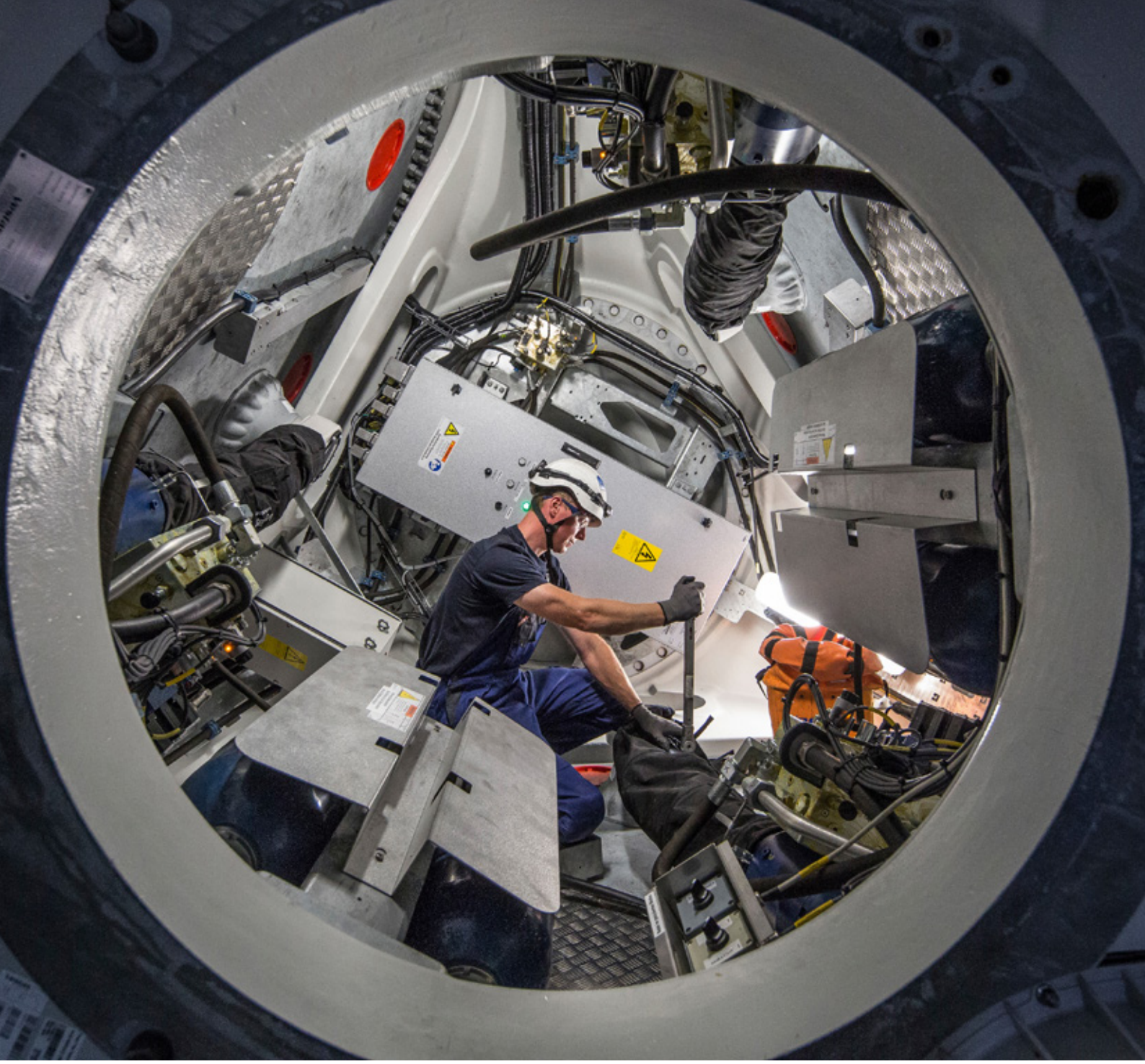

Local impact, global leadership

The impact of wind energy on jobs and the EU economy

Deloitte.

Wind EUROPE

Local impact, global leadership

The impact of wind energy on jobs and the EU economy

November 2017

WindEurope

windeurope.org

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 renewable energies in the economy.

Wind EUROPE

WindEurope has joined a climate neutral printing program. It makes choices as to what it prints, and how, based on environmental criteria. The CO_2 emissions of the printing process are then calculated and compensated by green emission allowances purchased from a sustainable project.

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CONTENTS

EXECUTIVE SUMMARY

Wind energy has transitioned in the last decade from a niche technology to an industrial sector that provides Europe with clean, competitive and reliable energy. In the process Europe has built up a world-beating wind energy industry with turbine manufacturers that lead the global market, developers with an international footprint and unmatched research and innovation capability.

This remarkable development has yielded considerable benefits to the European economy, generating revenue to local communities, creating tens of thousands of high-skilled jobs and reducing Europe's fuel import dependency.

However, international competition in wind energy has intensified in recent years. The growth of wind globally has not translated into more exports for EU manufacturers. The share of EU content in global installed capacity has fallen by 30% since 2011.

The significant international competition, alongside local content requirements and supply chain constraints, have limited the growth potential of European wind turbine and component manufacturers in markets outside the EU.

As the wind energy supply chain shifts to markets outside the EU, Europe risks losing the existing jobs and positive trade balance that wind energy has brought. European governments should respond with policies that will revive the local market and preserve the economic benefits. For Europe to cement its domestic leadership in wind energy there needs to be a strong domestic market.

This report details the economic footprint of the wind sector from 2011 to 2016 to inform the discussions on Europe's energy future as part of the Clean Energy Package[1]. It also recommends the policy and other measures that are needed to ensure Europe gets the most out of wind energy.

1. For economic indicators from 2007 to 2011 see the Green Growth report (available at http://www.ewea.org/fileadmin/files/library/publications/reports/Green_Growth.pdf)

Boosting the European economy

- The wind energy industry contributed (directly and indirectly) €36.1bn to the EU's Gross Domestic Product (GDP) in 2016. That is 0.26% of the overall EU GDP.
- The direct contribution was €22.3bn in 2016, up from €16.7bn in 2011. This 33% growth was four times higher than the EU's GDP growth over the period.
- The indirect contribution of wind energy to the EU GDP was €13.8bn in 2016. Every €1,000 of revenue in wind energy creates €250 of economic activity in other industrial sectors, including electrical equipment and machinery, metals, construction and engineering.

Cementing global leadership

- In 2016 the European wind energy industry exported €7.8bn and imported €5.4bn worth of products and services.
- While the industry remains a global net exporter with a €2.4bn positive trade balance, imported wind energy inputs have increased from 13% of total industry expenditure in 2011 to 16% in 2016.
- Over 80% of European wind energy companies have a commercial presence and manufacturing sites outside of Europe in more than 80 countries. Of the 10 biggest wind turbine manufacturers in the world, five are EU-based.

Creating jobs in Europe

- Wind energy has created jobs, not only in turbine manufacturing and electricity production, but also in many other industries and economic sectors. In 2016 the wind energy industry accounted – both directly and indirectly – for 262,712 jobs in the EU.

An innovation hub for Europe[2]

- The wind energy industry spent 4.9% of its GDP on research and development (R&D) activities in 2016. R&D spending has consistently represented around 5% of the industry's GDP, well above the economy-wide average of 2%. It is also considerably higher than the EU's objective of 3% of GDP being invested in R&D.

Reducing energy dependency and cutting CO_2 emissions

- Wind energy displaces electricity generated by fossil fuels. This not only reduces CO_2 emissions but also avoids the cost of buying those fuels.
- In 2016 wind energy avoided 34,578 ktoe (kilotonne of oil equivalent) fossil fuel imports in the EU, and a total of 171,951 ktoe for the period 2011-2016. This translates to €32bn in cost savings over the period.

Contributing with taxes

- The wind energy industry contributed €4.9bn in taxes to the EU economy in 2016. These include mostly corporate and income taxes, but also regional, local and property taxes. Taxes paid by the wind energy sector have grown by 46% between 2011 and 2016.

Capitalising on global leadership while delivering on Europe's 2030 Climate and Energy objectives

- The wind energy industry will continue to be a driver for economic growth over the coming years.
- By 2030 the wind industry's contribution to the EU's GDP could double and the sector could generate 0.51% of the EU's GDP whilst potentially doubling employment under the *Central Scenario*[3].

2. Modified on April 2018
3. See WindEurope's report "Wind Energy in Europe: Scenarios to 2030"

POLICY RECOMMENDATIONS

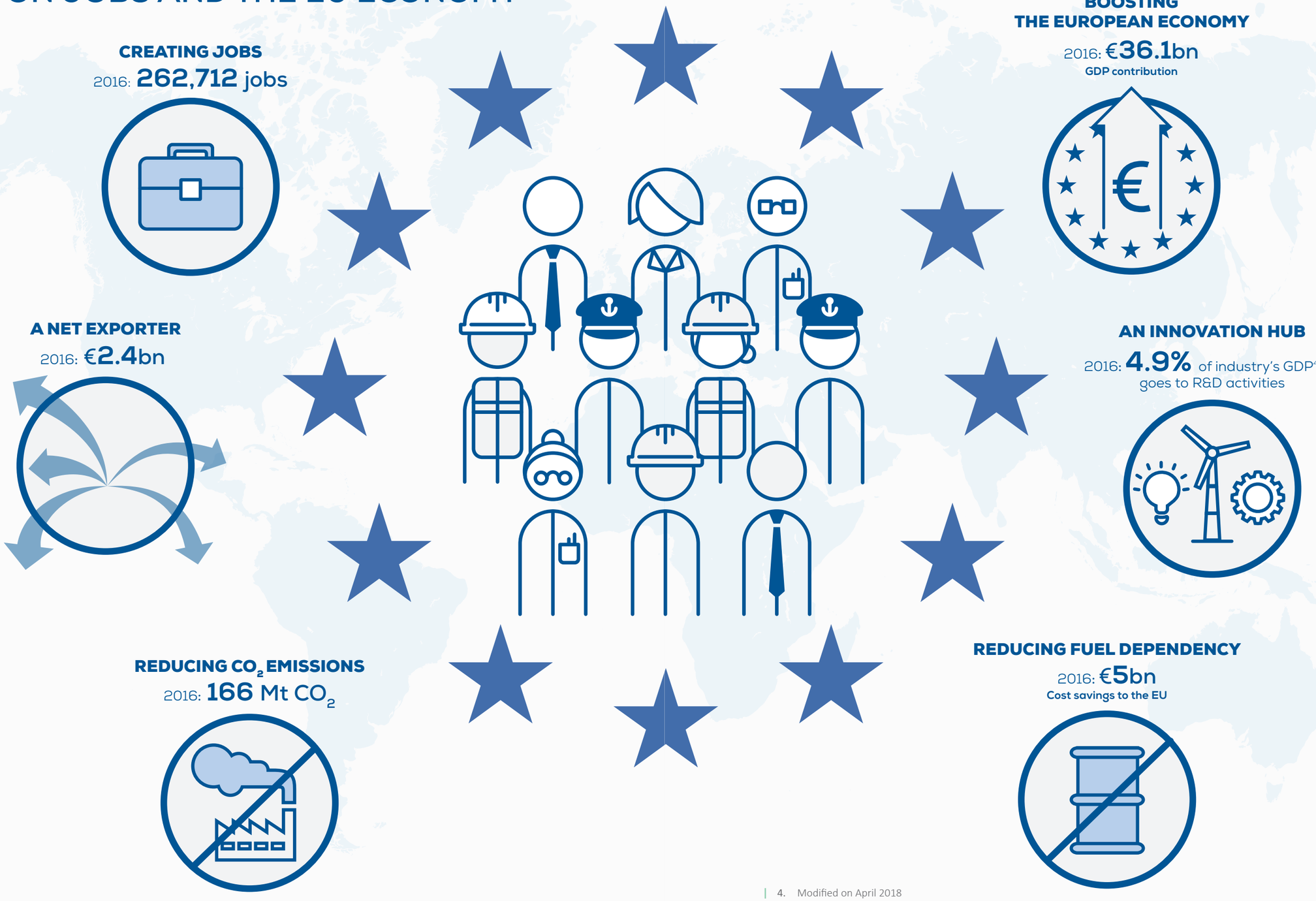
Ensuring a cost effective energy transition while maintaining Europe's global leadership in wind energy will require a comprehensive and ambitious EU Clean Energy Package. The EU must also make a clear choice in favour of the renewables-based electrification of heating, cooling and transport, while ensuring its trade, industrialisation, research and innovation policies underpin its Climate and Energy ambitions.

