

European Wind Energy Competitiveness Report

About ETIPWind

The European Technology & Innovation Platform on Wind Energy (ETIPWind) was established in 2016 to inform Research & Innovation policy at European and national level.

ETIPWind provides a public platform to wind energy stakeholders to identify common Research & Innovation (R&I) priorities and to foster breakthrough innovations in the sector.

Its recommendations highlight the pivotal role of wind energy in the clean energy transition. They inform policymakers on how to maintain Europe's global leadership in wind energy technology so that wind delivers on the EU's Climate and Energy objectives. As such, the platform is key in supporting the implementation of the Integrated SET-Plan.

ETIPWind activities and publications are free and publicly available. The platform is overseen by a Steering Committee of both industry, research and academia representatives and supported by a forum comprising the industry's Chief Technology Officers.

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About Deloitte

The socio-economic impact evaluation of wind energy on the European Union has been carried out using the SNA93 methodology (System of National Accounts adopted in 1993 by the United Nations Statistical Commission) and Deloitte's approaches, which evaluate the effects of the renewable energy in the economy.

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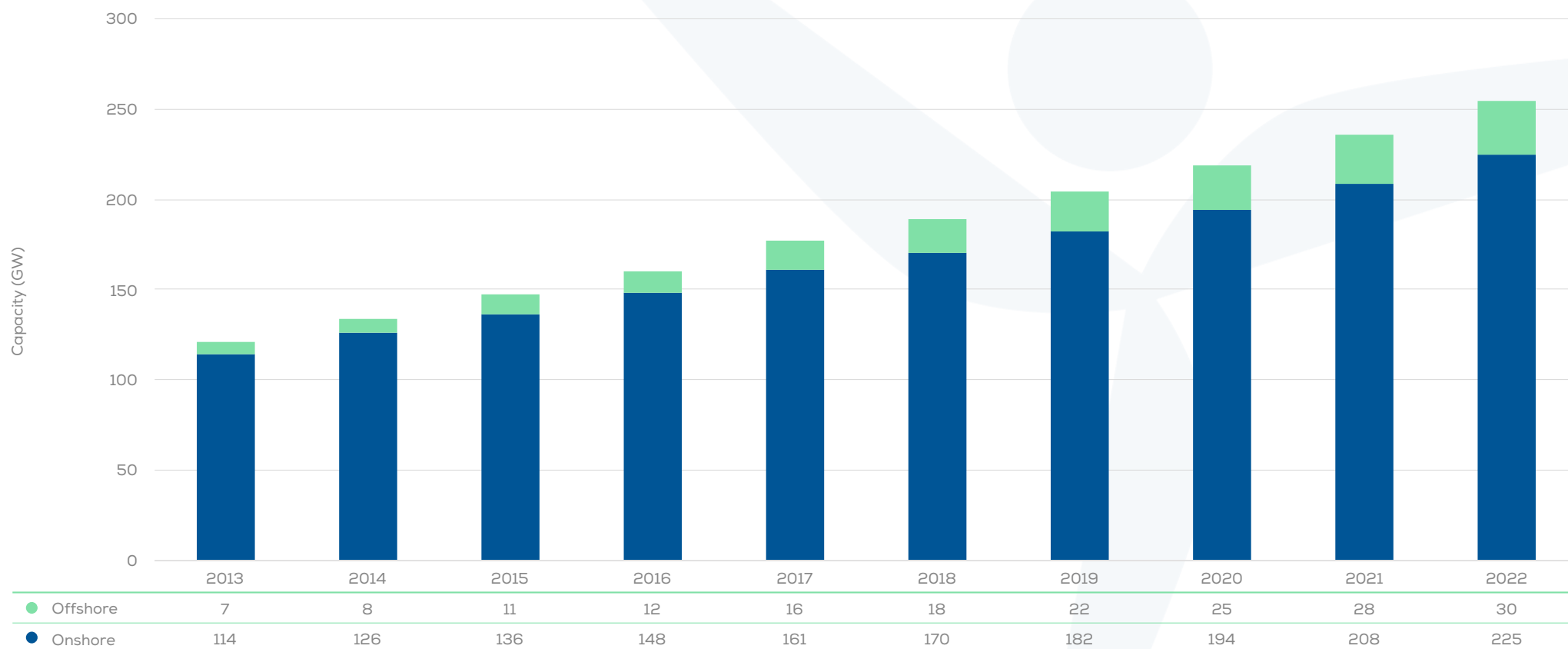
Executive Summary

- The European wind industry has an **annual turnover of €69bn**. Close to 60% of this adds value to the EU economy. The rest goes to payments of suppliers outside the EU, including EU companies with facilities abroad.
- Wind energy added **€41.8bn to EU GDP** in 2022. €26.3bn of this was a direct contribution from developers, manufacturers and components suppliers. Goods and services from other economic sectors to the wind industry generated an additional €15.5 bn of indirect economic activity.
- The wind industry generated **€2.2 bn** of value added to the EU economy in 2022 for each GW of **onshore wind** installed and **€2.5 bn** for each new GW of **offshore wind**. That means that on average every new onshore turbine added €9.2m to the EU economy and every new offshore turbine added €20.3m.
- In 2022 wind energy sustained **300,000 jobs** in the EU. The number of people employed in the industry has remained stable since 2019, even during the COVID-19 and energy crises in Europe.
- The gross value added per employee, a measure of productivity, from wind energy is higher in many sectors than the EU average value added per employee of many industrial and services in the economy.
- The wind industry **exports €9bn** of goods and services.
- The wind industry has decreased the **investments in R&I** since from an average of 5% to **3.12% in 2022**. This is still in line the EU target of 2.3% of the GDP.
- There were only **83 patents** were logged in Europe in 2021. The number of patents on wind energy technology registered in Europe has significantly declined to historical low levels since the year 2000.
- Wind energy generation avoided **138 million tons of CO2** in 2022. This would amount to **€11.5bn** using the average price of EU emission allowances in 2022 of €80.8/tCO2.
- During the 2022 energy crisis, wind energy avoided the equivalent of 80 bcm or **€71bn of fossil fuel imports** to the EU, more than double than in 2021 and 10 times more than in 2020 in monetary terms.
- In 2022 the wind energy industry paid **€7bn of taxes** of which €1.6bn were not linked to corporate taxes and were destined mainly to local governments and communities.
- Wind energy would add **€104.2bn to the EU GDP by 2030** under the REPowerEU plan. That is 2.5 times more than the contribution in 2022. By then it would employ **936,000 people**.

1. Wind energy installations

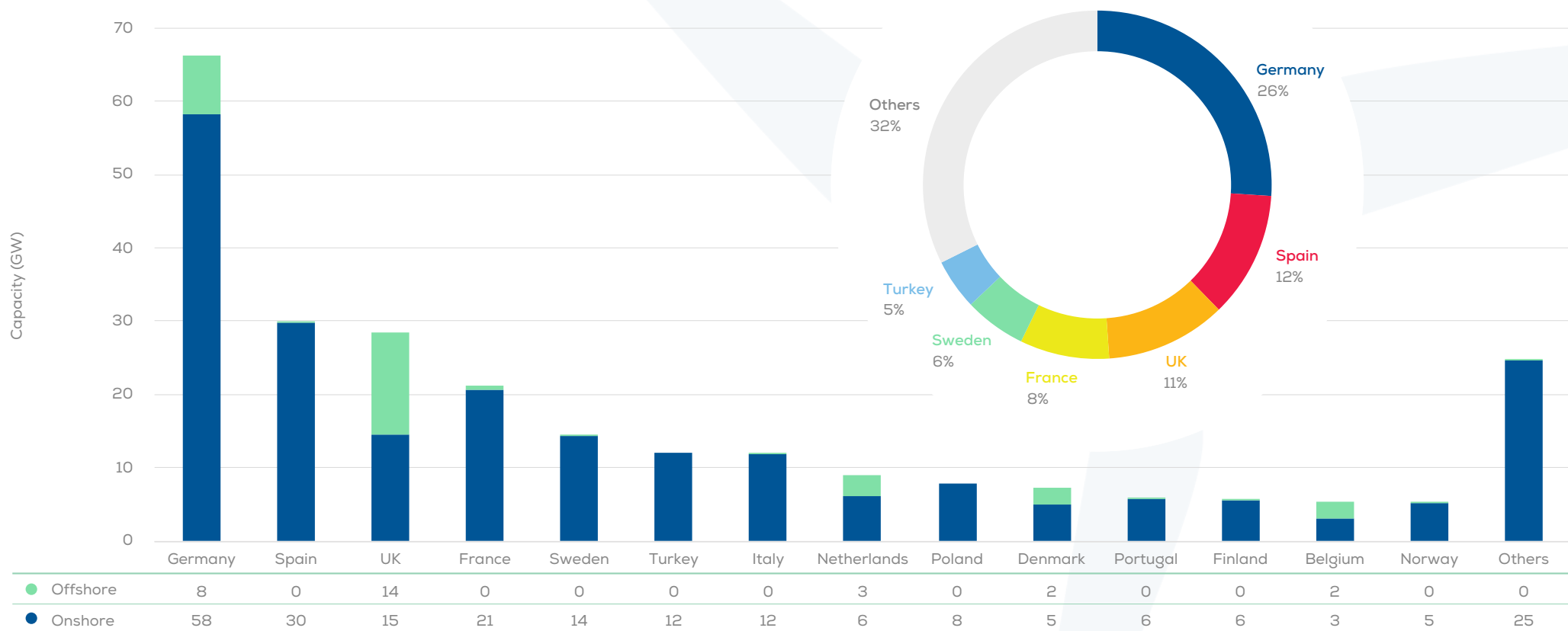
Wind energy installations in Europe

At the end of 2022, Europe had installed 255 GW of wind power capacity (204 GW in the EU-27). 88% of this (225 GW) is onshore and 12% (30 GW) is installed offshore.



