The new EU commitment now strives to install 420 GW by 2030. WindEurope estimates that these commitments will be sufficient to reach the EU's target share of renewable energy of 42.5%.

Progress and Operational Details

In 2022, the EU-27 installed 16 GW of capacity, split between 15 GW onshore and 1 GW offshore. Now, 204 GW of installed power capacity, 188 GW onshore and 16 GW offshore, contributes to the European electricity demand. Furthermore, 454 MW of old onshore wind farm capacity was decommissioned.

Germany had the highest new capacity installed in 2022, with 2.7 GW, followed by Finland, France, Sweden, and Spain.

In 2022, wind energy generated 412 TWh, which was a 9% increase in production within the EU-27. This was primarily attributed to significant installations in Sweden and Finland and favourable wind conditions in Northern Europe. This coincided with a decrease in energy demand, likely due to rising electricity prices



	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Offshore	0.8	0.6	2.4	1.4	1.5	1.4	1.9	2.4	0.6	1.2
Onshore	8.7	9.3	9.1	10.0	10.0	7.2	9.1	8.3	10.9	14.9

Figure 1: New onshore and offshore wind power installations in the EU-27.

and governmental interventions to curtail consumption. As a result, wind energy supplied 16% of the EU-27 energy demand, an increase of 2% from 2021.

On average, the capacity factor for the EU-27 wind fleet was 24%. Specifically, the capacity factor for onshore wind was 23%, up from 22% in 2021. Offshore wind constituted 35%, also increasing by 1% compared to the previous year. It is worth noting the fleet-wide capacity factor numbers are lower when compared to new wind farms. This is because the performance is representative of the entire wind fleet, which includes very old installations.

In 2022, the average power rating of onshore turbines installed across Europe remained at the same value as in 2021, with 4.1 MW. Similarly, the average rated capacity of newly installed offshore turbines was the same level as in 2021, standing at 8 MW. Based on disclosed wind turbine orders, the average power rating of onshore turbines ordered in 2022 was 5.1 MW. For offshore turbines, this figure reached 12.2 MW. As these turbines are installed over the next few years, the trend of increasing power ratings for installed turbines is anticipated to continue.

Project acquisitions, where investors acquire shares in wind energy projects, reached an all-time high in 2022, with more than 22 GW changing ownership. The record marked close to a 30% increase compared to 2021, predominantly driven by the acquisition of projects in the early stages of development. This trend in investors acquiring early-stage projects may indicate a strategy to boost returns in a competitive field by taking on more early-stage risk or by gaining a greater market share. Regardless, investors have had to become more sophisticated to enter projects at earlier stages.

Matters Affecting Growth and Work to Remove Barriers

Over the next five years, the build-out rate of wind energy is expected to increase. New wind energy installations are expected to average 20 GW a year. However, this pace may still fall short of the rate required to meet the 2030 climate and energy targets.

Permitting bottlenecks remain the most significant barrier to the expansion of wind energy. Governments are now actively addressing these, and the introduction of the new REPowerEU regulations is expected to help.

In 2022, investment in new wind farms in the EU fell to 15 billion EUR (15.8 billion USD), down by almost half of the investments made in 2021. These investments cover 11 GW of new capacity that will be built in 2023 and beyond. High inflation, rising interest rates, and increased risk margins have worsened financing conditions. Although national governments introduced emergency measures to protect consumers from soaring energy prices, many inadvertently undermined generator revenues. The mismatched coordination of measures led to a patchwork of different market interventions. This created uncertainty and affected investor confidence.

In February 2023, the European Commission adopted The Green Deal Industrial Plan to enhance the competitiveness of Europe's net-zero industry and accelerate the transition to climate neutrality. A pillar of the Plan is about the regulatory environment. Three main initiatives have been adopted in this area: First, a

reform of the EU's internal electricity market and emergency market interventions. Second, a Net-Zero Industry Act identifies goals for net-zero industrial capacity and provides a regulatory framework suited for its quick deployment. Finally, the Critical Raw Materials Act ensures sufficient access to materials, such as rare minerals, that are vital for manufacturing key technologies. It is critical for investor confidence that regulatory certainty is restored, and a unified market fit for renewables investment is introduced as soon as possible.