- The EU should raise its 2030 **renewable energy target to at least 35%** of the final energy demand by 2030.
- EU Member States should adopt **early National Energy and Climate Action Plans based on a binding template** that provides clarity to investors on the post-2020 market volumes, including repowering and lifetime extension.
- The post-2020 Renewable Energy Directive should mandate Member States to **set a forward schedule for renewable energy support** with at least three years' visibility.
- The post-2020 Renewable Energy Directive should set clear design rules for renewable energy support mechanisms, including **technology-specific tenders**.
- In order to support existing investments in wind energy and other renewables, market design rules should **maintain prority dispatch for existing wind power plants** and **ensure new ones are curtailed last** with a market-based approach.
- Member States should **stop capacity payments** to polluting power plants through the adoption of an **Emissions Performance Standard of 550 g CO_2/kWh**.
- Europe should realign the **Emissions Trading System** to deliver the Paris Climate Agreement.
- The next EU Multiannual Financial Framework should **ensure that research and innovation policy and other funding instruments**, in particular for energy and transport infrastructure, drive the transition to a decarbonised energy system.
- Europe's trade policy should **tackle export barriers, in particular local content requirements**, which undermine the cost-effectiveness of the wind industry's supply chain and its competitiveness vis-à-vis conventional energy.
- The EU's industrial policy should continue to **focus on innovation, digitalisation and decarbonisation**.

Photo: Siemens Gamesa Renewable Energy

FIGURE 1

THE IMPACT OF WIND ENERGY ON JOBS AND THE EU ECONOMY



4. Modified on April 2018

Photo: Vestas

1. INTRODUCTION

Europe installed 160 GW of wind power capacity during the last 20 years thanks to the emergence of a quickly maturing industry. 31% of the global installed wind capacity is in Europe. 46% of the global installed wind capacity is manufactured by European companies.

This industrialisation has brought wind energy costs down at a remarkable pace. Onshore wind energy is the cheapest source of new power capacity in many places in Europe today. Offshore wind is not far behind: auction prices in 2016-2017 fell significantly below the industry's cost reduction target of €80/MWh.

The wind energy industry is contributing to a fundamental transformation of the European energy sector. It also represents a growing industrial sector supporting 262,712 jobs and making a notable direct and indirect contribution to the European economy.

This report analyses wind energy's contribution to the EU economy over the period between 2011 and 2016. This contribution is measured across six indicators: Gross Domestic Product (GDP), employment, exports, tax revenues, innovation and energy dependency. These indicators are split between onshore and offshore wind. Between March and September of 2017 Deloitte surveyed more than 400 companies working in wind energy to analyse the following:

- The direct contribution of the sector and its sub-sectors to the EU's GDP, estimated through three different approaches: estimation of demand, production of value added to the economy and estimation of income;
- The indirect contribution to other GDP sectors: metallurgy, electronic equipment providers, chemical industry, financial services, professional services and so on;
- Comparison of the wind energy sector's contribution to GDP with that of other economic sectors;
- Direct and indirect contribution to job creation in the different wind industry sub-sectors, as well as related economic sectors;
- Impact on the European Union trade balance: exports and imports;
- Research and development (R&D) effort in the wind energy industry compared to the rest of the EU economy;
- Impact on reducing greenhouse gas emissions, fossil fuel consumption and energy dependency in the EU;
- Tax balance assessment: corporate, local and regional taxes.

The report also covers the socio-economic benefits of WindEurope's wind energy deployment scenarios to 2030. This includes direct and indirect contribution to the EU's GDP, job creation as well as its impact on greenhouse gas emissions and energy independence. Chapter 9 illustrates the stark differences between the economic activity associated with ambitious wind energy policies and the potential outcome of an unambitious set of policies at EU and national level.

Photo: ENERCON

2.
WIND ENERGY TODAY AND FUTURE GROWTH

With 160 GW of installed capacity at the end of June 2017, wind energy plays a significant role in the European power sector. Installed capacity has grown by an average 11 GW over the last decade. Technology costs have fallen significantly.

This deployment has been underpinned by the development of an industrial base making Europe the global leader in wind energy. Today the EU represents 32% of global onshore wind energy capacity and 86% of global offshore wind energy capacity. The UK alone accounts for 36% of the offshore wind capacity installed globally.

However, growth in Europe has been uneven, leading to market concentration over the years.

Germany represents a third of the installed capacity in the EU, with 32.5%. Spain and the UK follow with 15% and 9.5% respectively. 70% of all the wind power capacity installed in the EU at the end of June 2017 comes from five countries: Germany, Spain, the UK, France and Italy. Four other countries (Sweden, Denmark, Poland, and Portugal) have more than 5 GW installed. Seven other countries have over 1 GW of installed capacity: Austria, Belgium, Finland, Greece, Ireland, the Netherlands and Romania.

The operational wind capacity in the EU at the end of 2016 generated an average of 298 TWh of electricity, enough to power 10.4% of the EU's gross final electricity consumption.

WindEurope forecasts wind power capacity in the next four year period to 2020 to grow at an average annual rate of 12.6 GW. Installed wind capacity in the EU is expected to reach 204 GW by 2020. Wind energy could be the largest source of renewable electricity generation in 2020 and produce enough power to meet 16.5% of Europe's electricity needs.

In the long term, policy ambition and regulatory certainty will be crucial to setting the growth rate of the European wind energy market. Based on different levels of policy ambition, WindEurope has developed three different growth pathways for wind energy by 2030.

In the WindEurope *Central Scenario* wind energy could see a doubling of onshore wind capacity and a fivefold increase in offshore wind capacity. Cumulative installed wind power capacity could reach 323 GW by 2030: 253 GW onshore and 70 GW offshore. Wind energy could produce 888 TWh of electricity, meeting 30% of the EU's power demand.

To achieve this, the *Central Scenario* assumes that the EU goes well beyond a 27% renewable energy target in 2030 through the adoption of the Clean Energy Package proposals presented by the European Commission in 2016. It relies on the implementation of a clear Governance for the Energy Union with detailed National Energy and Climate Plans delivering the EU binding targets and effective regional cooperation.

It also assumes:

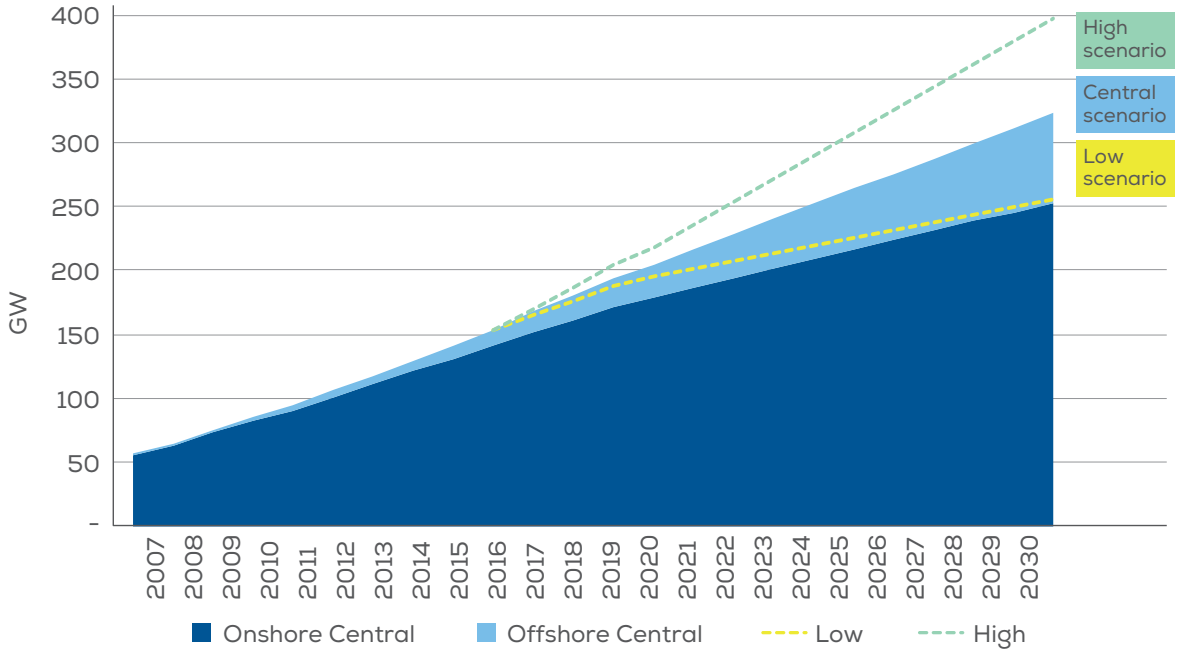
- Sustained progress on system integration to allow for a higher penetration of wind energy and other renewables;
- Sufficient grid infrastructure to meet the EU's 15% interconnection target;
- Clear policy commitments on electrification to drive demand for renewable power;
- Onshore wind cost reductions to continue;
- Offshore wind cost reduction objectives to 2025 are met as a result of governments providing a visible pipeline of projects between 2020 and 2030.

A more ambitious *High Scenario* assumes favourable market and policy conditions including renewable energy deployment going beyond a 35% renewable energy target. If this ambition were realised, a total of 397 GW of wind energy capacity would be installed in the EU by 2030, 298.5 GW onshore and 99 GW offshore. Wind energy could produce 1,129 TWh of electricity, meeting 38% of the EU's power demand.

In contrast, a *Low Scenario* for wind energy sees only 256 GW of wind capacity in 2030, 207 GW onshore and 49 GW offshore. This would lead to 20% less capacity than in the *Central Scenario*, producing only 21.6% of the EU's power demand in 2030 as a result.