Source: WindEurope

Wind energy installations in Europe by country

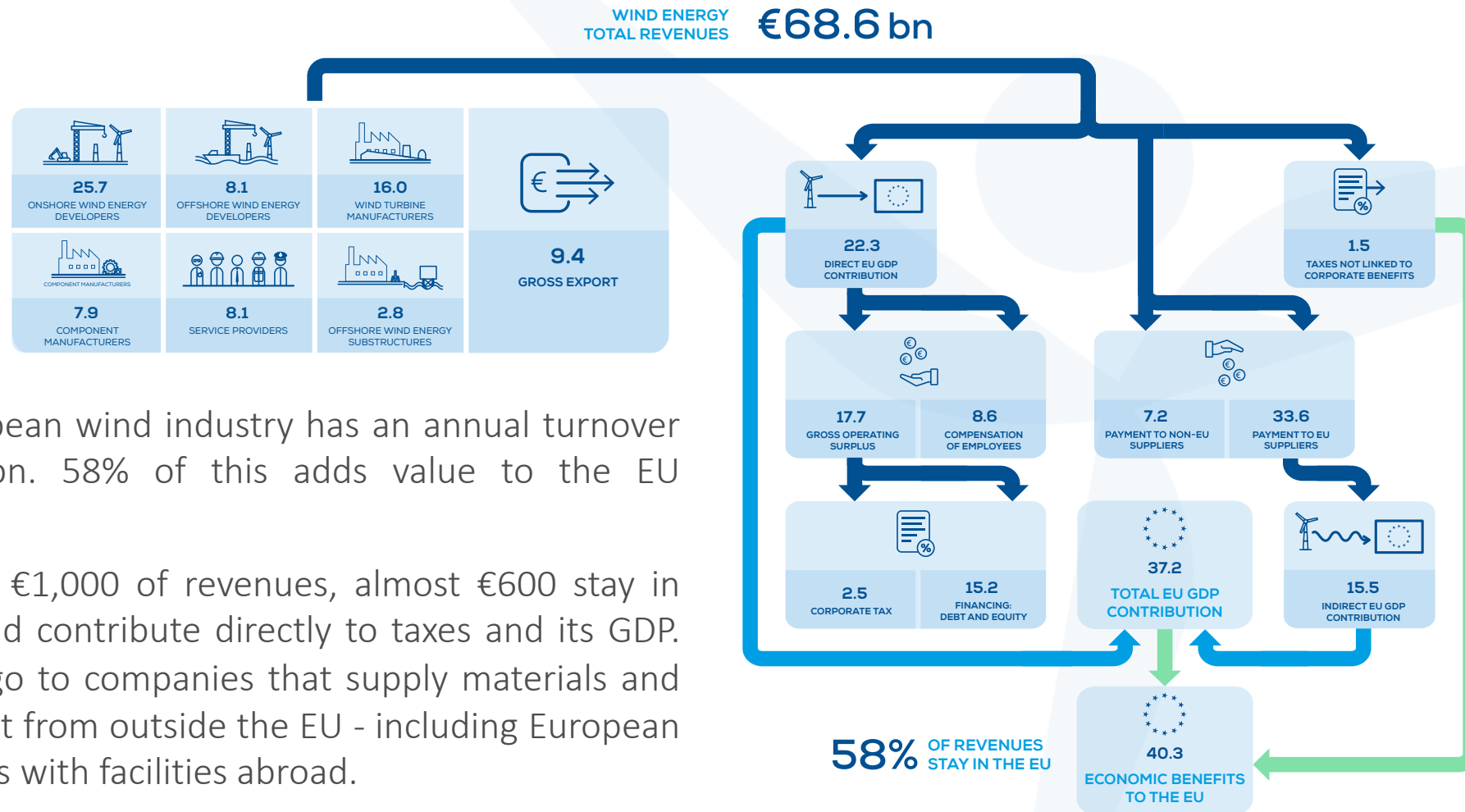


Source: WindEurope

2. Contribution of wind energy to the EU GDP

The background features a dense pattern of white line-art icons on a blue-to-green gradient. The icons include wind turbines, light bulbs, gears, circuit boards, pie charts, bar graphs, a globe, a magnifying glass, a car, a factory, a person's head profile, a battery, a checklist, and various symbols representing energy and industry.

EU added value generated by the wind energy



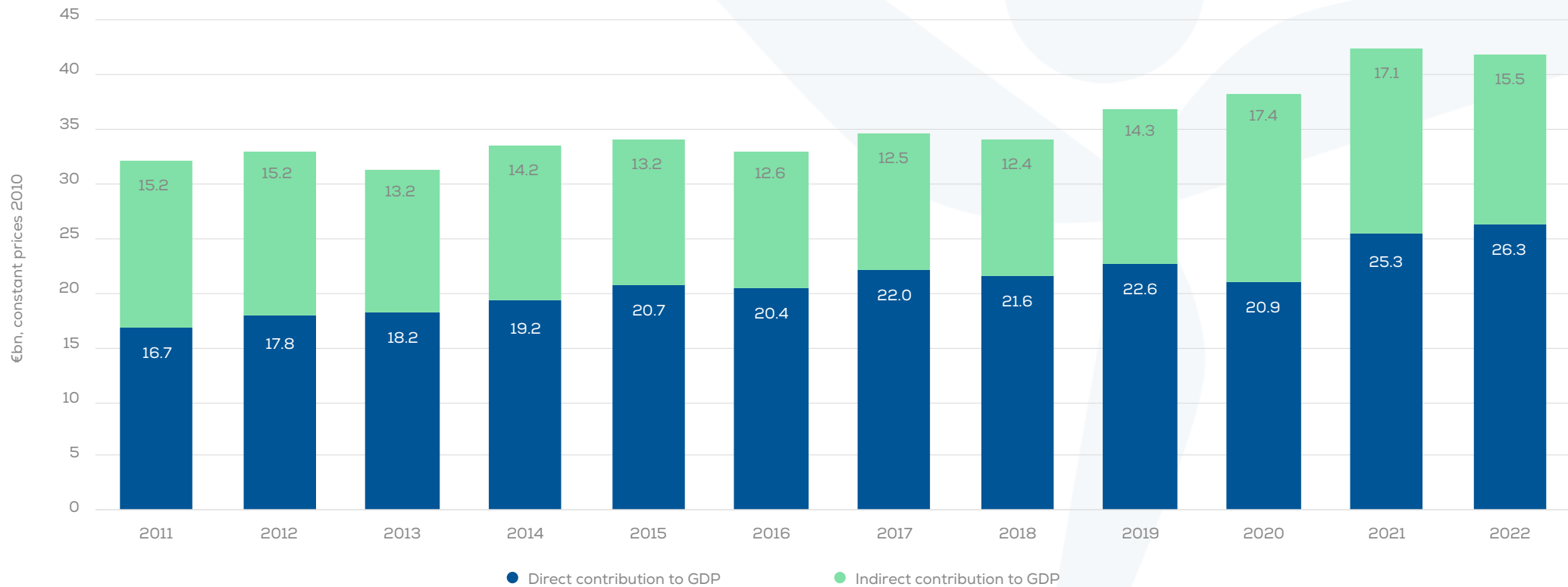
The European wind industry has an annual turnover of €68.6bn. 58% of this adds value to the EU economy.

For every €1,000 of revenues, almost €600 stay in the EU and contribute directly to taxes and its GDP. The rest go to companies that supply materials and equipment from outside the EU - including European companies with facilities abroad.

Source: WindEurope

Contribution to EU GDP by wind energy

The European wind energy industry and the activities related to it added **€41.8bn** to EU GDP in 2022. €26.3bn of this was a direct contribution from onshore and offshore wind energy developers, turbine manufacturers, service providers, and offshore wind energy substructures. Goods and services from other economic sectors to the wind industry generated an additional €15.5 bn of indirect economic activity.



Source: Deloitte for ETIPWind

Wind energy sector's share of total EU GDP

The wind industry's impact on the European economy – both direct and indirect – is equivalent to 0.29% of the total value of goods and services produced in the EU.

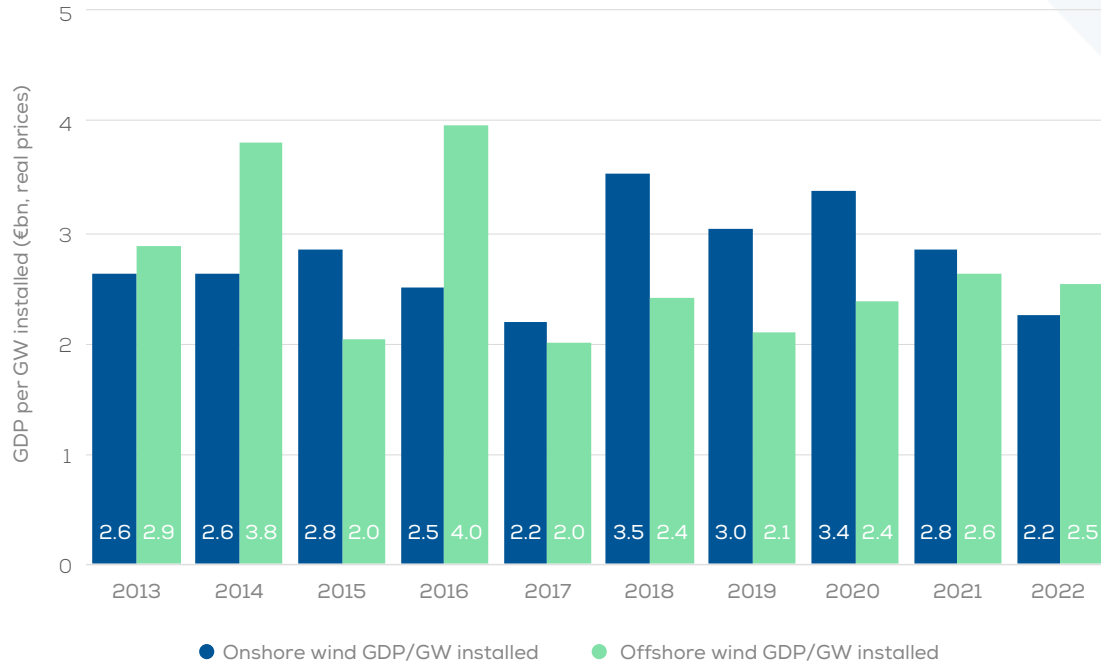


Source: Deloitte for ETIPWind

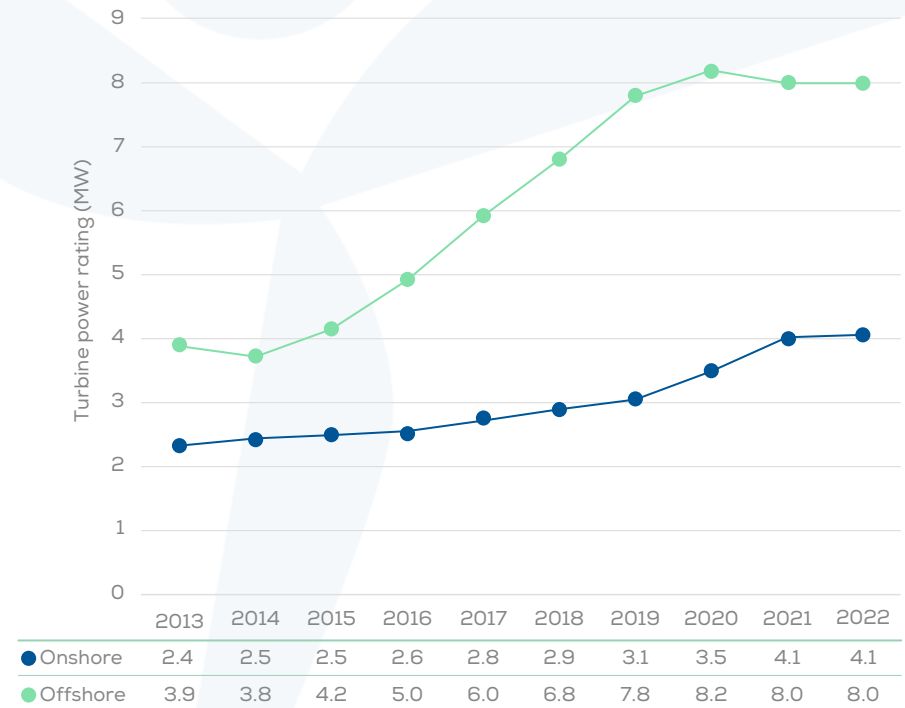
Contribution to EU GDP per GW installed of wind energy

The wind industry generated €2.2bn of value added to the EU economy for each new GW of onshore wind installed in 2022 and €2.5bn for each new GW of offshore wind. That means that on average every new onshore turbine added €9.27m to the EU economy and every new offshore turbine added €20.3m.

The annual value added per GW varies depending on the revenues, costs and capacity installed on- and offshore. The average value added per wind turbine varies depending on the number of turbines installed and their average size every year.