Finally, supply chain bottlenecks still need to be addressed. However, increased costs of raw materials and energy have increased project expenses. This resulted in several wind energy auctions being undersubscribed, as their respective bid price ceilings were too low to cover the additional costs, making projects uneconomical. Given the impact of inflation, Government support (which the electricity market reform proposes should be in the form of 2-sided Contracts-for-Difference) must be fully indexed to inflation to protect developers and the supply chain from increasing project costs.

RD&D Activities

RD&D Priorities and Budget

Research funding in Europe's biggest research and innovation programme showed continued support for wind energy in the last year. Funding in 2022 increased in terms of the number of projects funded and in financial support, indicating a recovery to 2020 levels. The number of new wind energy projects increased from 11 to 15 in 2022 and cumulated investment granted to European wind energy projects doubled to 67.7 million EUR (71.4 million USD) compared to 2021 (30 million EUR; 31.6 million USD) (see Table 1), returning to 2020 levels.

Figure 2 shows the development of R&I funding in 2009 – 2022 under the Horizon Europe funding programme and its predecessors, FP7 and H2020. 29% of EC funding (19.5 million EUR (20.9 million USD)) was granted to wind energy projects starting in 2022, which focused on offshore wind technology research, followed by floating offshore (17.4%) and new materials and components (7%).

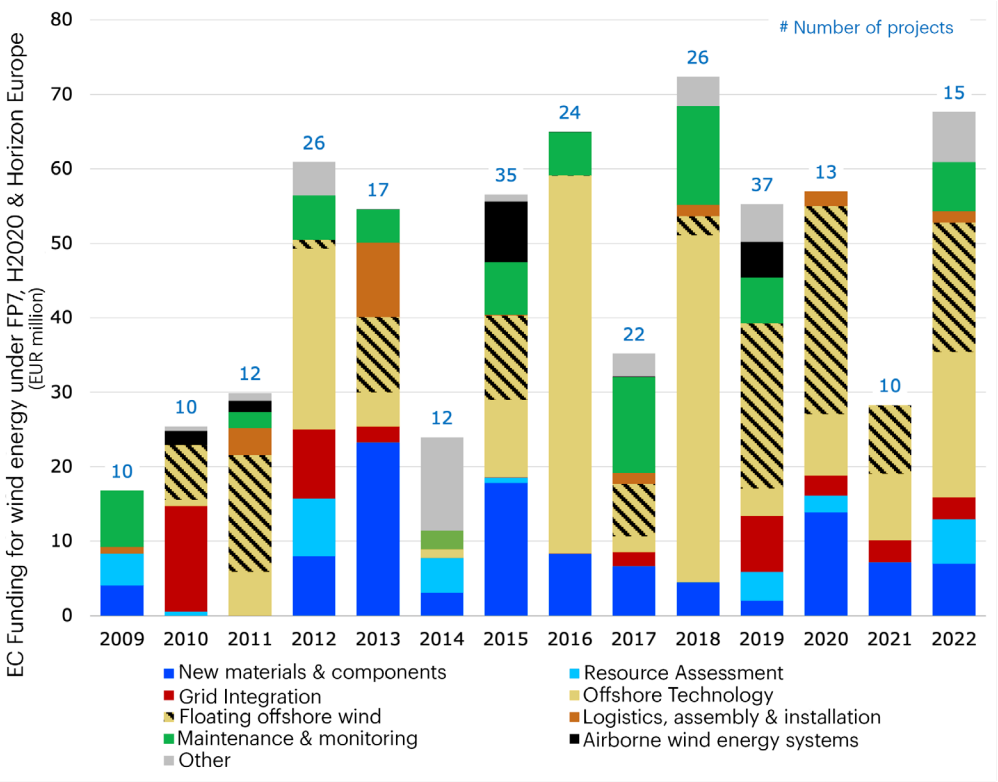


Figure 2: Evolution of EU R&I funding categorised by R&I priorities for wind energy under FP7 (2009-2013), H2020 (2014-2021) and Horizon Europe (2022) programmes and the number of projects funded in the period 2009-2022. Projects on wind energy and those with a significant wind energy component are accounted for (see Table 2). Note: The item "Other" includes projects exploring emerging technologies such as social acceptance and critical rare earth elements, among others. Funds granted refer to the start year of the project. *Source: JRC based in CORDIS, 2023.*