FIGURE 2

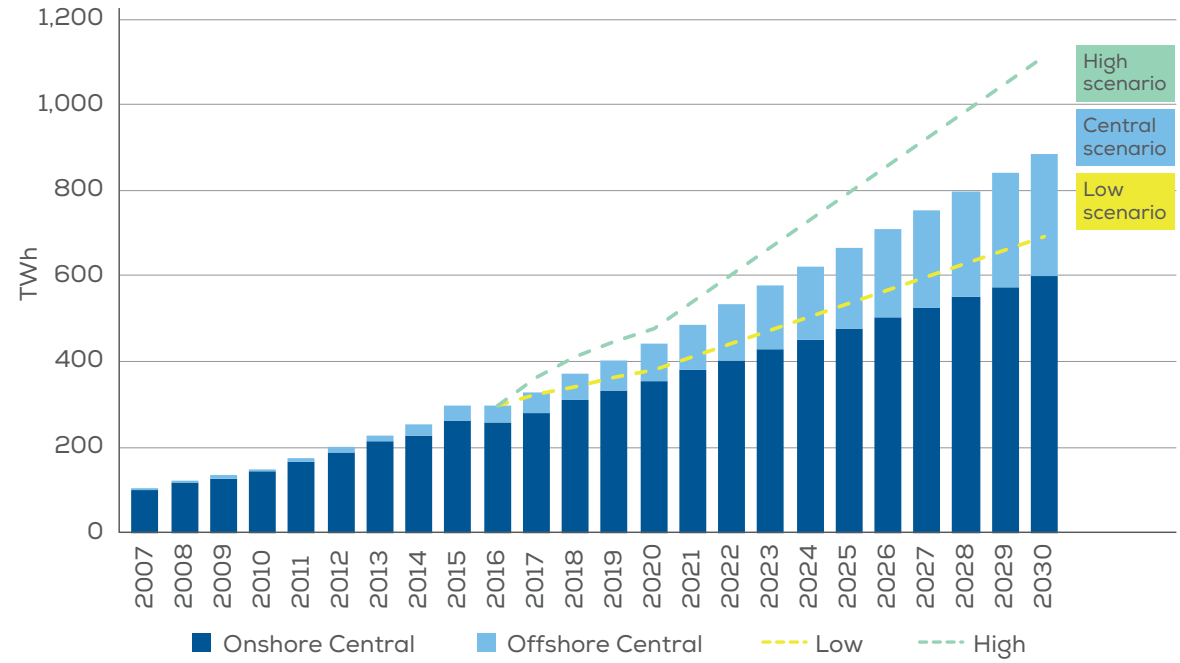
Cumulative wind power capacity in the EU: 2017 to date, 2020 forecasts and possible scenarios to 2030



Source: WindEurope

FIGURE 3

Wind energy generation between 2007 and 2016, 2020 forecasts and possible scenarios to 2030 (TWh)



Source: WindEurope

Photo: Vattenfall

3.

THE IMPACT OF THE WIND ENERGY INDUSTRY ON THE EU ECONOMY

In 2016 the wind energy industry and the activities related to it added €36.1bn to EU GDP[5] in total. €22.3bn of this was a *direct* result of activity within the wind energy industry: onshore and offshore wind energy developers, turbine manufacturers, component manufacturers, service providers, and offshore wind energy substructures.

The deployment of wind energy also requires goods and services from other economic sectors. The interaction of the wind energy industry with these other economic sectors generated an additional €13.8bn of *indirect* economic activity.

5. Real prices, constant 2010 (i.e adjusted for inflation in order to enable comparisons as if prices had not changed. Changes in real terms exclude the effects of inflation)

FIGURE 4

Distribution of the EU added value generated by the wind energy industry in 2016: €bn, real prices (base 2010)

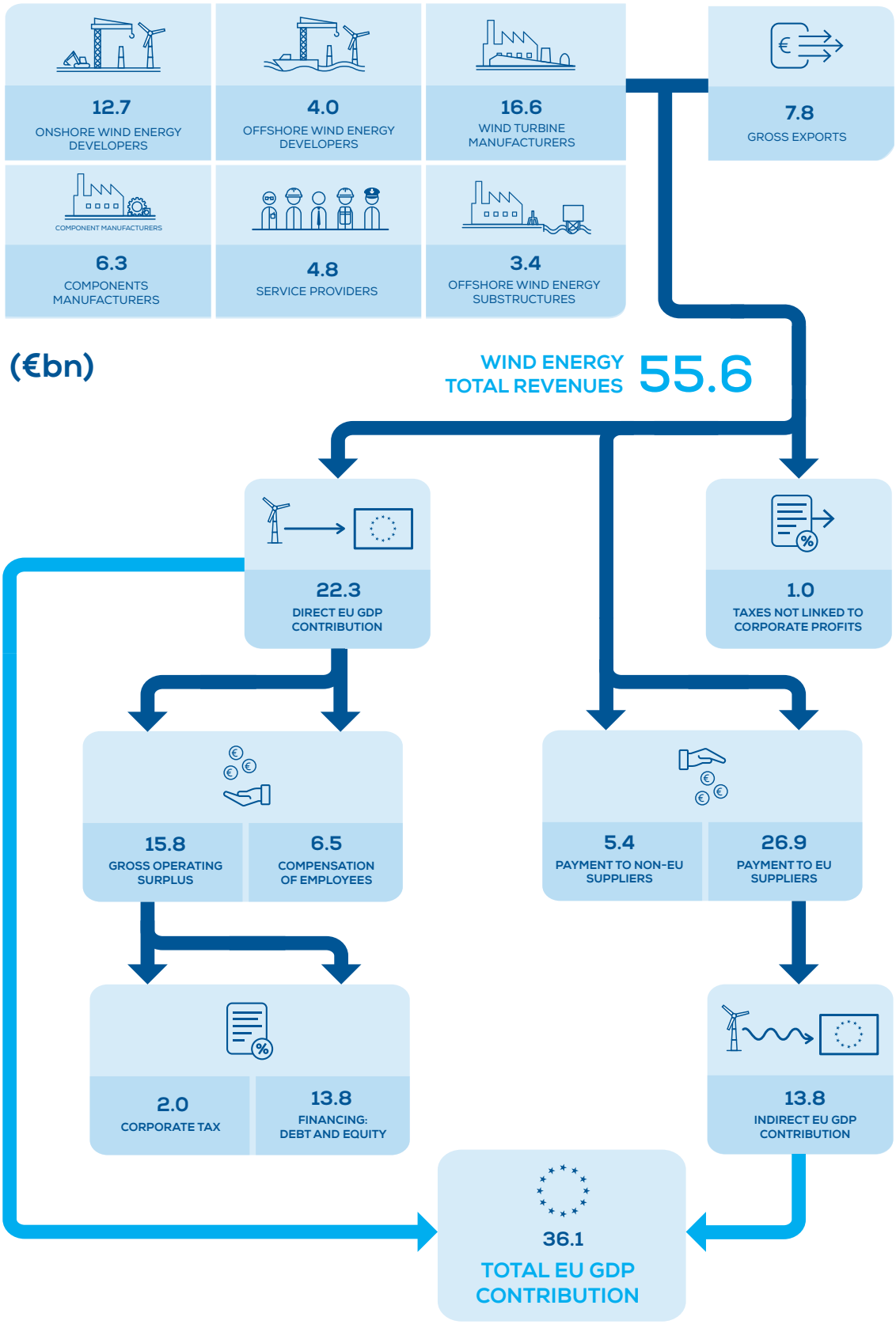
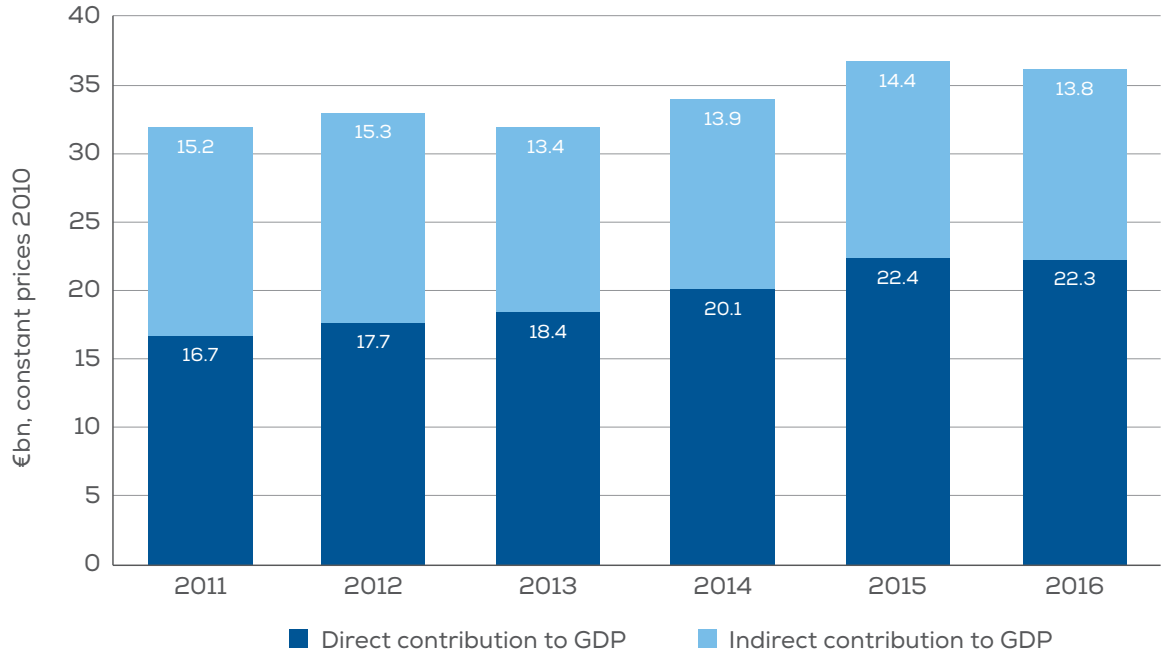


FIGURE 5
Direct and indirect contribution of wind energy to EU GDP (real prices, constant 2010)[6]



Source: Deloitte for WindEurope

The wind industry's contribution to GDP – both direct and indirect – has grown by 13.2% in real terms between 2011 and 2016. This contribution varies with the level of new deployment of new wind power capacity. For instance, contribution was highest in 2015 because 2015 was a record year for wind energy deployment.