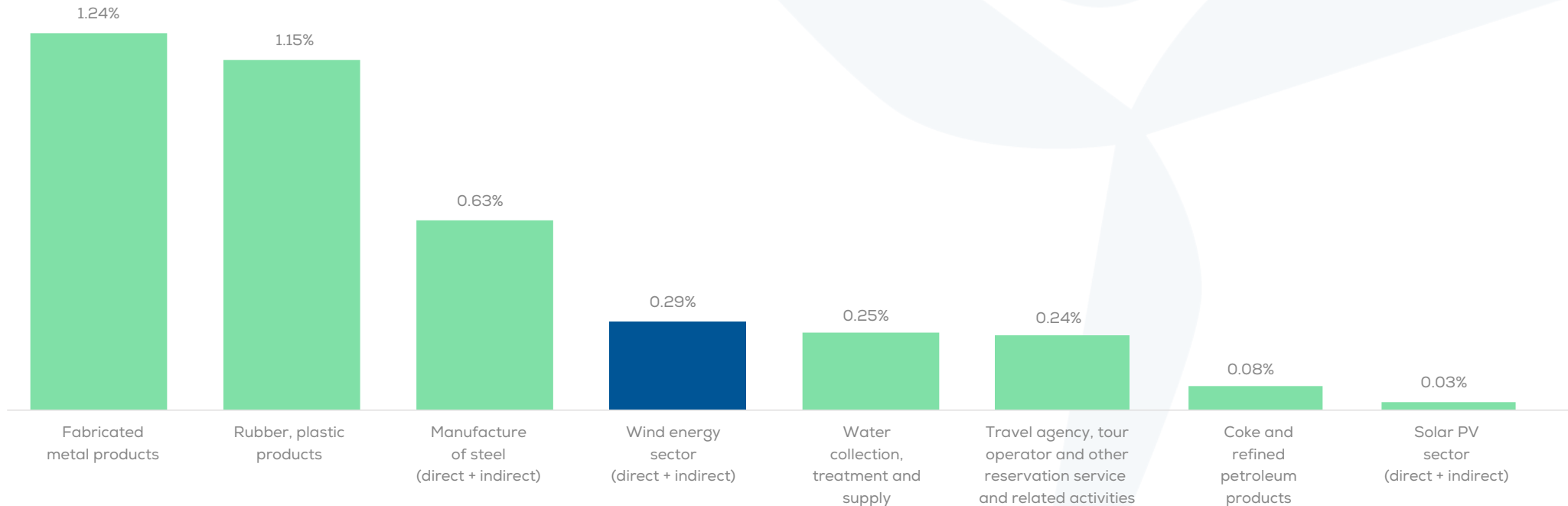
Source: Deloitte for ETIPWind



Source: WindEurope

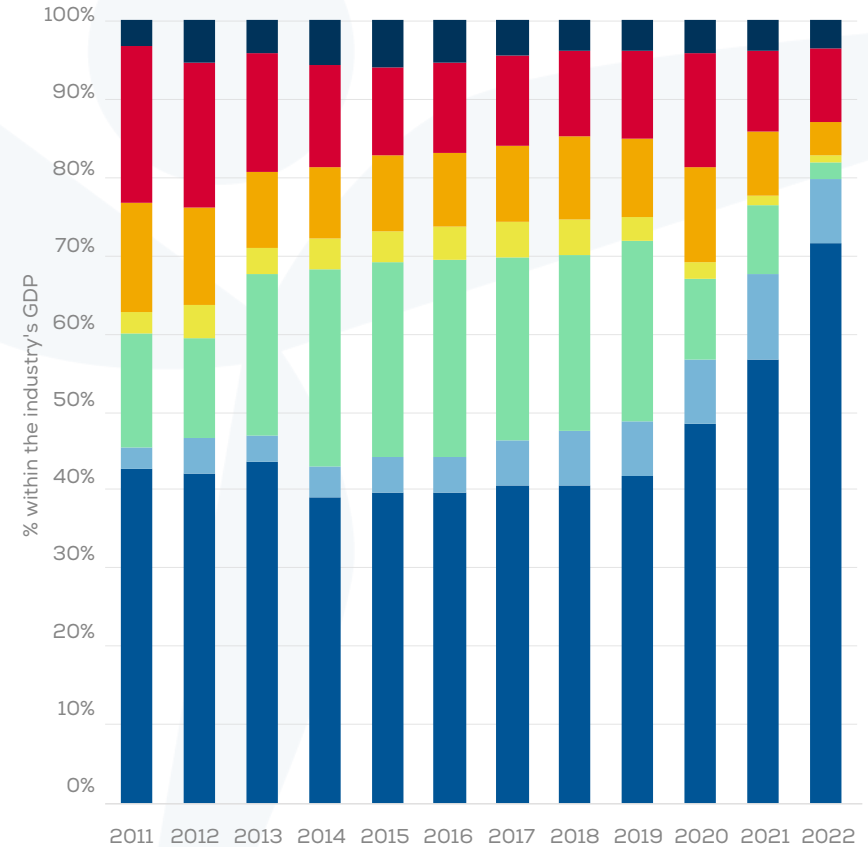
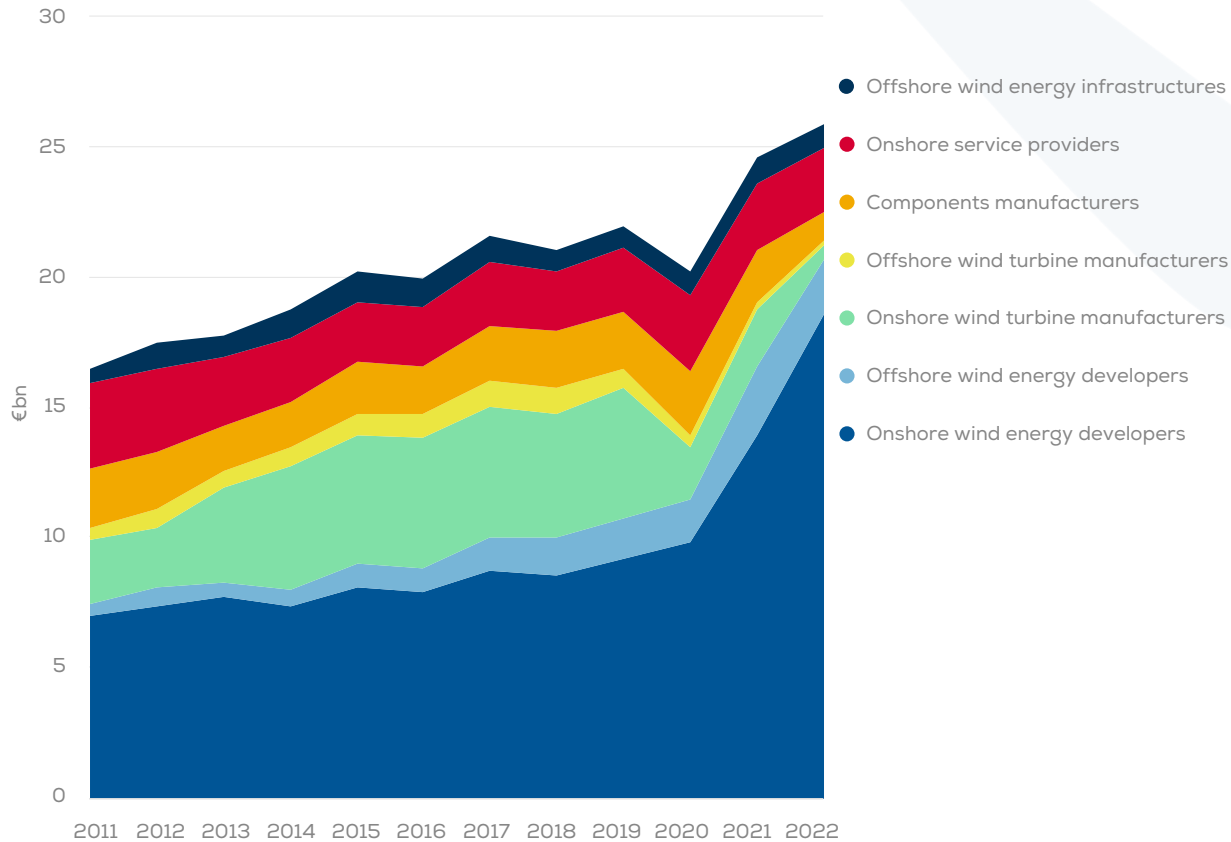
Share of GDP of leading EU economic sectors in 2022

The economic contribution of wind energy represents 0.29% of the EU GDP. By way of comparison, the manufacturing of steel accounts for 0.63% of EU GDP while the entire supply of rubber and plastic products is 1.15%.



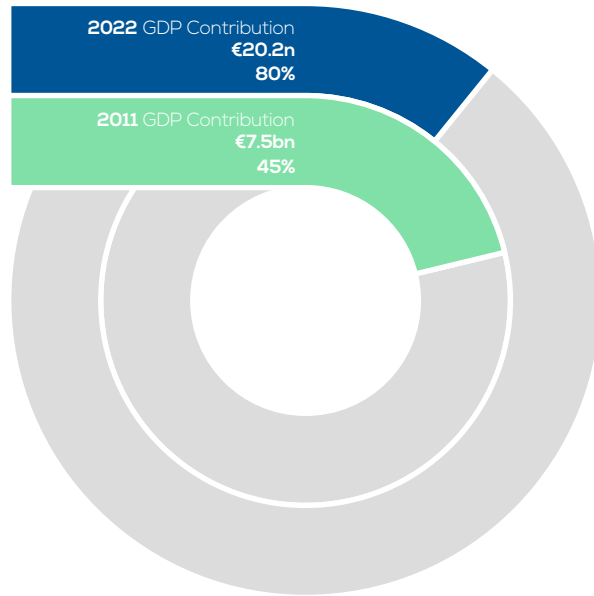
Source: Deloitte for ETIPWind

Subsector's share in the direct contribution to the EU GDP



Source: Deloitte for ETIPWind

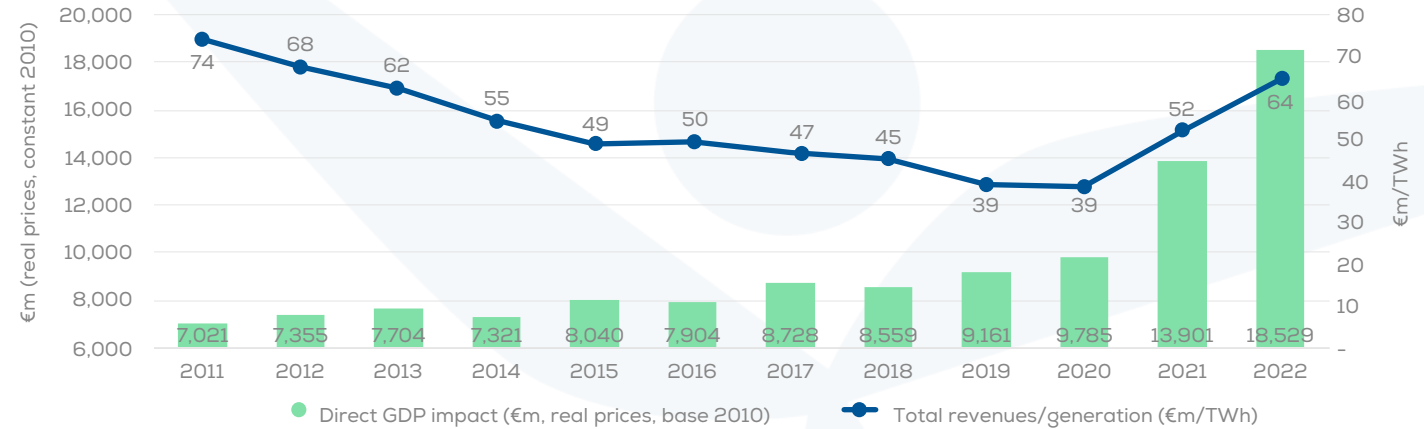
Wind energy developers' direct contribution to EU GDP



Source: Deloitte for ETIPWind

Contribution of wind energy developers' to EU GDP and total revenues per TWh of energy generated