Table 2. Wind energy-specific funding under Horizon Europe granted to projects starting in 2022 ***Source: JRC based in CORDIS, 2023.***

Horizon Europe-funded projects	Total project cost Million EUR(Million USD)	EU contribution Million EUR(Million USD)	Number of projects
Wind-specific projects	67 (72)	60(64.6)	12
Non-wind specific projects	8(9)	7.7 (8.3)	2
Total funding for wind energy	75(81)	67.7(72.9)	15

Since 2009, FP7, H2020, and Horizon Europe have allocated substantial funding across all wind research R&I priorities with projects on offshore wind technology (186 million EUR; 196 million USD), floating offshore wind (132 million EUR; 139 million USD) and research on new materials and components (105 million EUR; 110 million USD) accumulating most of the funds (see Figure 3).

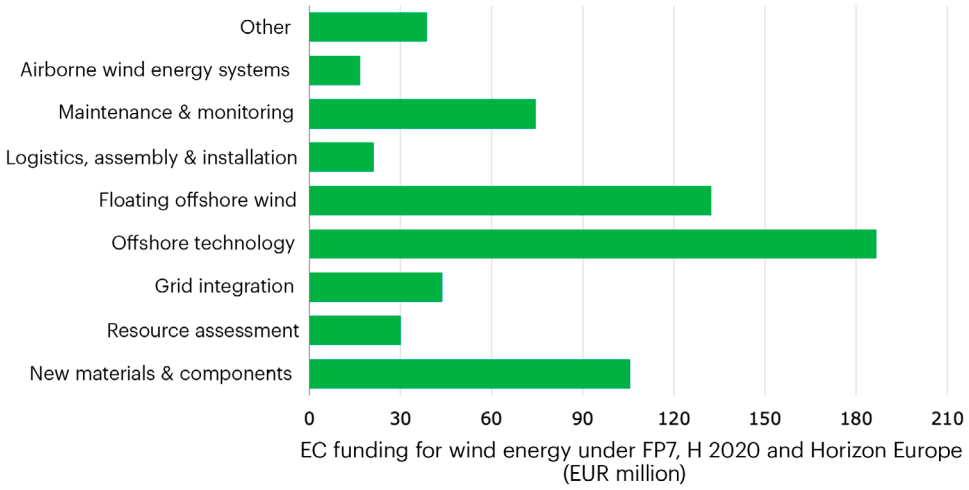


Figure 3: Share of wind energy funding under H2020 granted to projects completed in 2022 categorised by research area for wind energy. *Source: JRC based in CORDIS, 2023.*

Research Initiatives and Results

18 projects were scheduled to end in 2022, comprising a cumulated EC investment of 49.8 million EUR (53.4 million USD). 35% of EC funding addressed maintenance and monitoring, followed by floating technology (20%), new turbine materials and components (12%) and grid integration (8%) (see Figure 4).

The following selected projects exemplify the research progress made:

- The ROMEO project has developed a solution for monitoring the structural health of wind turbines using big data,