Having a robust European wind energy market in the coming years will underpin a sustained contribution from the sector to EU GDP. A robust market requires:

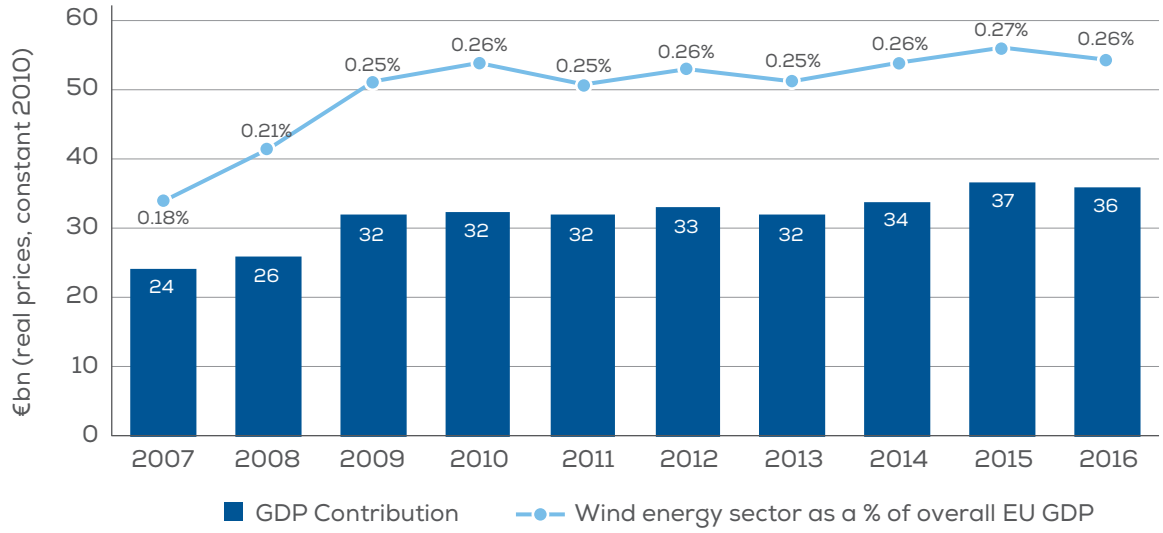
- Ambitious Clean Energy Package;
- Clear governance for the Energy Union with detailed National Energy and Climate Plans;
- Sustained progress on system integration to allow for a higher penetration of wind energy and other renewables;
- Sufficient grid infrastructure to meet the EU's 15% interconnection target;
- Clear policy commitments on electrification to drive demand for renewable power;
- Onshore wind cost reductions to continue;
- Offshore wind cost reduction objectives to 2025 are met as a result of governments providing a visible pipeline of projects between 2020 and 2030.

A robust market also needs sustained, consistent, and visible planning to further buildout.

Though relatively small in size, wind energy has made an important contribution to the EU economy, in particular during challenging economic times. The €36.1bn generated by wind energy in 2016 could cover a quarter of the EU's Budget that same year.

6. Current prices included in Annex 5

FIGURE 6
Wind energy sector's share of total EU GDP

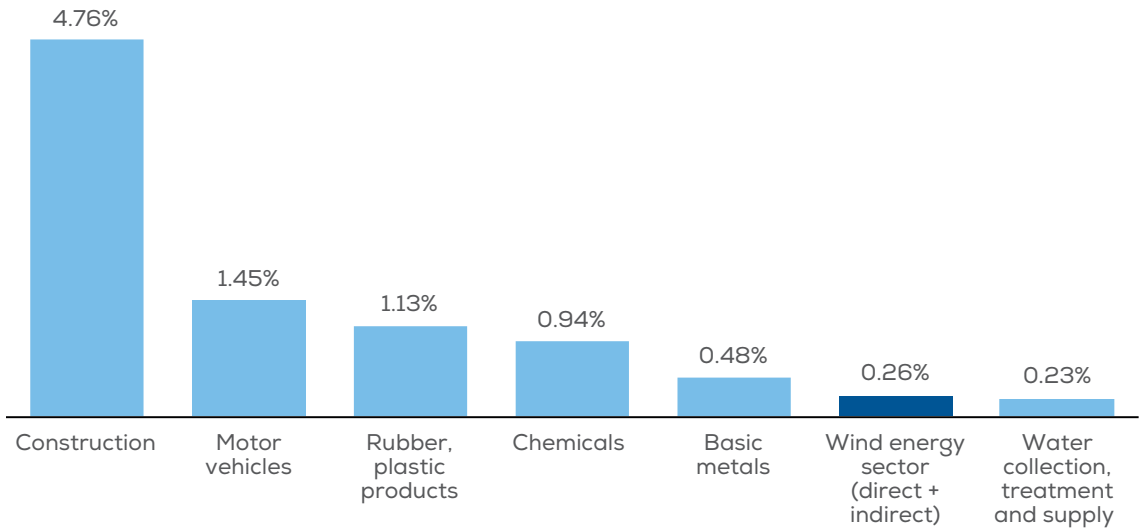


Source: Deloitte for WindEurope

The wind energy industry accounted for 0.26% of the total value of goods and services produced in the EU in 2016. The industry is still young, but its GDP contribution is similar in size to that of entire countries, such as Croatia, Slovenia or Lithuania.

By way of comparison, the basic metals industry accounts for 0.48% of the EU GDP, and the chemicals industry accounts for 0.94%.

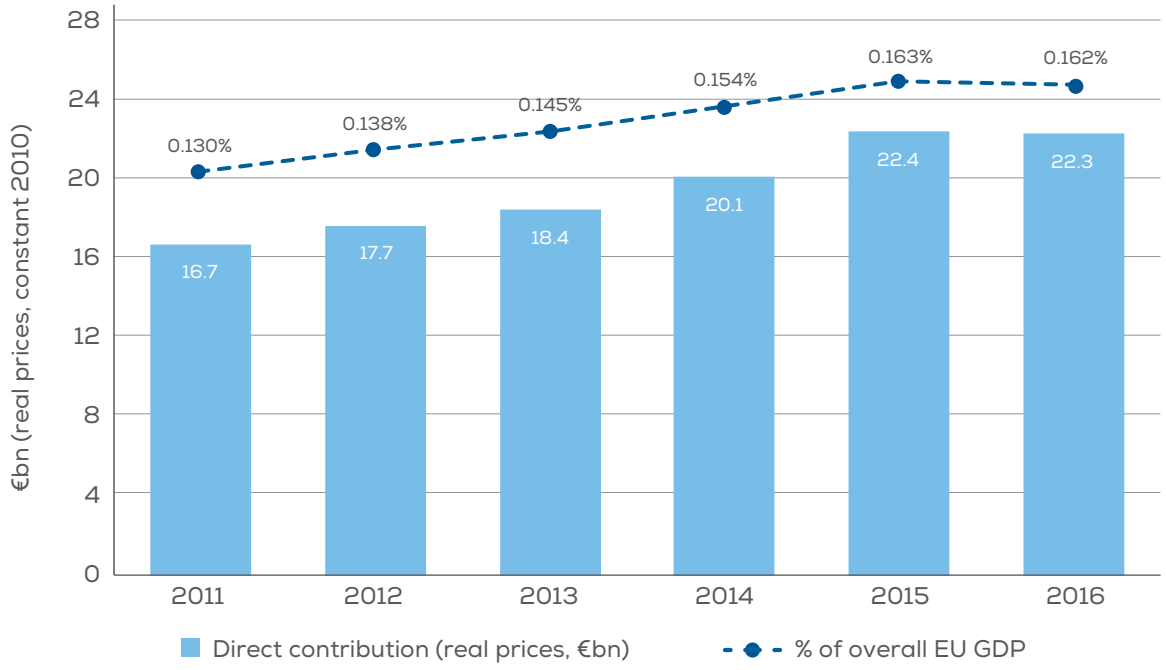
FIGURE 7
Share of GDP of leading EU economic sectors in 2016



Source: Deloitte for WindEurope

3.1 DIRECT IMPACT OF THE WIND ENERGY INDUSTRY ON EU GDP

FIGURE 8
EU wind energy sector's direct contribution to EU GDP in real prices (constant 2010) and % of EU GDP from 2011 to 2016



Source: Deloitte for WindEurope

The direct contribution of the wind energy sector to the EU's GDP was €22.3bn[7] in 2016 in real prices, or €24bn in current prices.

Over the last six years, the wind sector has increased its direct contribution to GDP by 33.2% in real terms, at an average annual growth rate of 6.6%.

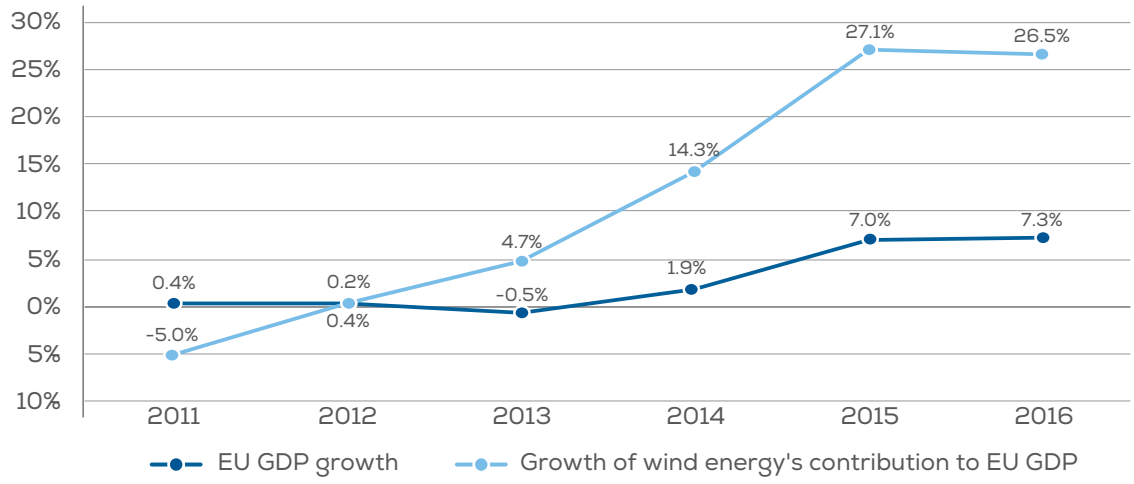
In 2016, the wind industry's direct contribution to GDP was more than 0.16% of the EU's total GDP. This compares to 0.13% in 2011, and less than 0.1% in 2007, illustrating the rapid emergence of a fully-fledged industrial sector.

The growth of the wind indutry's contribution to GDP has been positive for the EU economy, in particular in periods of slow growth.

In 2015 the wind industry's contribution to EU GDP grew by 11.2% on the year before, five times higher than the growth of the EU's GDP itself that year.

7. Real prices, base 2010.

FIGURE 9
Growth of the wind energy industry's direct contribution to GDP indexed to 2010 (in %)

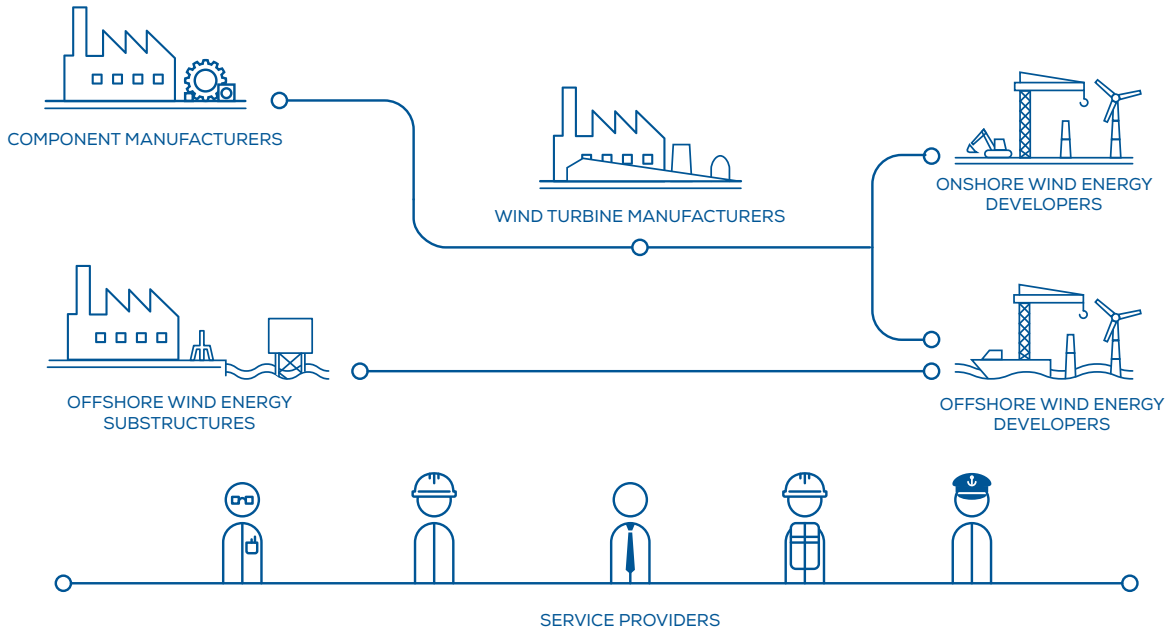


Source: Deloitte for WindEurope

3.2 DIRECT IMPACT OF WIND ENERGY SUB-SECTORS ON EU GDP

The wind energy value chain can be divided into seven sub-sectors, each representing different activities: onshore wind energy developers, offshore wind energy developers, onshore wind turbine manufacturers, offshore wind turbine manufacturers, component manufacturers, services providers and offshore wind energy susbstructure providers.