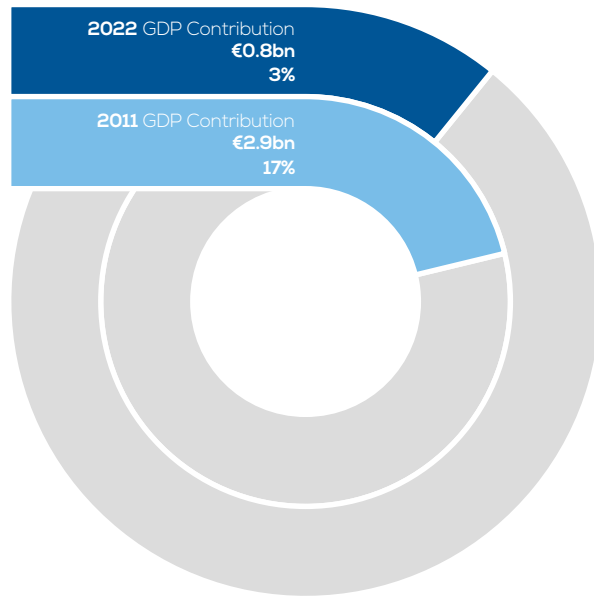
Onshore wind energy developers



Offshore wind energy developers



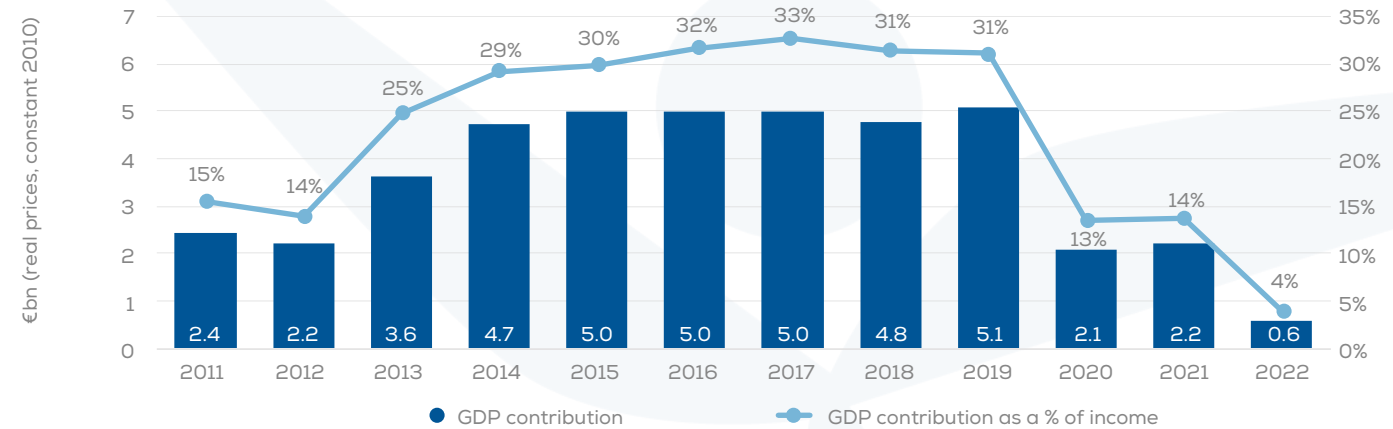
Wind energy manufacturers' direct contribution to EU GDP



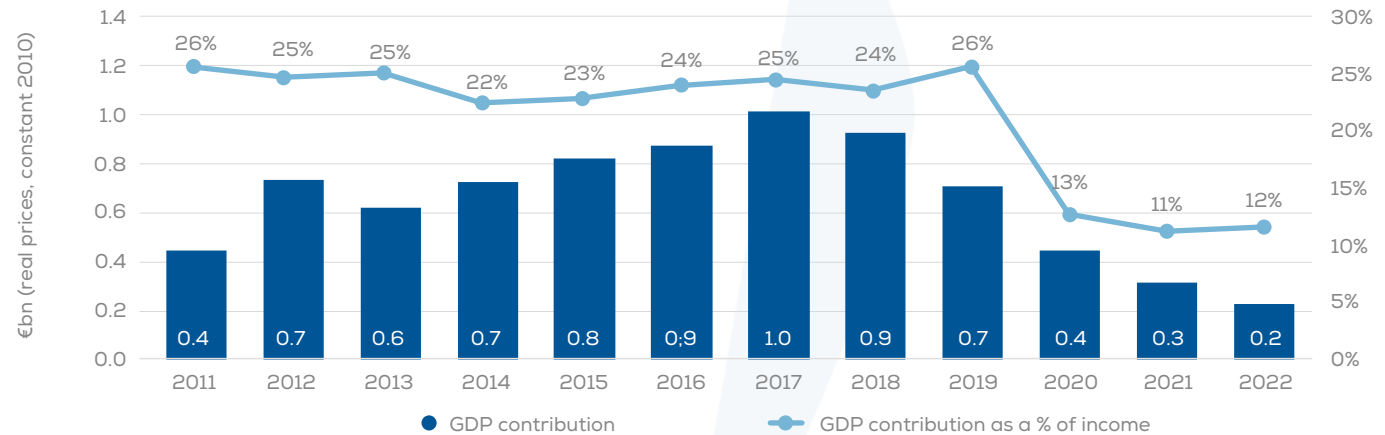
Source: Deloitte for ETIPWind

Manufacturers' contribution as a percentage of sub-sector income (real prices, constant 2010)

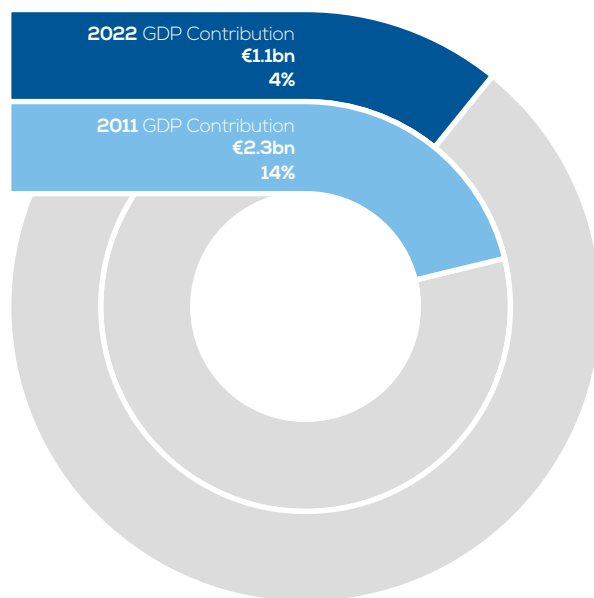
Onshore wind manufacturers



Offshore wind manufacturers



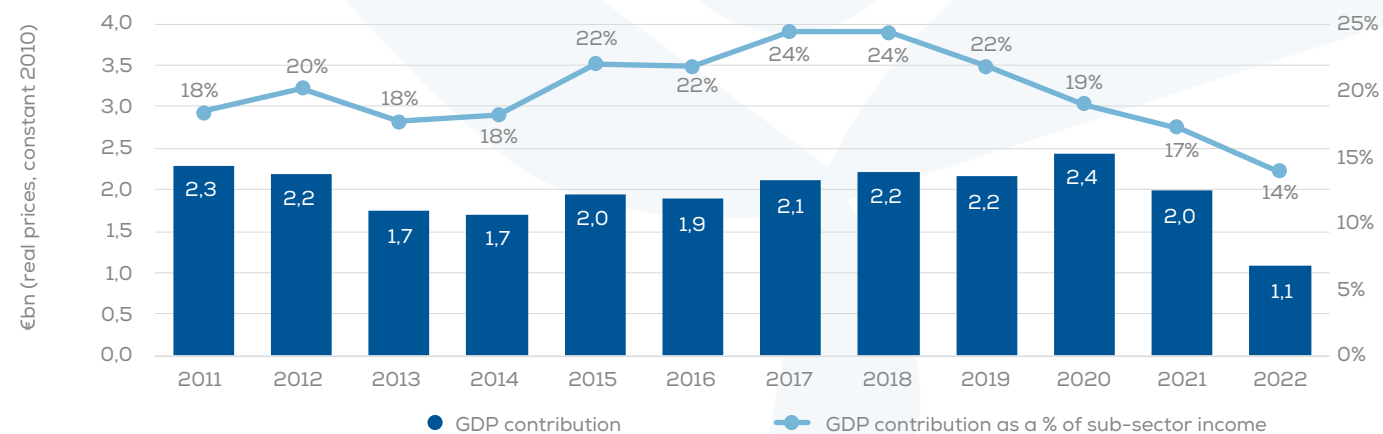
Wind energy component manufacturers' direct contribution to EU GDP



Source: Deloitte for ETIPWind

Component Manufacturers' contribution as a percentage of sub-sector income (real prices, constant 2010)

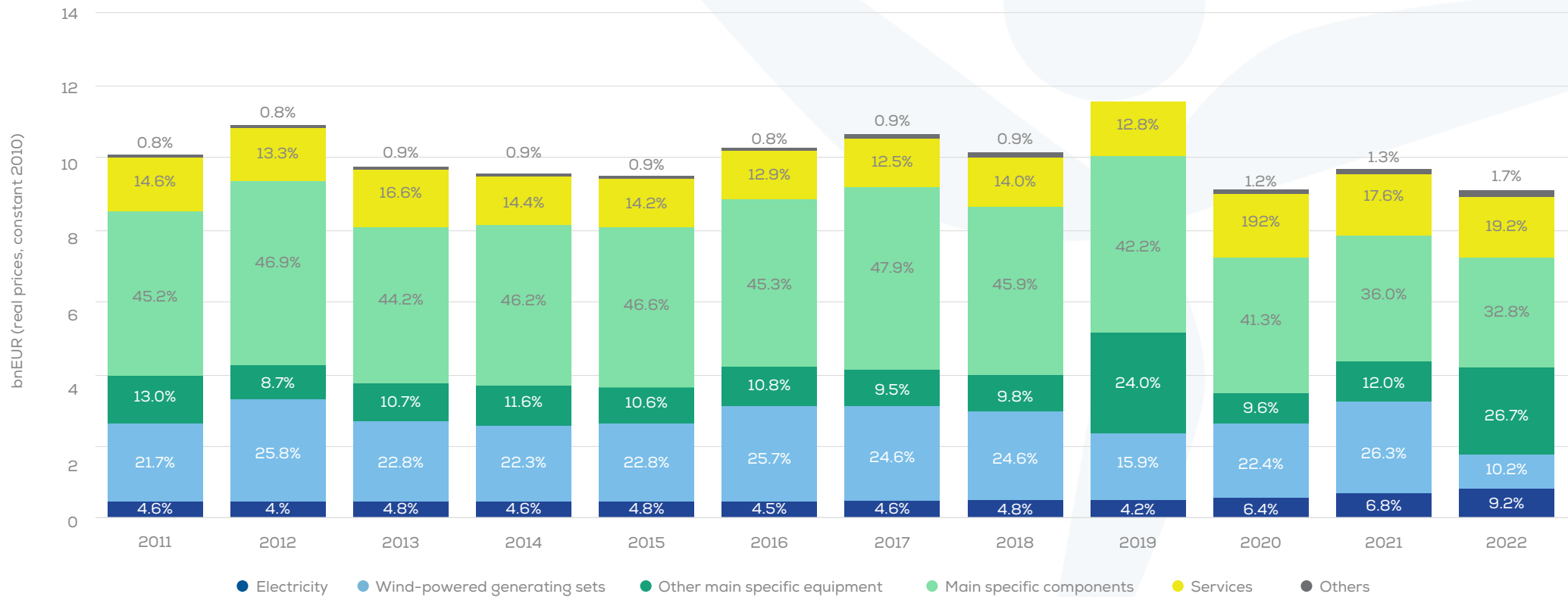
On- and offshore component manufacturers (excl. offshore wind substructures)



3. Trade Balance

EU wind energy industry gross exports

The wind industry exports €9bn/year of goods and services. Wind energy turbine nacelles and generators, including or not blades, accounted for only 10.2% of gross exports in 2022*. While other various components accounted for around 60% (hubs, rotor, pitch systems, blades, towers, foundations for offshore wind, etc.).



● Electricity ● Wind-powered generating sets ● Other main specific equipment ● Main specific components ● Services ● Others

Source: Deloitte for ETIPWind

Years 2011-2019 show data EU-28, 2020-2022 show data EU-27.

Information on exports and imports has been reviewed for all the historical series, according to changes in statistics provided by Eurostat and the European Commission.