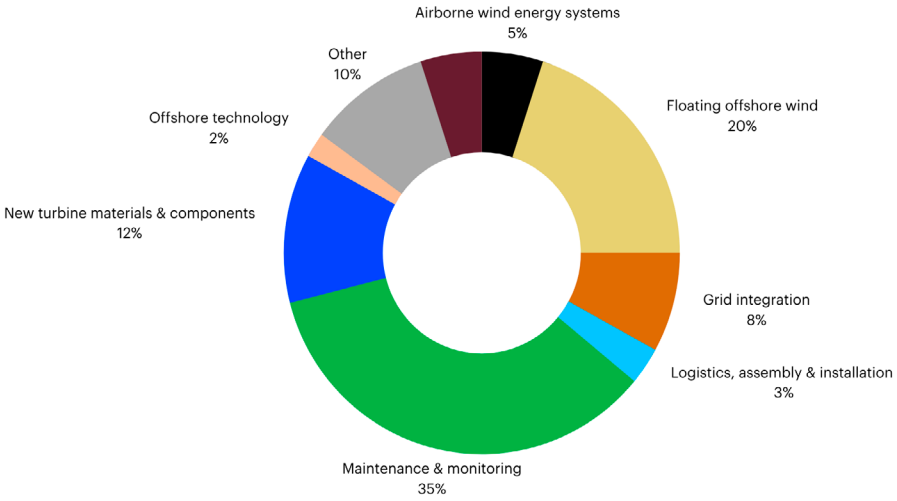


Figure 4: EC funding on wind energy R&I priorities in 2009 -2022 under FP7, H2020, and Horizon Europe. *Source: JRC based in CORDIS, 2023.*

machine learning and cloud-based analytics. Three pilot tests for the demonstration of the advances in the algorithms and architectures were carried out in the United Kingdom and Germany. The innovations cover a wide range of offshore wind applications, such as diagnosis and prognosis solutions, failure mode models, digital twins for asset management, data acquisition ecosystem and centralised O&M management. These innovations contribute to reducing costs and improving O&M of offshore wind [1].

- The FLOTANT project constructed and tested a hybrid concrete-plastic floating substructure that featured new composites, multistranded tethers, polymer springs, and lightweight power cables. During the lifetime of the project, the platform completed tests to validate its 1/50-scale prototype in the offshore basin of the Dutch MARIN research institute [2].

- The TotalControl project developed control tools to move from optimising individual wind turbine control to optimising the output of a wind power plant as a whole. Throughout the project, the plant control itself was improved, as well as the collaboration between individual wind turbines and plant control (production, load and O&M aspects) [3].

Selected examples of new R&I projects

- The NEXTFLOAT project (EU support: 15.9 million EUR; 17.1 million USD) aims to demonstrate a competitive, sustainable, and integrated floating offshore wind solution optimised for deep waters, and to accelerate the industrial-scale deployment of floating offshore wind. The integrated solution relies on X1 Wind's floating offshore wind technology, which is said to be a lighter floater design with a reduced steel requirement, as well as a more efficient and compact mooring system that minimises its impact on seabed [4].

- With a budget of around 15 million EUR (16.6 million USD), the INFINITE project aims to demonstrate a floating offshore wind system at 100m depth with two key technology innovations: an environmentally friendly concrete tension leg platform anchored with an innovative tendon-based mooring system and a dynamic aluminium cable design that is safer, lighter, cheaper, and allows for more standardisation in O&M [5].

- The MERIDIONAL project (EU support: 6 million EUR; 6.4 million USD) aims to produce a knowledge and data hub, as well as a toolchain that will be accessible to a range of users from industrial to academic sectors to improve wind farm design, performance assessment, and loading [6].

Impact of Wind Energy

The EU has been a worldwide leader in wind energy R&I since 2014. It currently hosts 38% of all innovation companies and the largest pool of start-ups and corporations. The European manufacturing supply chain is built mainly on companies from EU Member States. The EU's current manufacturing capabilities easily cover the demand for major wind energy components. However, supply chain bottlenecks may emerge as annual deployment rates must significantly increase to reach the ambitious 2030 targets [7].

Wind energy has a central role in the EU's climate and energy policy, as the acceleration of wind energy deployment is essential to deliver on the European Green Deal, the Fit for 55, and the REPowerEU objectives. REPowerEU calls for faster installation of wind energy capacities, with 510 GW of wind to be installed by 2030, which is projected to correspond to a 31% share of EU-installed power production capacities [8].

Next Term

In order to achieve its ambitious goals, the EU needs to ensure that the market is fit for renewable investments and create the regulatory certainty needed to restore investor confidence. With the new Renewable Energy Directive, the Green Deal Industrial Plan, and the initiatives derived from it, the EU has taken action to speed up the deployment of renewable energies and increase the resilience, autonomy, and competitiveness of the European energy system and its supply chains.

References

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