FIGURE 10
Wind energy value chain



Source: WindEurope

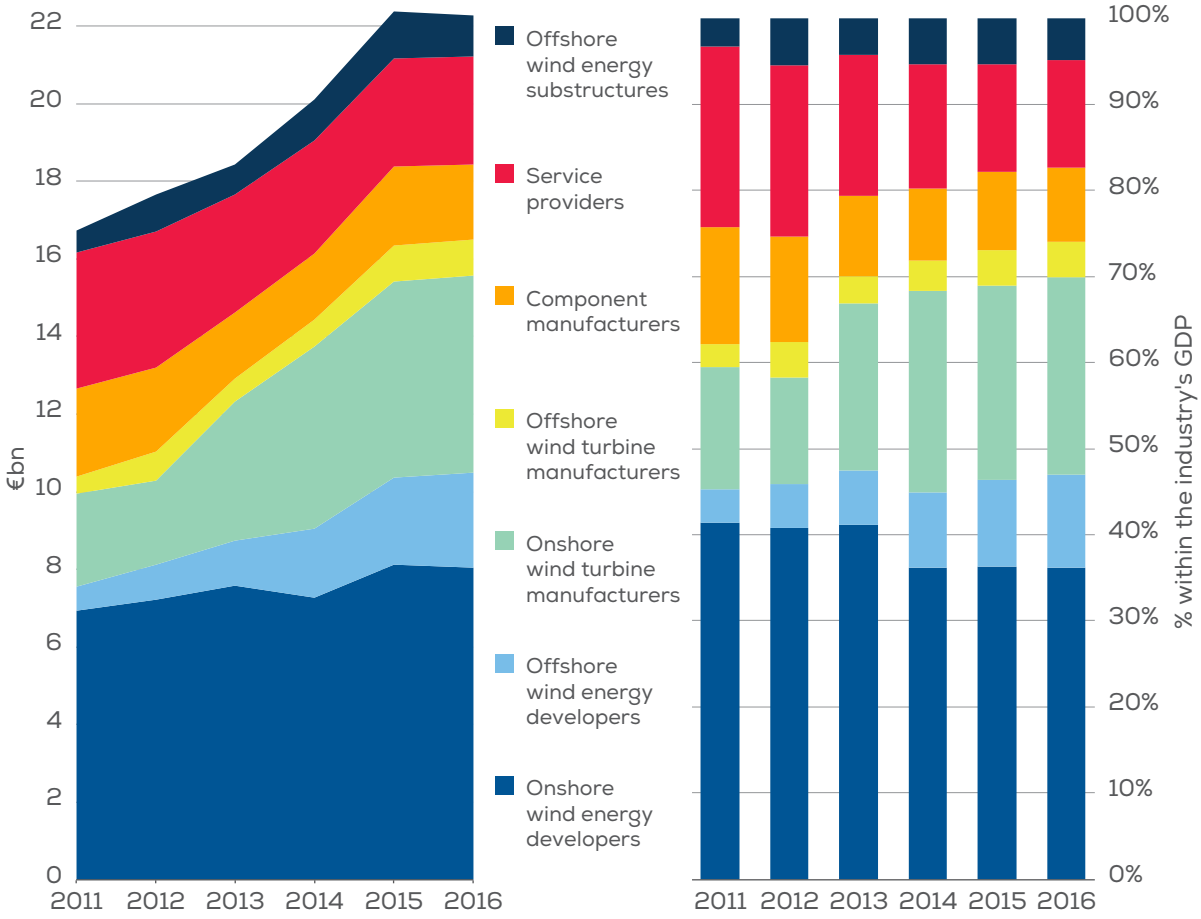
Different variable affect these sub-sectors in such a way that growth of the industry across the value chain can be uneven. The figure below shows the evolution of the different sub-sectors' weight within the industry's GDP.

Wind energy developers have maintained a stable weight within the industry's GDP. While the weight of offshore wind developers has increased within the industry, onshore wind developers have seen their economic activity fall as a share of the total sector from 41.4% in 2011 to 36.1% in 2016.

Despite international competition and rapid cost reductions, growth has been solid for both onshore and offshore wind turbine manufacturers.

In contrast, component manufacturers and service providers have been impacted by the industrialisation of the sector and the development of a global supply chain. The economic activity in these sub-sectors, and therefore their weight within the industry's and the EU GDP, has considerably declined in recent years.

FIGURE 11
Relative weight of the wind industry's sub-sectors in terms of GDP



Source: Deloitte for WindEurope

3.2.1 WIND ENERGY DEVELOPERS

The activity of wind energy developers may have a direct impact on other sub-sectors , notably the wind turbine manufacturers, component manufacturers and service providers.

To avoid double counting, the money that wind energy developers pay towards these suppliers is counted as part of these other sub-sectors' contribution to GDP.

In 2016 wind energy developers represented 47% of the industry's total contribution to GDP, up from 45% in 2011 (Figure 12). Their revenues increased over the last six years, as operational wind capacity – and therefore electricity produced and sold – increased from 95 GW in 2011 to 154 GW in 2016.

ONSHORE WIND ENERGY DEVELOPERS

Among all sub-sectors, onshore wind energy developers provide the largest share of industry revenues. In 2016 onshore wind produced 7.9% of the total electricity generated in Europe and contributed €8bn to EU GDP. Their contribution to the EU's GDP increased by 16.2% from 2011, even though their revenues were subject to high volatility.

Figure 13 shows that wind energy direct revenue per TWh has actually declined by more than 30% in the last six years. This is largely due to cost reductions and the shift from Feed-in-Tariffs to auctions in combination with Feed-in-Premiums resulting from the 2014 European State aid guidelines.

However, the increase in generating capacity over the period has offset the loss of revenue from declining prices, increasing developers' overall revenue and therefore their contribution to EU GDP.

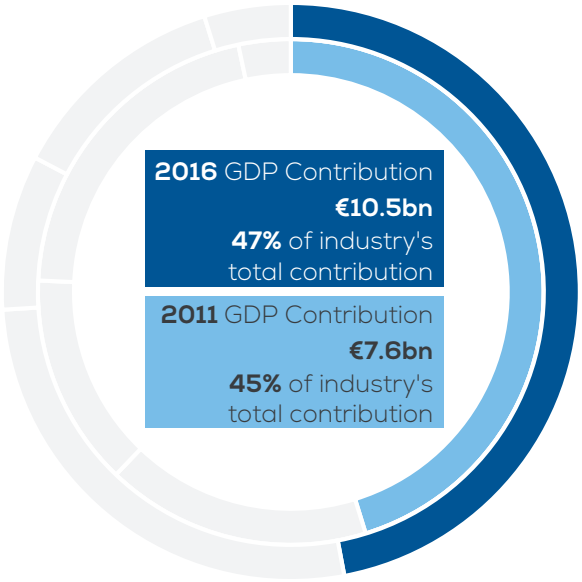
OFFSHORE WIND ENERGY DEVELOPERS

Growth within the developers' sub-sector came mainly from offshore wind developers, whose contribution increased by almost four times between 2011 and 2016. In 2016 offshore wind produced 1.2% of the total electricity generated in the EU and €2.4bn in the EU's GDP.

Technological innovations and sector maturity have made it possible for the offshore wind industry to deliver – and exceed – its cost reduction commitments. Figure 14 shows that between 2011 and 2016, offshore wind developers' revenue per unit of energy generated has declined by 10%. But their GDP impact increased four fold over the same period.

This is an extremely positive development for the sector, which strives to compete with conventional technologies. Ultimately lower energy costs contribute to the competitiveness of the European economy.

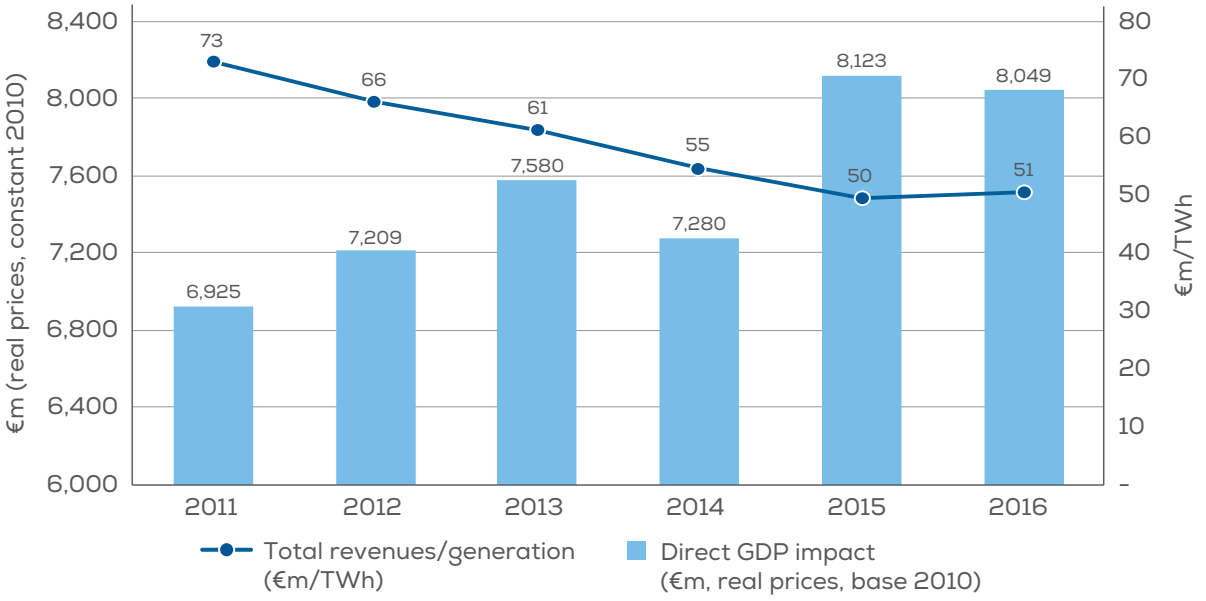
FIGURE 12
Wind energy developers' contribution to EU GDP in 2011 and 2016