*NACE code 8502.31: "Wind turbines and generators, including or not blades". 2022 data is an estimate.

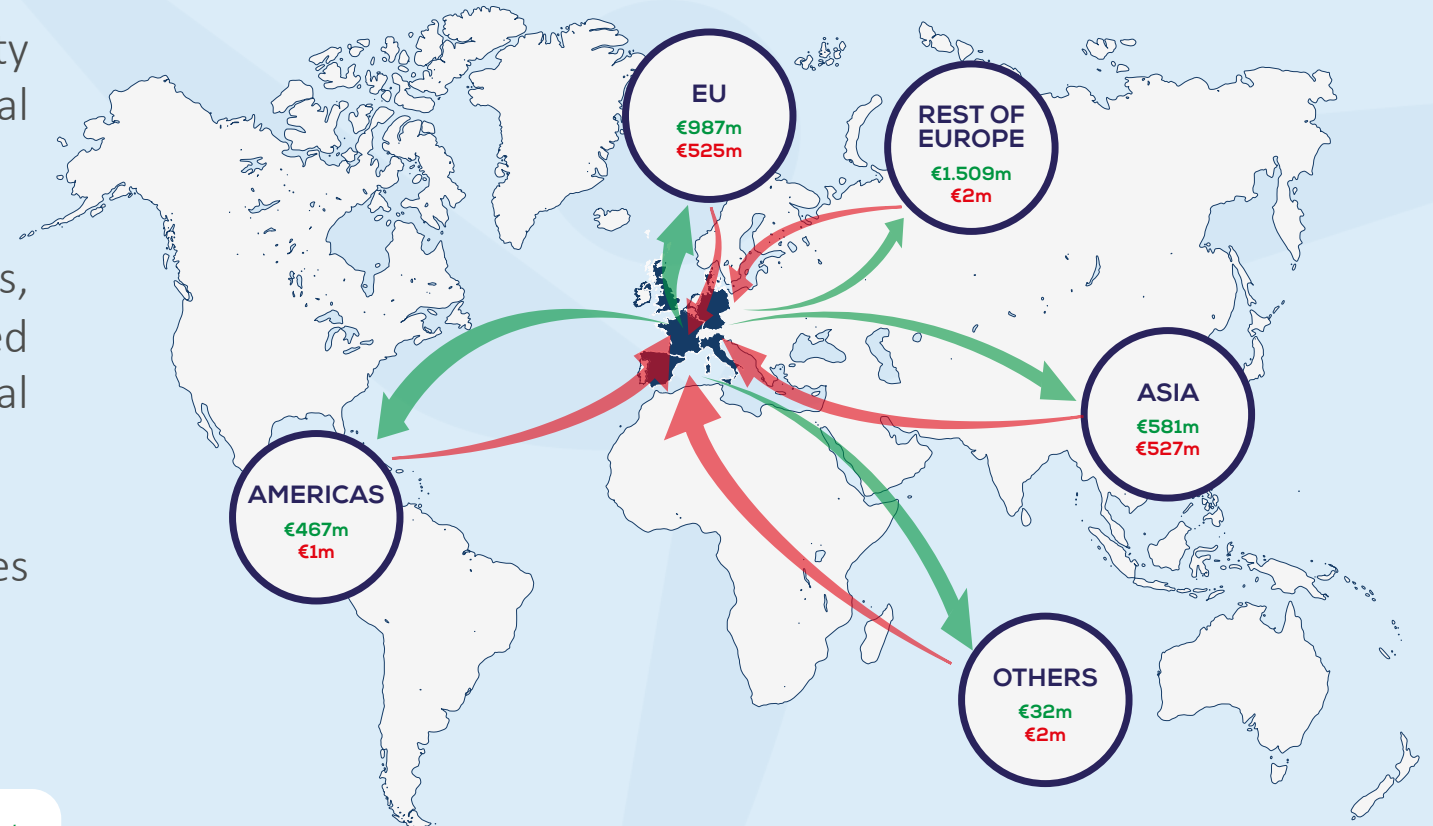
Wind turbine generators exports and imports in 2021

Wind turbine generators (real prices, constant 2010)

The European wind industry exports a variety of assembled equipment and individual components globally.

Fully assembled wind turbines, generators, with or without their rotor blades accounted for €2.5bn of EU exports in 2021. (Additional €987m were traded within the EU).

The EU imported €532m of these assemblies the same year.



This map sets out exports and imports of 'wind power generating sets' (export product NACE code 8502 31 00) from the EU-28 in 2021.

The "Rest of Europe" includes exports and imports of EU wind power generating assets in European countries outside the EU27.

"Others" include Africa and Oceania

■ Export
■ Import
(mEur)

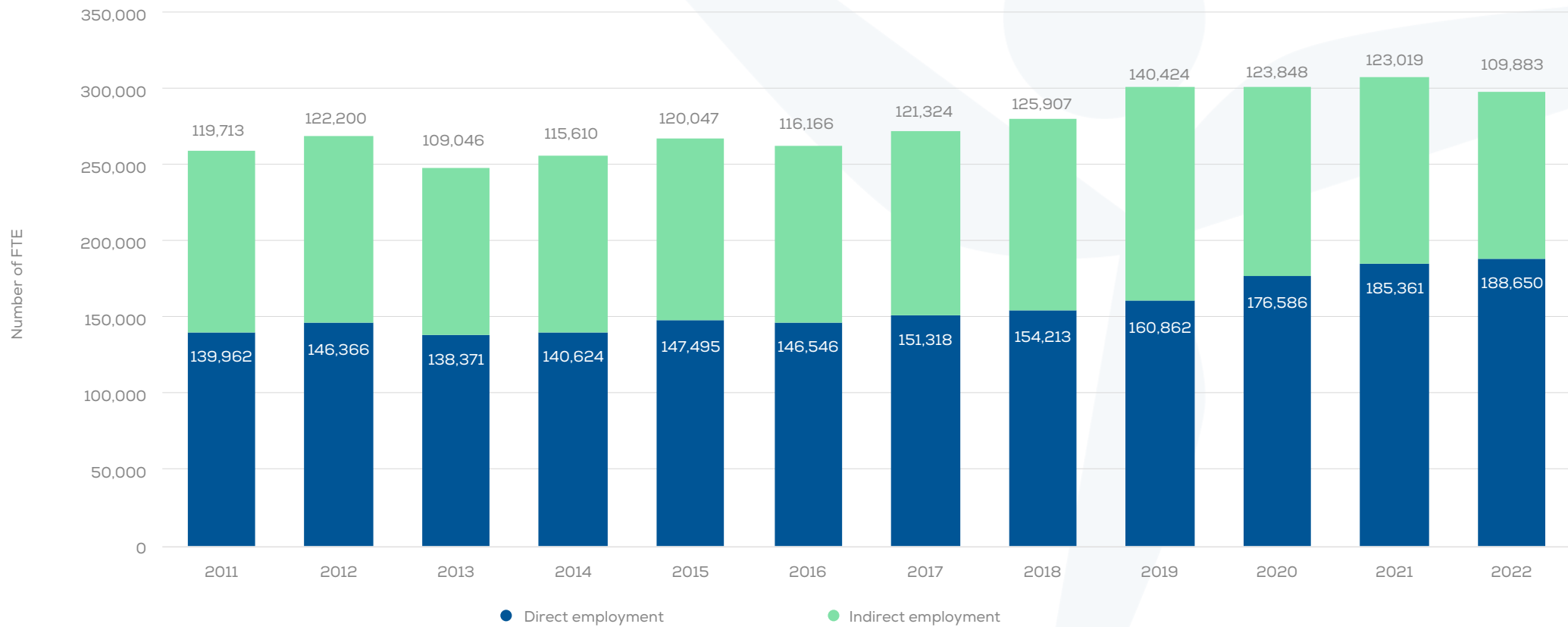
Source: Deloitte for ETIPWind

4. Jobs

The European wind energy

Jobs in the wind energy industry

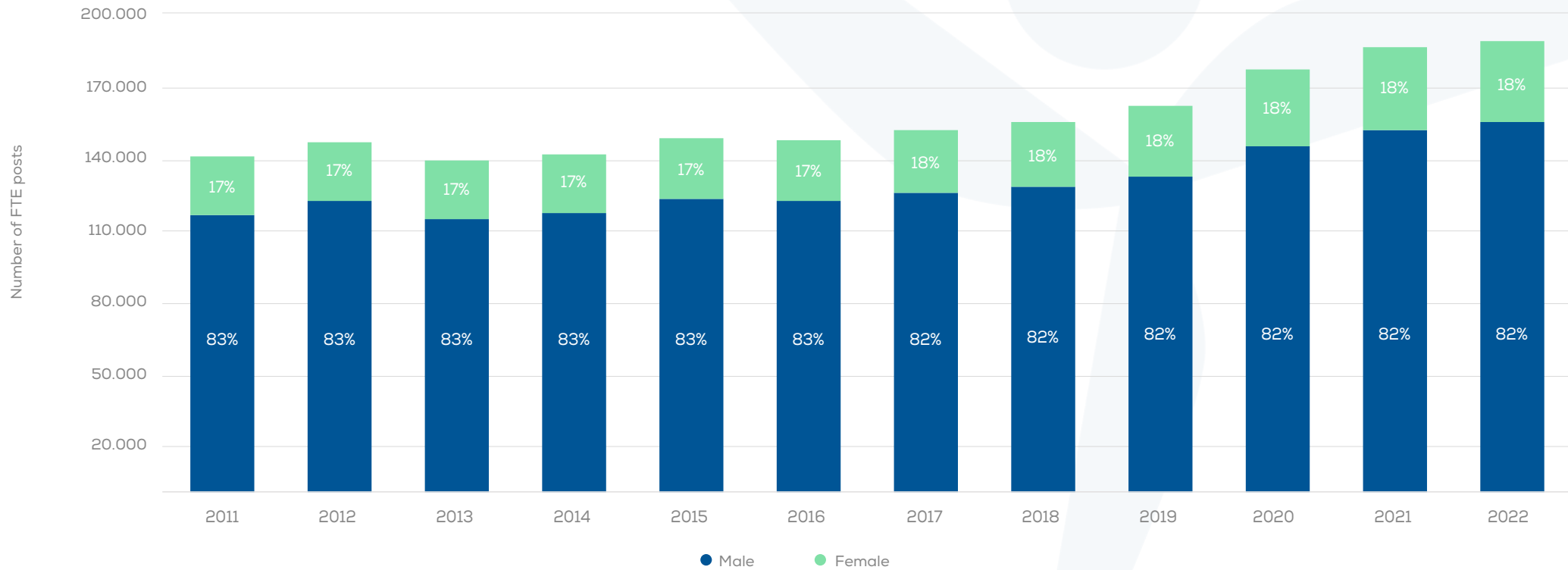
In 2022 wind energy sustained 300,000 jobs in the EU. The number of people employed in the industry has remained stable since 2019, even during the COVID-19 and energy crises in Europe.



Source: Deloitte for ETIPWind

Gender in the jobs in wind energy in Europe

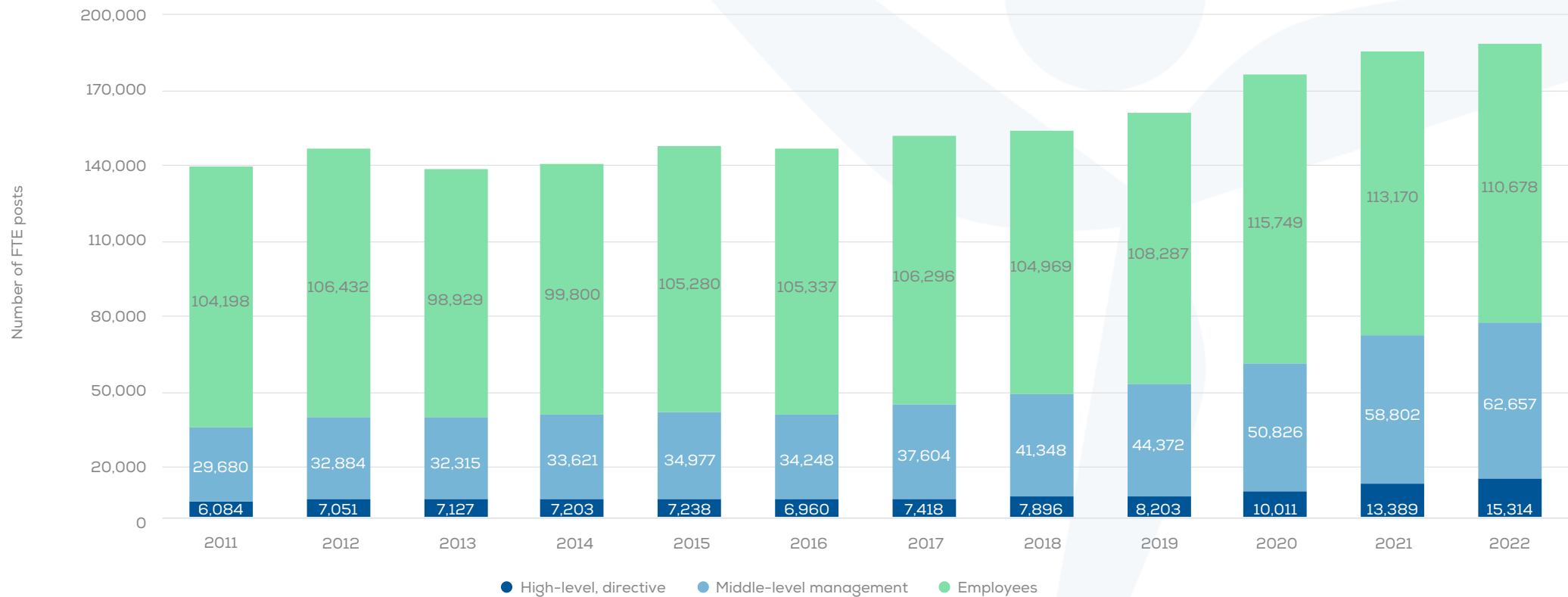
82% of workers in the European wind industry are men. The number of **women** working in the wind industry has been maintained at 18% since 2016.



Source: Deloitte for ETIPWind

Distribution of jobs per function in wind energy

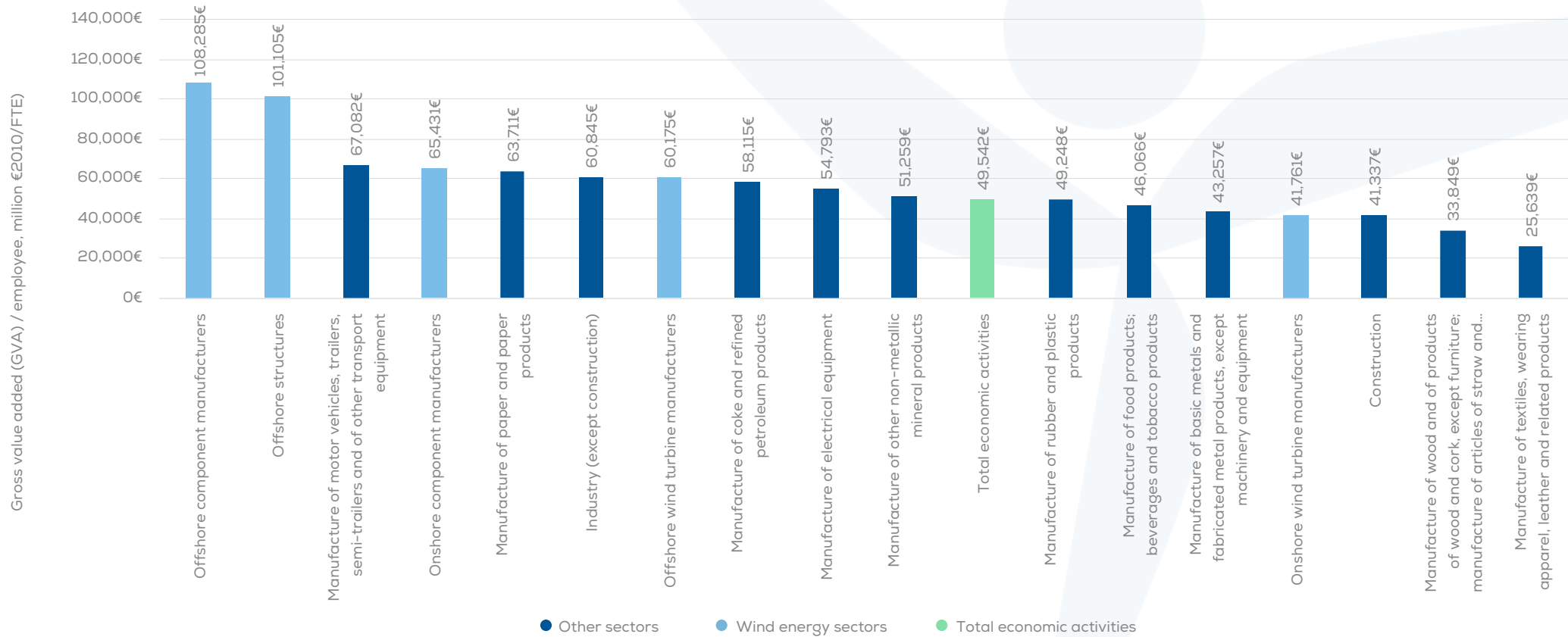
Technical, commercial and administrative employees represent 59% of the workforce in the European wind industry while 33% are in management roles and 8% in executive or directive functions.



Source: Deloitte for ETIPWind

Productivity of wind energy manufacturing and other sectors

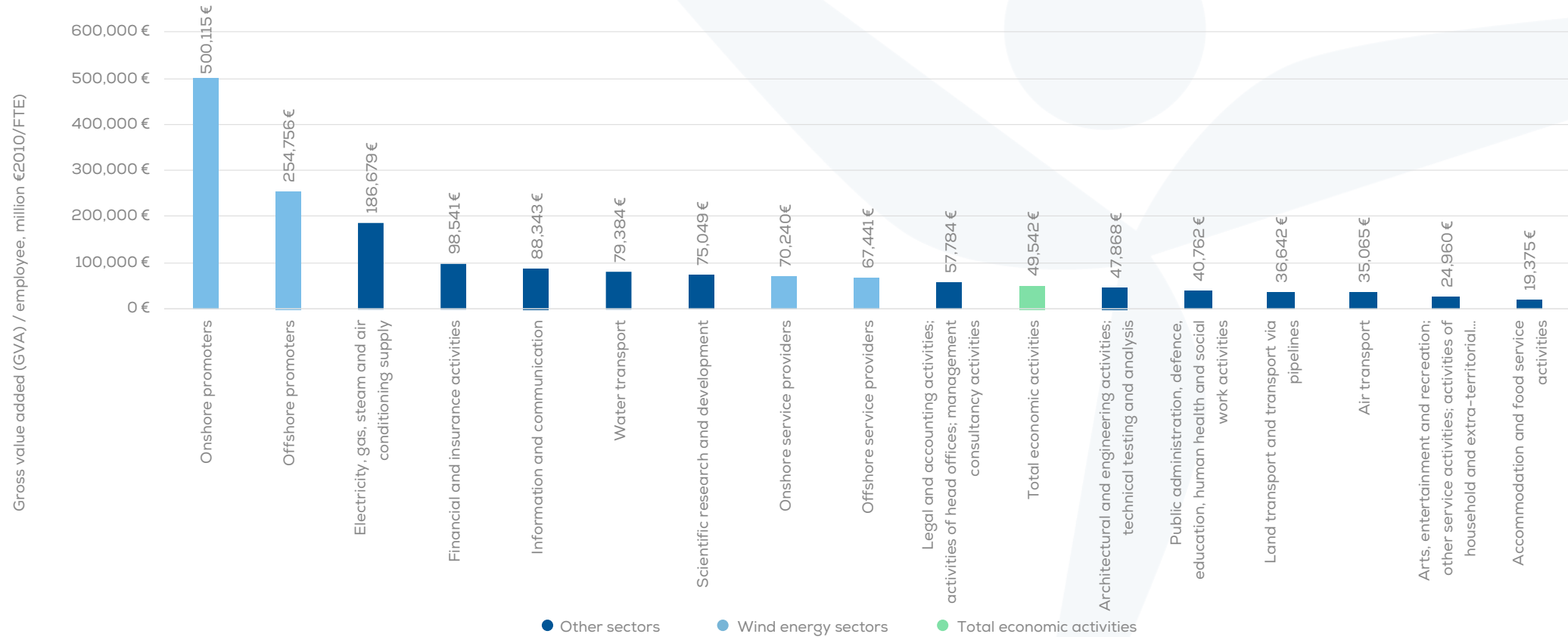
The gross value added per employee of most industrial activities in the wind energy sector is higher than in many sectors of the EU economy. For example, offshore component manufacturers and substructures add twice as much value to the economy per employee compared to the EU average of industrial sectors.



Source: Deloitte for ETIPWind

Productivity of wind energy services and other services

Similarly, the gross value added per employee of services in the wind energy sector is higher than the EU average of service sectors. For example, wind energy developers generate significantly higher gross value added per employee than information and communication or the accommodation and food service activities (tourism).