Source: Deloitte for WindEurope

FIGURE 13

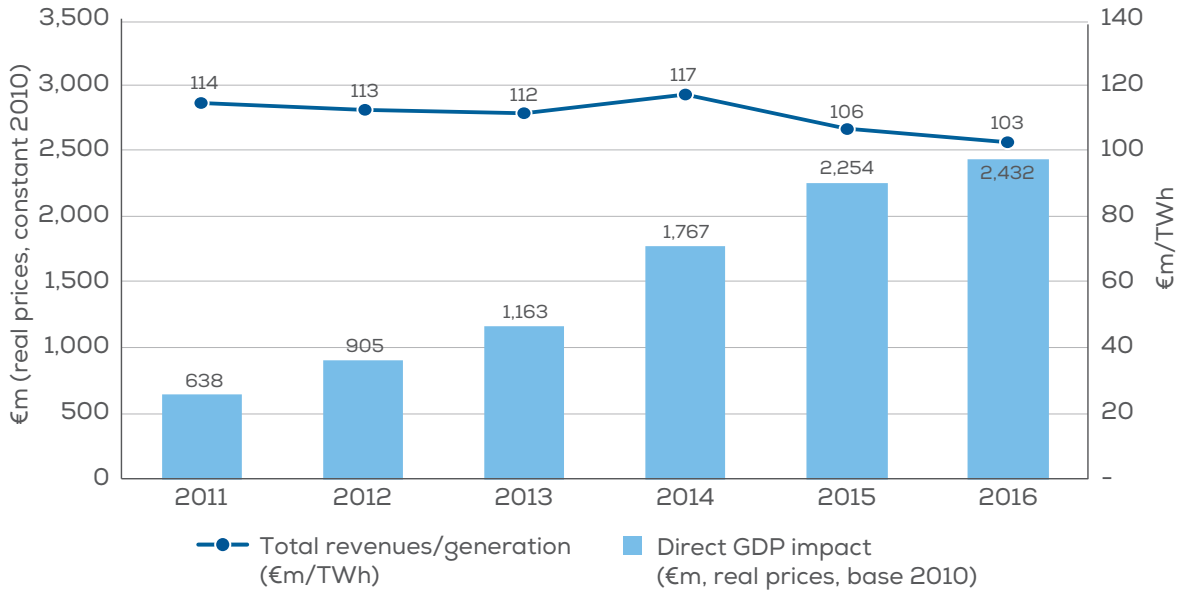
Contribution of onshore wind developers to EU GDP and total revenues per TWh of energy generated



Source: Deloitte for WindEurope

FIGURE 14

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



Source: Deloitte for WindEurope

EGMOND AAN ZEE OFFSHORE WIND FARM

VATTENFALL

Egmond aan Zee is the first large scale offshore wind farm to be built off the Dutch coast. It is jointly owned by Nuon, a subsidiary of Vattenfall, and Shell, who also serves as an off-taker through a power purchase agreement for the entire production of the wind farm.

The wind farm had a total investment cost of over €200m and has been operational since 2006. With a total capacity of 108 MW, its 36 turbines generate enough electricity to power 100,000 households.

Significant employment was created during the construction phase, with over 350 full time equivalent technicians, engineers, supervisors and administration staff employed to build the wind farm. Today, Egmond aan Zee employs up to 20 full time equivalent employees, depending on operational activity during the year.

Besides job creation, the wind farm has generated significant economic activity, in particular through the use of local sub-contractors for the procurement of goods and services. Local infrastructure has also been upgraded, with investments in roads and ports to facilitate the transportation of wind turbines on land as well as at sea.

In addition, a service centre has been opened close to the wind farm, in the region of Ijmuiden. The service centre performs routine checks, maintenance of electrical and mechanical systems, and replacement of components for the wind turbines.

As one of the first offshore wind farms in the country, Egmond aan Zee has contributed to building and improving the local knowledge of offshore wind farms on marine ecology.

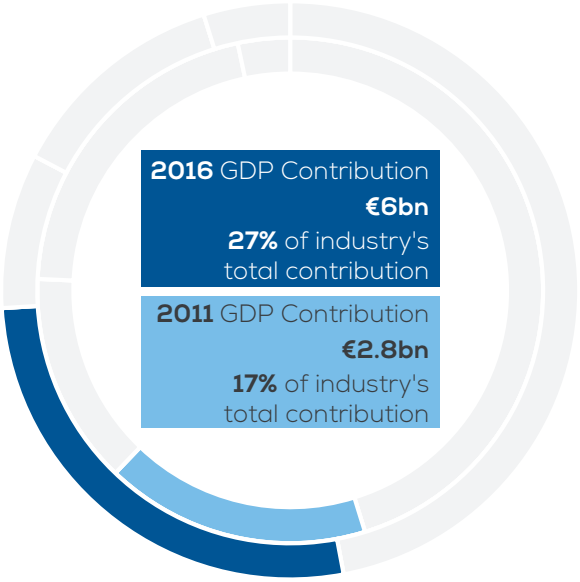
Photo: Vattenfall

3.2.2 WIND TURBINE MANUFACTURERS

A significant part of the revenue generated by wind turbine manufacturers comes from exports to countries outside the EU.

However, due to local content requirements and transportation constraints, some manufacturing also takes place in non-EU countries. Over 339 EU wind energy players have developed activities through subsidiaries outside of the European Union and they span in more than 80 countries[8].

FIGURE 15
Wind turbine manufacturers' contribution to EU GDP in 2011 and 2016



Source: Deloitte for WindEurope

With the growth in installed capacity, wind turbine manufacturers – both onshore and offshore – more than doubled their contribution to the EU's GDP from €2.8bn in 2011 to €6bn in 2016.

Their share in the industry's GDP contribution went up from 17% in 2011 to 27% in 2016. Growth rates started to slow in 2013 due to global competition, lower turbine prices and cost reduction strategies across the value chain.

ONSHORE WIND TURBINE MANUFACTURERS

Onshore wind turbine manufacturers more than doubled their contribution to the EU's GDP, from €2.4bn in 2011 to €5.1bn in 2016. This activity includes new capacity additions in the EU as well as exports in non-EU countries.

The rapid growth and expansion of wind power in Europe has resulted in increased competition, pushing turbine prices down. Increased operational efficiency and improved supply chain integration have been crucial to keeping up with international competition in recent years. As a result, onshore wind turbine manufacturers have maintained stable revenues during this period, while increasing their GDP impact. In 2011 the GDP contribution of the sub-sector was equivalent to 15% of the sub-sector revenues. In 2016 their contribution amounted to 32% of the sub-sector's income.

OFFSHORE WIND TURBINE MANUFACTURERS

European offshore wind turbine manufacturers lead the industry worldwide in terms of technology, market share and quality of turbines. The industry has grown from 3 GW of installed capacity in 2010 to 12.6 GW in 2016. Today, Europe accounts for 88% of the global offshore wind installed capacity.

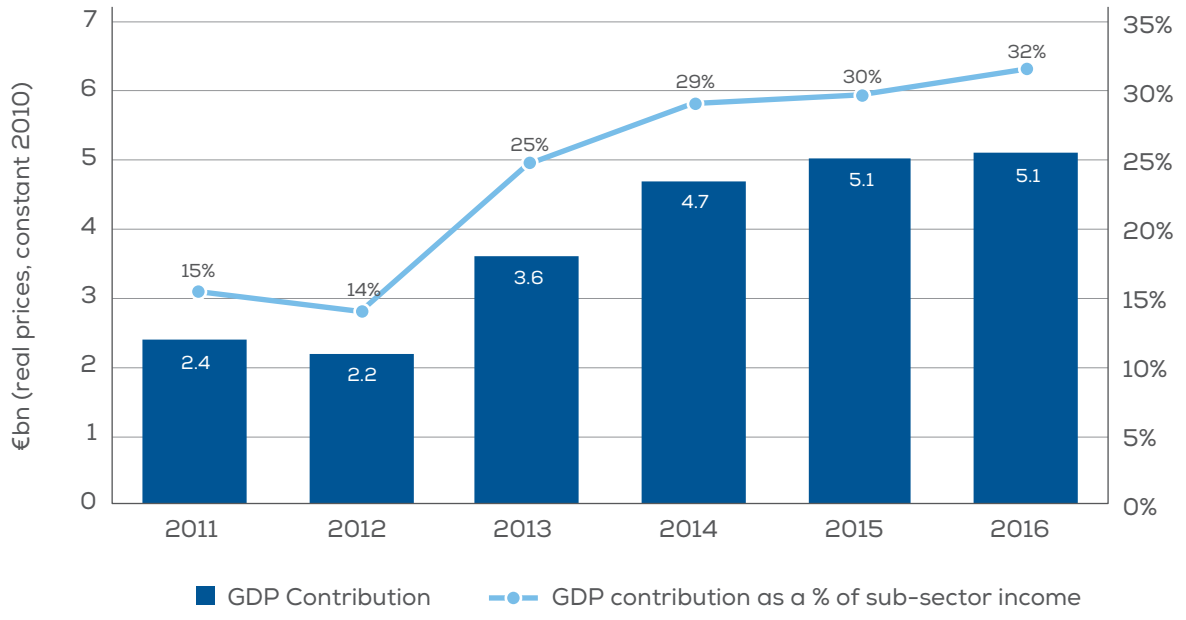
As a result, the contribution of offshore wind turbine manufacturers to the EU's GDP has almost doubled over the period, from €0.5bn in 2011 to €0.9bn in 2016. This translates into a total contribution of over €4.3bn between 2011 and 2016. Overall, the GDP impact of offshore wind turbine manufacturers is equivalent to a quarter of the sub-sector's income.

Technological developments and cost reductions across the industry's supply chain have also impacted the activity of offshore wind turbine manufacturers. Investment costs for an offshore wind turbine in 2016 are around half their cost in 2010. This downward trend in costs has positioned offshore wind as one of the key technologies to deliver on the EU's 2030 Climate and Energy objectives. A robust pipeline of projects of 4 to 7 GW per year will enable this drive towards competitiveness to continue.

8. This activity cannot be counted as part of the EU's GDP. A list of the companies with active operations outside of the EU has been included in Annex IV of this report.