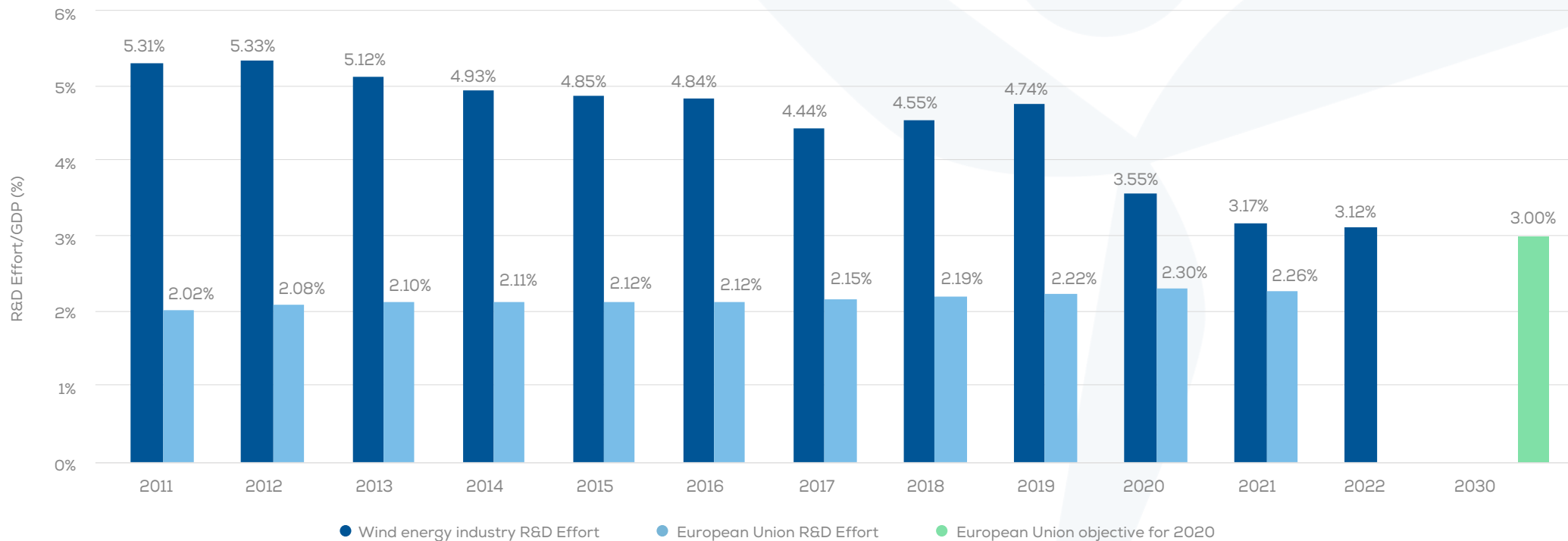


Source: Deloitte for ETIPWind

5. Research & Innovation

R&I investments

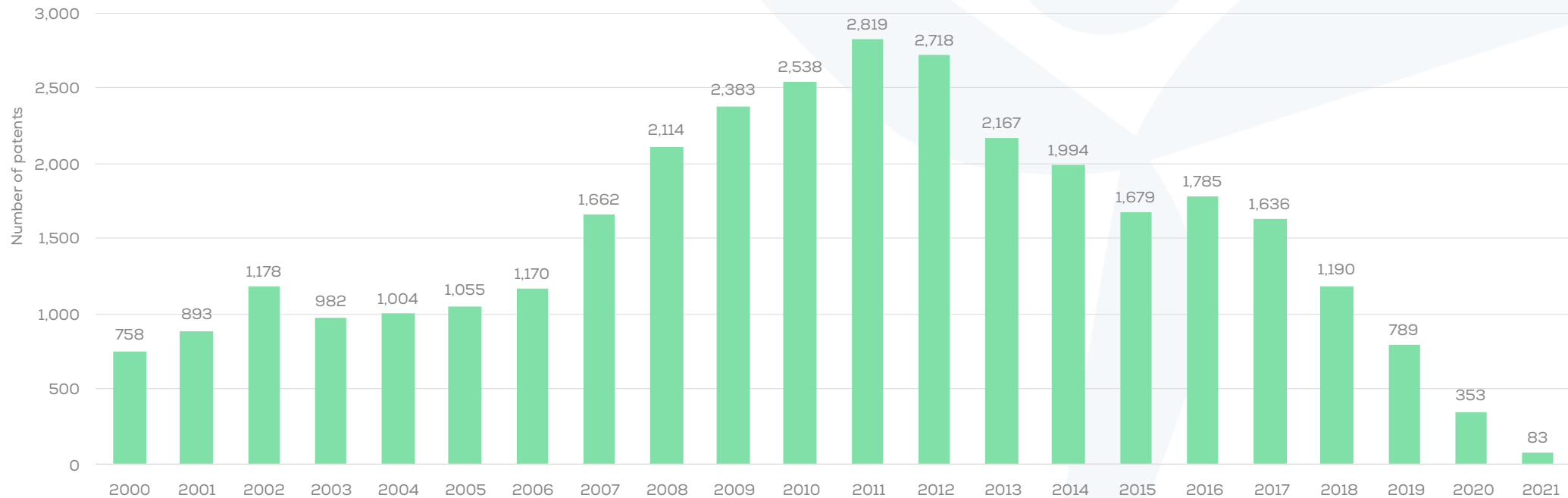
The wind industry has decreased the investments in R&I since from an average of 5% to 3.12% in 2022. Despite this it is still in line with the EU level of 2.3% of the GDP from the immediate 2 previous years.



Source: Deloitte for ETIPWind

Patents

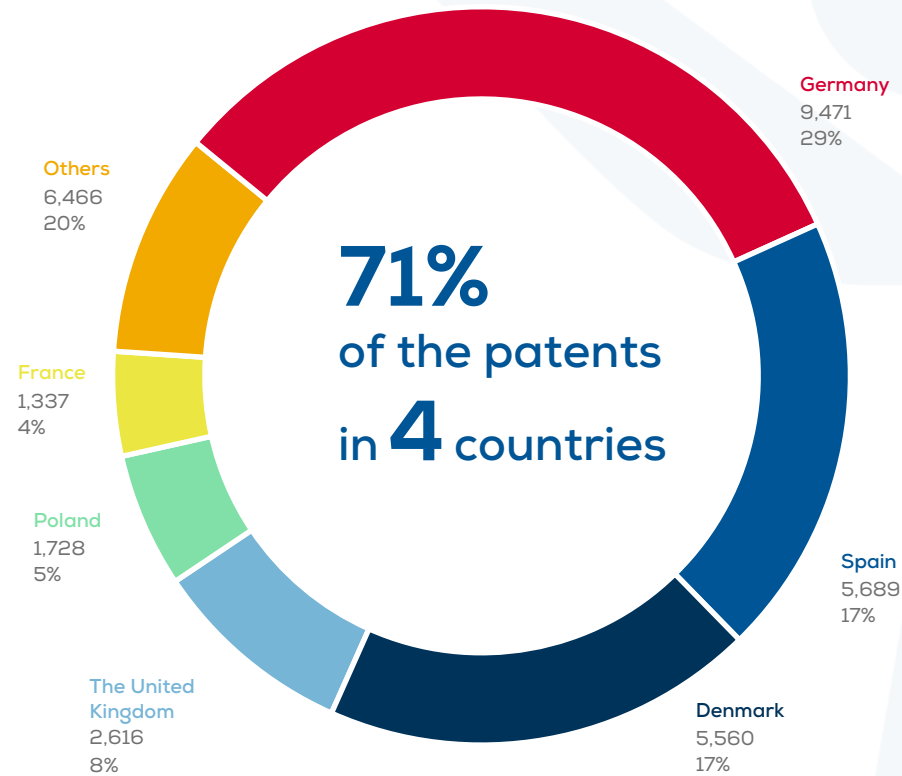
The number of patents on wind energy technology registered in Europe has significantly declined to historical low levels since the year 2000. **Only 83 patents** were logged in Europe in 2021.



Source: Deloitte for ETIPWind

Patents

Historically, 71% of patents were from 4 countries: Germany, Denmark, Spain and the UK. Together they hold 23,336 patents on wind energy and related technologies.

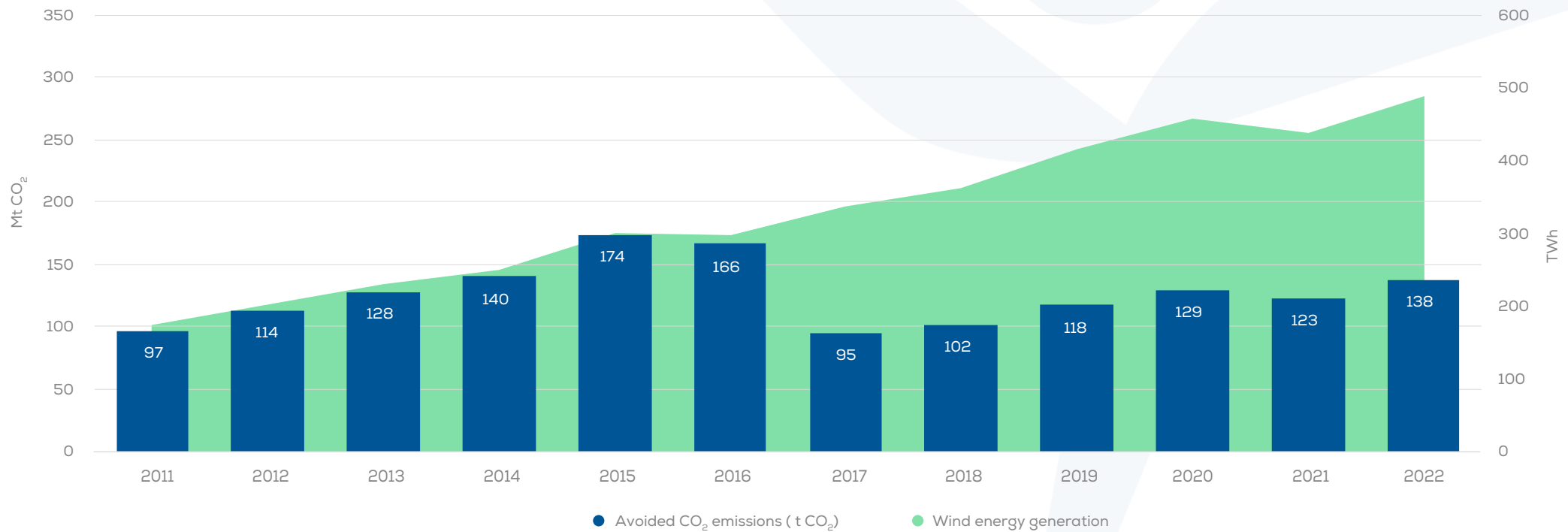


Source: Deloitte for ETIPWind

6. CO₂ emissions savings

Avoided CO₂ emissions

Wind energy generation avoided 138 million tons of CO₂ in 2022. This would amount to €11.5bn using the average price of EU emission allowances in 2022 of €80.8/tCO₂.



Source: Deloitte for ETIPWind

7. Avoided fossil fuel imports

Avoided fossil fuel imports due to wind energy generation

During the 2022 energy crisis, wind energy avoided the equivalent of **80 bcm** or **€71bn** of fossil fuel imports to the EU, more than double than in 2021 and 10 times more than in 2020 in monetary terms.

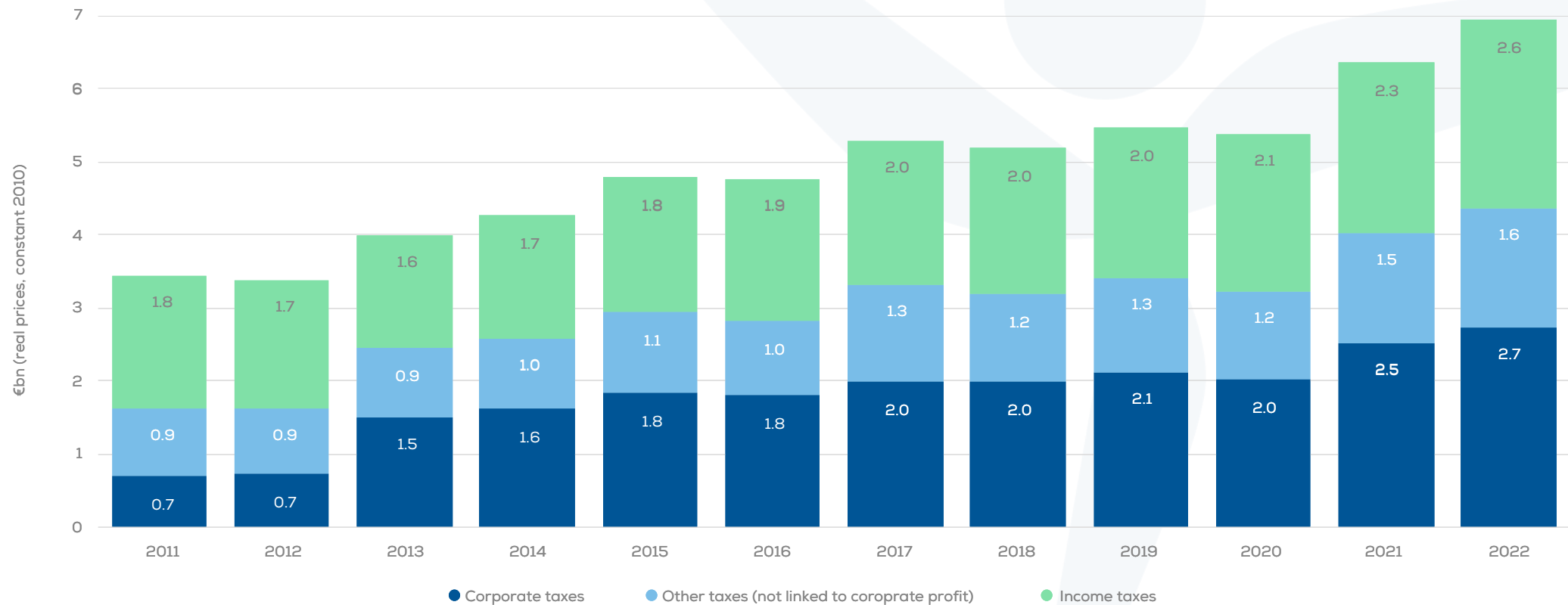


Source: Deloitte for ETIPWind

8. Taxes

Taxes paid by the EU wind energy industry

In 2022 the wind energy industry paid €7bn of taxes of which €1.6bn were not linked to corporate taxes and were destined mainly to local governments and communities. This includes taxes on the value of the electricity production, taxes focused on real state, environmental taxes, and contributions to local development.