FIGURE 16

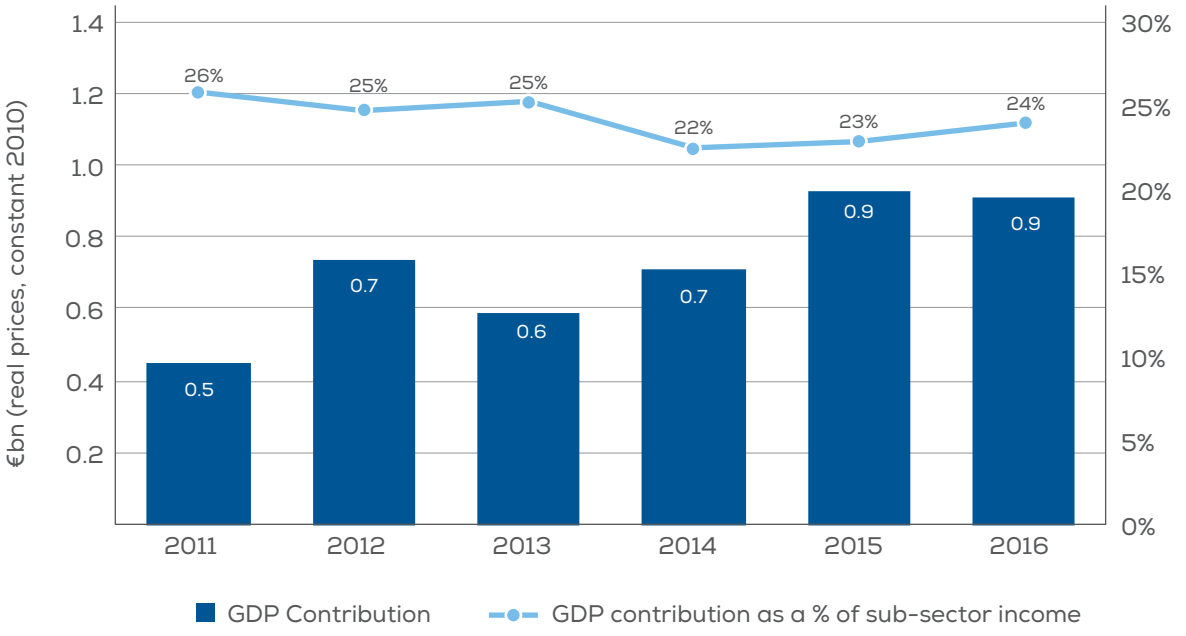
Onshore wind turbine manufacturers' GDP contribution as a percentage of sub-sector income (real prices, constant 2010)



Source: Deloitte for WindEurope

FIGURE 17

Offshore wind turbine manufacturers' GDP contribution as a percentage of sub-sector income (real prices, constant 2010)



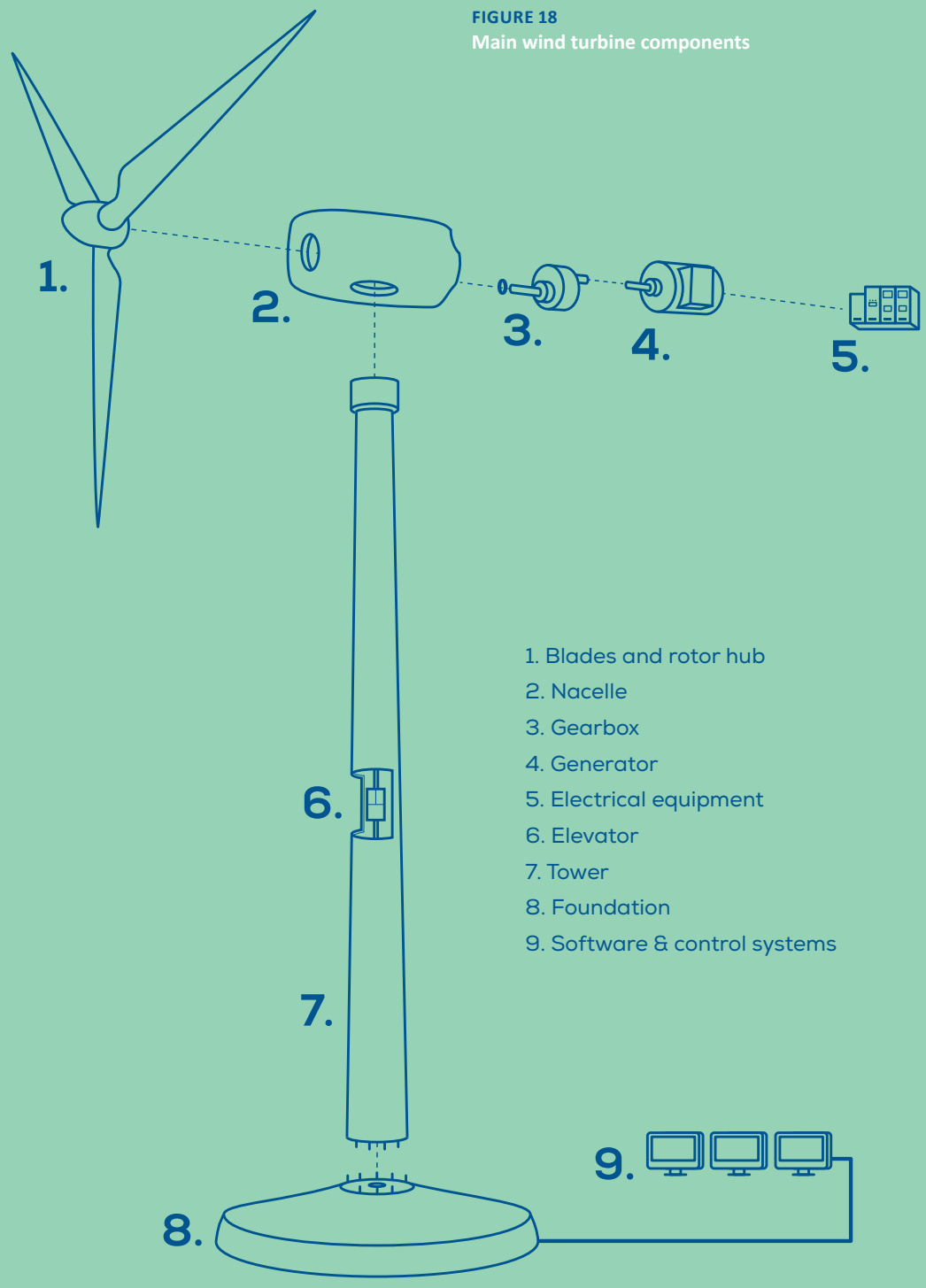
Source: Deloitte for WindEurope

3.2.3 COMPONENT MANUFACTURERS

Many companies today produce both components and complete wind turbines. Some companies produce which are also relevant to other industries.

So, it is important to define the boundaries between wind turbine manufacturing and component manufacturing.

FIGURE 18
Main wind turbine components



Source: WindEurope

For the purpose of this report, the component manufacturing sub-sector includes companies producing goods other than turbines which are specific for the wind industry turbines. More specifically, the sector includes the following components as part of its *direct* GDP contribution:

- Towers
- Brakes
- Blades and rotor hubs
- Elevators
- Generators
- Electrical equipment
- Control and IT equipment
- Software manufacturers
- Other

Other components and raw materials for these families of products are also taken into account. However, they are included in the *indirect* GDP contribution of the wind energy sector.

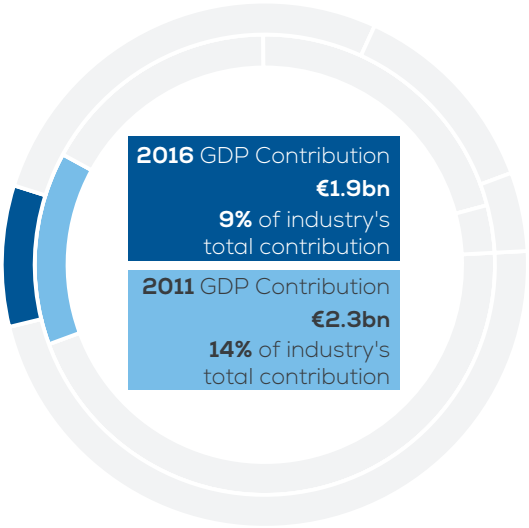
The activity of the component manufacturing sub-sector depends on investments in new installed onshore and offshore capacity, market evolution, production costs and exports to countries outside of the EU.

Component manufacturers contributed €1.9bn to the EU's GDP in 2016, down 17% from €2.3bn in 2011. They generated 9% of the industry's GDP in 2016. This compares to 14% in 2011.

The European wind supply chain is increasingly exposed to international competition in a context of rapid cost reductions. The industrialisation of the sector means it is increasingly drawing on a global supply chain for wind energy components.

FIGURE 19

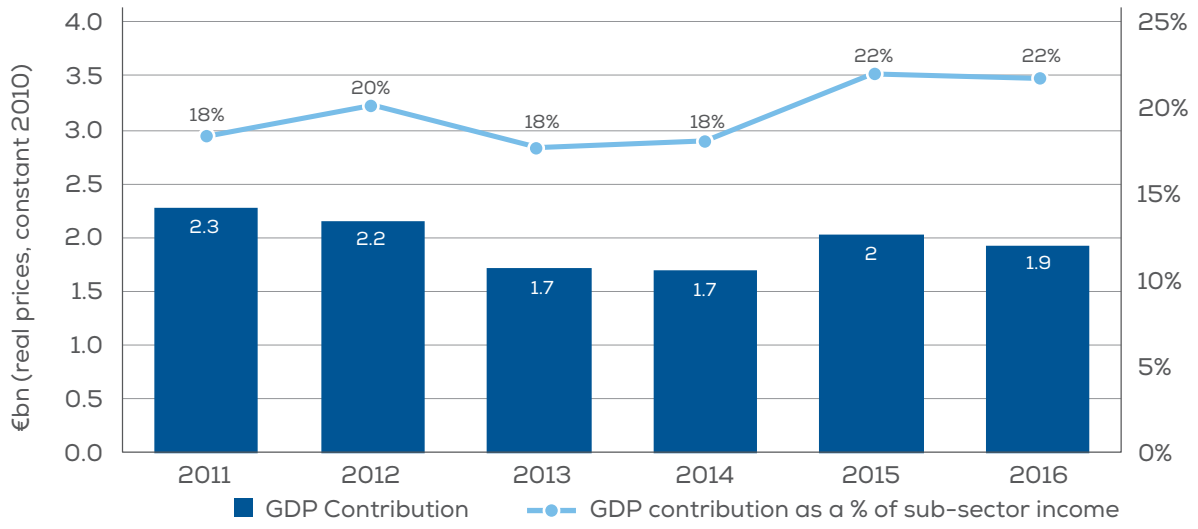
Component manufacturers' contribution to EU GDP in 2011 and 2016



Source: Deloitte for WindEurope

FIGURE 20

Contribution of the component manufacturing sub-sector to EU GDP (real prices, constant 2010)



Source: Deloitte for WindEurope

This has resulted in a 28% decline in the component manufacturers sub-sector revenues between 2011 and 2016. But overall the share of revenues contributing to GDP remained steady over this period. In 2016, the GDP impact of component manufacturers was 21.8% of the sub-sector income, compared to 18.4% in 2011.

Having a robust market in Europe and sustained investments in research and innovation will be critical to ensuring players in the European supply chain maintain their competitive edge. This is all the more relevant as wind supply chains in the US and China benefit from great investor certainty resulting from robust and clearer regulatory frameworks compared to the EU.