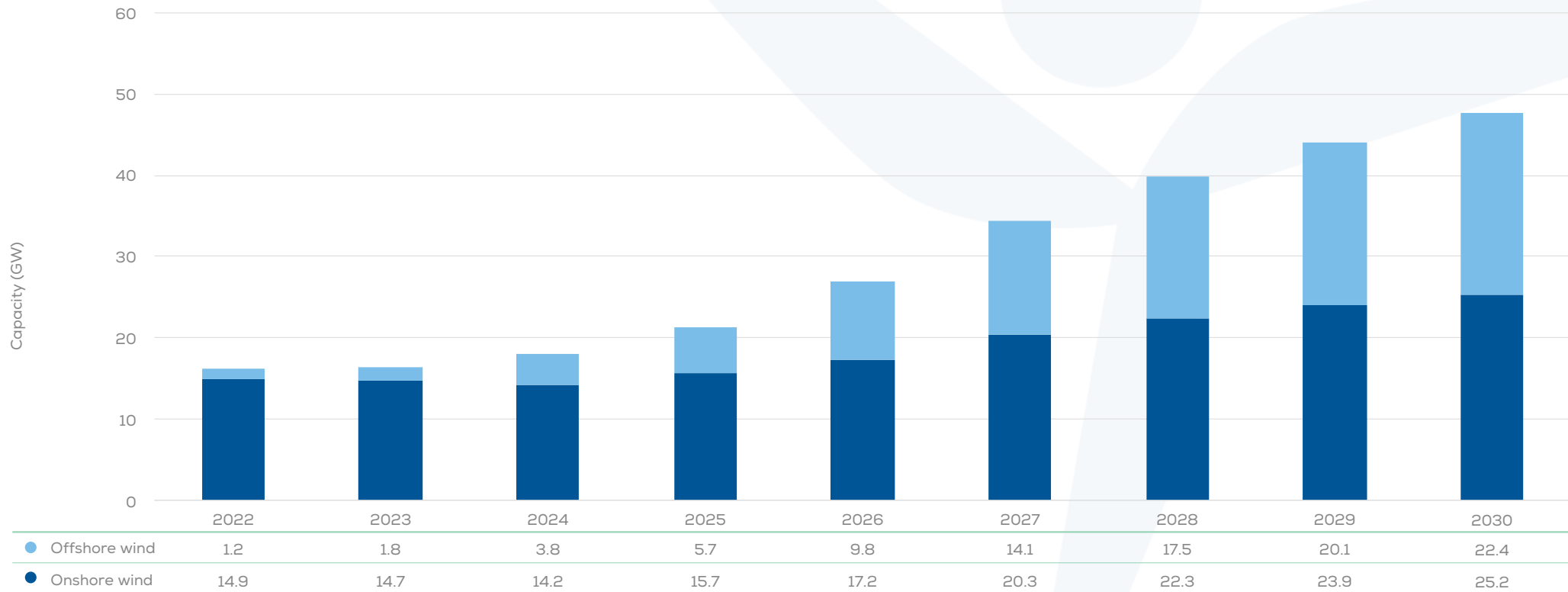


Source: Deloitte for ETIPWind

9. Wind Energy in 2030

Wind energy installations to 2030 in REPowerEU

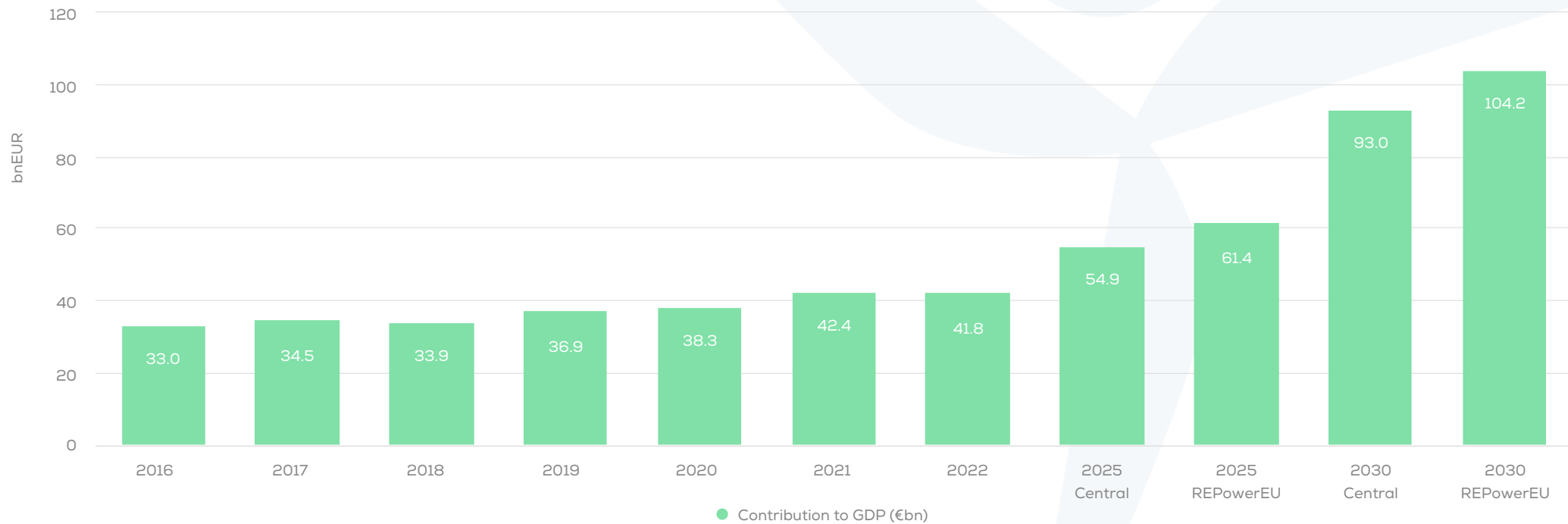
The REPowerEU plan from the European Commission envisions 440 GW of wind energy by 2030. At 205 GW installed in the EU at the end of 2021, the EU would need an average of 31 GW a year to reach such 2030 target.



Source: WindEurope

Forecast of contribution to EU GDP by wind energy

The economic contribution to the EU GDP in 2030 of 440 GW of wind power would be €104.2bn, 2.5 times more than the contribution in 2022. Wind energy would be 0.81% of the EU GDP by 2030.



Source: Deloitte for ETIPWind

Jobs in the wind energy industry by 2030

The number of jobs in 2030 would increase to 936,000 under the REPowerEU targets for wind energy.



Source: Deloitte for ETIPWind

Annex

Annex: EU Wind Energy sector direct contribution to GDP from 2011 to 2016 in current and real prices (base 2010)

EU-28 (MW)	2011		2012			2013			2014			2015			2016			2017			2018			2019			2020			2021			2022		
	Constant prices	Current prices	Constant prices	% Y-o-Y change	Current prices	Constant prices	% Y-o-Y change	Current prices	Constant prices	% Y-o-Y change	Current prices	Constant prices	% Y-o-Y change	Current prices	Constant prices	% Y-o-Y change	Current prices	Constant prices	% Y-o-Y change	Current prices	Constant prices	% Y-o-Y change	Current prices	Constant prices	% Y-o-Y change	Current prices	Constant prices	% Y-o-Y change	Current prices	Constant prices	% Y-o-Y change	Current prices			
Internal final demand	43.0	43.5	45.2	5%	46.3	41.8	-7%	43.7	44.3	6%	47.2	46.7	5%	50.6	43.9	-6%	48.2	44.6	2%	49.7	45.9	3%	52.2	47.9	4%	55.7	55.5	16%	65.6	60.4	9%	73.6	63.5	5%	80.7
Net exports	5.3	5.4	5.7	8%	5.9	4.6	-20%	4.8	4.4	-4%	4.7	3.8	-13%	4.1	4.2	10%	4.6	4.7	12%	5.2	3.7	-22%	4.2	3.8	3%	4.4	1.4	-62%	1.7	2.2	52%	2.6	1.9	-13%	2.4
Gross exports	10.1	10.2	11.0	8%	11.2	9.8	-10%	10.3	9.6	-2%	10.3	9.5	-1%	10.3	10.3	8%	11.3	10.7	3%	11.9	10.2	-5%	11.6	11.7	15%	13.6	9.1	-22%	10.8	9.8	8%	12.0	9.1	-7%	11.6
Imports	4.8	4.9	5.2	8%	5.3	5.2	0%	5.5	5.3	0%	5.6	5.7	9%	6.2	6.1	7%	6.7	6.0	-2%	6.7	6.5	9%	7.4	7.9	21%	9.2	7.7	-2%	9.1	7.7	0%	9.4	7.2	-6%	9.2
Intermediate inputs demand	31.6	31.9	33.1	5%	34.0	28.2	-15%	29.5	29.5	5%	31.5	29.8	1%	32.3	27.7	-7%	30.4	27.2	-2%	30.4	28.0	3%	31.9	29.1	4%	33.8	36.0	24%	42.6	37.3	4%	45.5	39.1	5%	49.7
Demand	16.7	16.9	17.8	6%	18.2	18.2	2%	19.0	19.2	6%	20.4	20.7	8%	22.4	20.4	-2%	22.4	22.0	8%	24.6	21.6	-2%	24.5	22.6	5%	26.3	20.9	-8%	24.7	25.3	21%	30.8	26.3	4%	33.4
Total revenue	53.1	53.6	56.0	5%	57.4	51.5	-8%	53.9	53.9	5%	57.4	56.2	4%	60.9	54.2	-4%	59.6	55.3	2%	61.7	56.1	1%	63.8	57.0	2%	66.2	61.4	8%	72.6	66.1	8%	80.5	68.6	4%	87.2
Total expenditures	36.3	36.7	38.2	5%	39.2	33.4	-13%	34.9	34.7	4%	37.0	35.5	2%	38.5	33.9	-5%	37.2	33.3	-2%	37.1	34.6	4%	39.3	34.4	0%	40.0	40.5	18%	47.9	40.8	1%	49.7	42.3	4%	53.8
Production or value added approach	16.7	16.9	17.8	6%	18.2	18.2	2%	19.0	19.2	6%	20.4	20.7	8%	22.4	20.4	-2%	22.4	22.0	8%	24.6	21.6	-2%	24.5	22.6	5%	26.3	20.9	-8%	24.7	25.3	21%	30.8	26.3	4%	33.4
Compensation of employees	6.3	6.3	6.6	5%	6.8	5.9	-11%	6.2	5.9	0%	6.3	6.4	9%	6.9	6.7	5%	7.4	6.7	0%	7.5	6.8	1%	7.8	7.0	3%	8.2	7.4	6%	8.8	8.0	7%	9.7	8.6	8%	10.9
Gross operating surplus	10.5	10.6	11.2	7%	11.5	12.3	9%	12.8	13.3	8%	14.2	14.3	8%	15.5	13.7	-4%	15.0	15.3	12%	17.1	14.7	-4%	16.8	15.6	6%	18.1	13.5	-14%	15.9	17.3	28%	21.0	17.7	2%	22.5
Income	16.7	16.9	17.8	6%	18.2	18.2	2%	19.0	19.2	6%	20.4	20.7	8%	22.4	20.4	-2%	22.4	22.0	8%	24.6	21.6	-2%	24.5	22.6	5%	26.3	20.9	-8%	24.7	25.3	21%	30.8	26.3	4%	33.4

2022 European Wind Energy Competitiveness Report