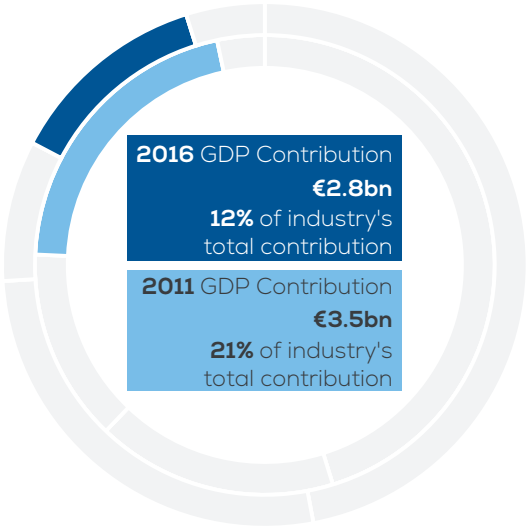
3.2.4 SERVICE PROVIDERS

The service providers sub-sector covers specialised services provided by or to the other sub-sectors. Specifically, these include:

- transport of wind energy equipment;
- maintenance services;
- monitoring and control equipment;
- wind energy engineering;
- consulting companies (resource assessment, location evaluation and so on);
- information providers;
- R&D agents;
- training providers;
- specialised insurance services and sector associations.

The services sub-sector's share of the industry's GDP reflects two main trends. The first one is sector maturity and the experience acquired over two decades of growth. The second one is the vertical integration ongoing in the wind energy industry.

FIGURE 21
Services providers' contribution to EU GDP in 2011 and 2016

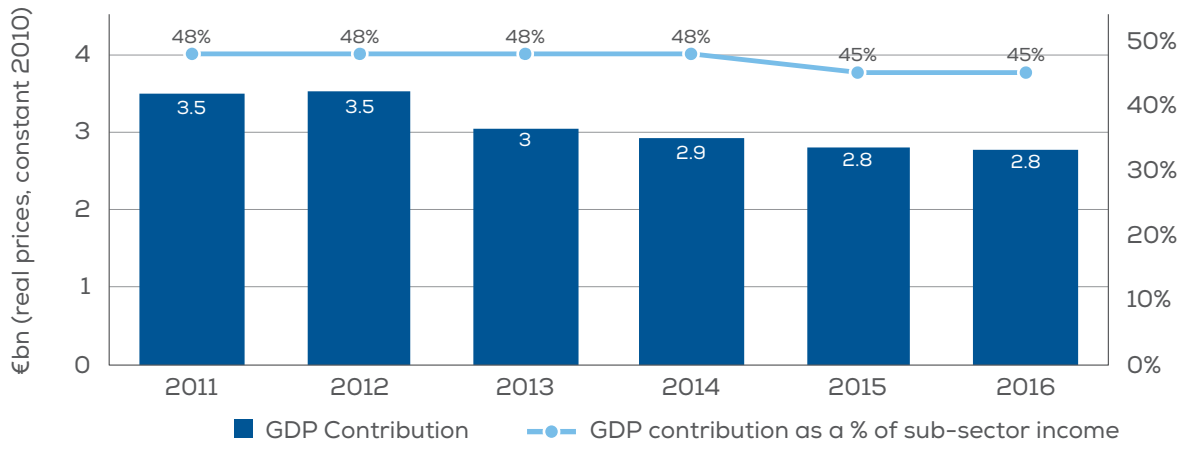


Source: Deloitte for WindEurope

In 2016 service providers generated 12% of the wind energy industry's GDP. Their impact was much higher in 2011, when they generated 21% of the wind energy industry's GDP.

While their GDP contribution has decreased between 2011 and 2016, the share of their income that goes towards their GDP contribution has remained steady throughout the period at 45-48% (figure 22).

FIGURE 22
Contribution of the service providers to EU GDP (real prices, constant 2010)



Source: Deloitte for WindEurope

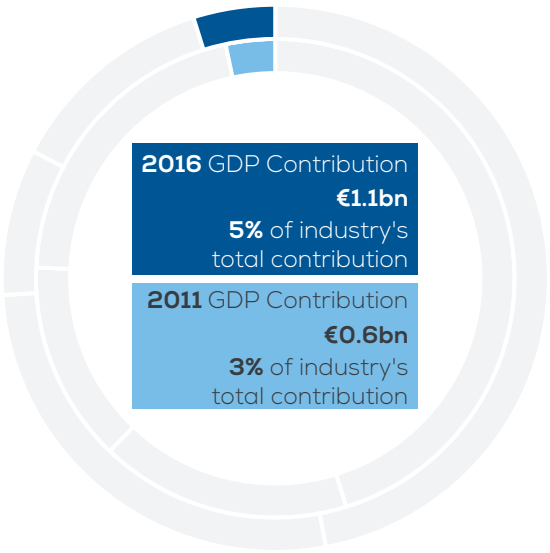
3.2.5 OFFSHORE WIND ENERGY SUBSTRUCTURES

The "offshore wind energy substructures" sub-sector covers the manufacturing of specific equipment, such as foundations, offshore substations, as well as moorings and anchoring systems for floating offshore wind.

With the growth of the offshore wind industry, related infrastructures have also experienced significant increases in activity.

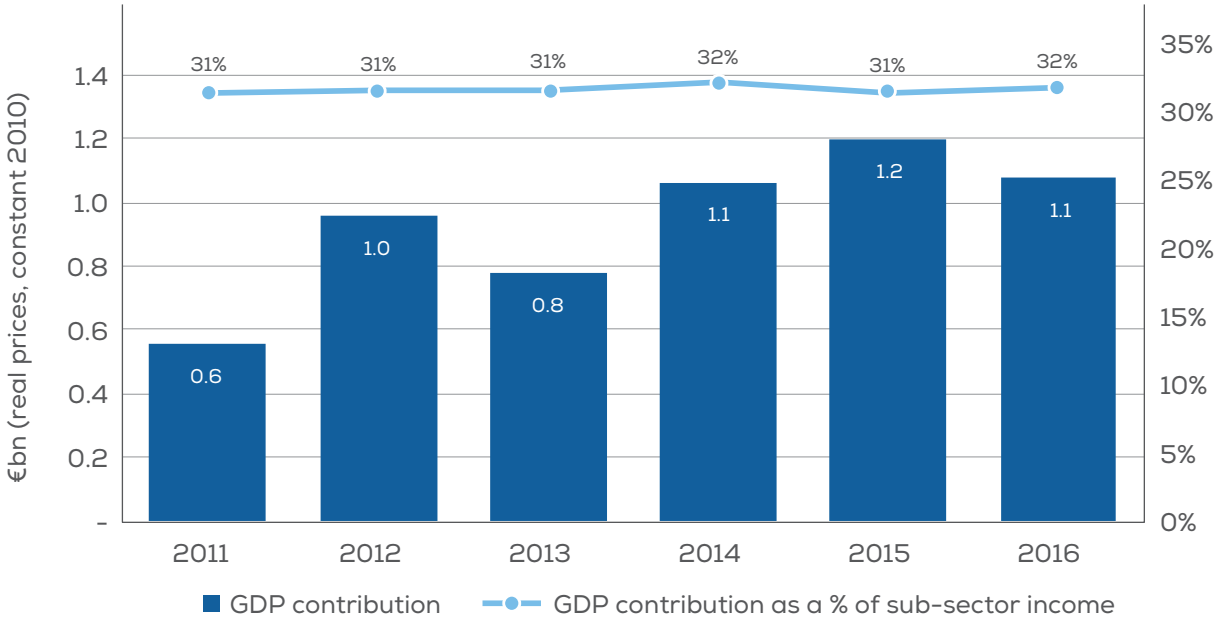
This sector's evolution is linked to the overall growth in offshore wind. Its revenues have doubled during the period, bringing the GDP contribution to €1bn in 2016.

FIGURE 23
Offshore wind energy substructures' contribution to EU GDP in 2011 and 2016



Source: Deloitte for WindEurope

FIGURE 24
Contribution of the offshore wind energy substructure providers to EU GDP (real prices base 2010)



Source: Deloitte for WindEurope

3.3 INDIRECT IMPACT OF THE WIND ENERGY INDUSTRY ON EU GDP

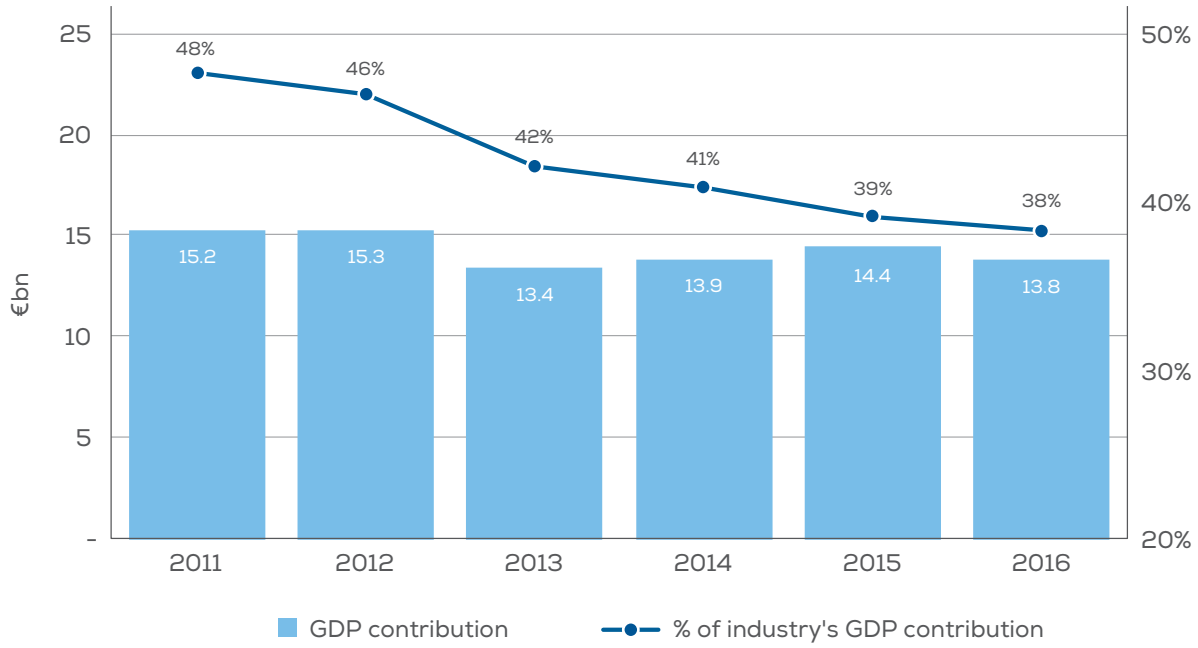
The wind energy industry interacts with and has an impact on numerous other economic sectors. The relationship between the different economic sectors can be calculated by using an input-output model, such as those used by the EU's statistics office, Eurostat. Based on a survey of wind industry players, the data was adapted to single out that activity that can specifically be identified as wind[9].

The sector's indirect contribution to the economy is significant. Increased deployment of wind energy has created strong industrial activities around Europe and in numerous sub-sectors. In 2016 the wind energy industry added €13.8bn to the EU economy as indirect value created by the wind energy industry, an 8.9% decrease on 2011.

The indirect GDP contribution of wind energy depends on the level of interaction between the wind industry and different economic sectors. As the industry grows, there is a higher need for specialised wind industry products and services. As such, there is a shift of activities from indirect impact to direct impact on the EU's GDP. This decline, therefore, reflects the sector's maturity.

EVERY €1,000 IN WIND ENERGY GENERATES €250 REVENUE IN OTHER ECONOMIC SECTORS

FIGURE 25
Indirect impact of the EU wind energy industry (in real prices and % of industry's GDP)



Source: Deloitte for WindEurope

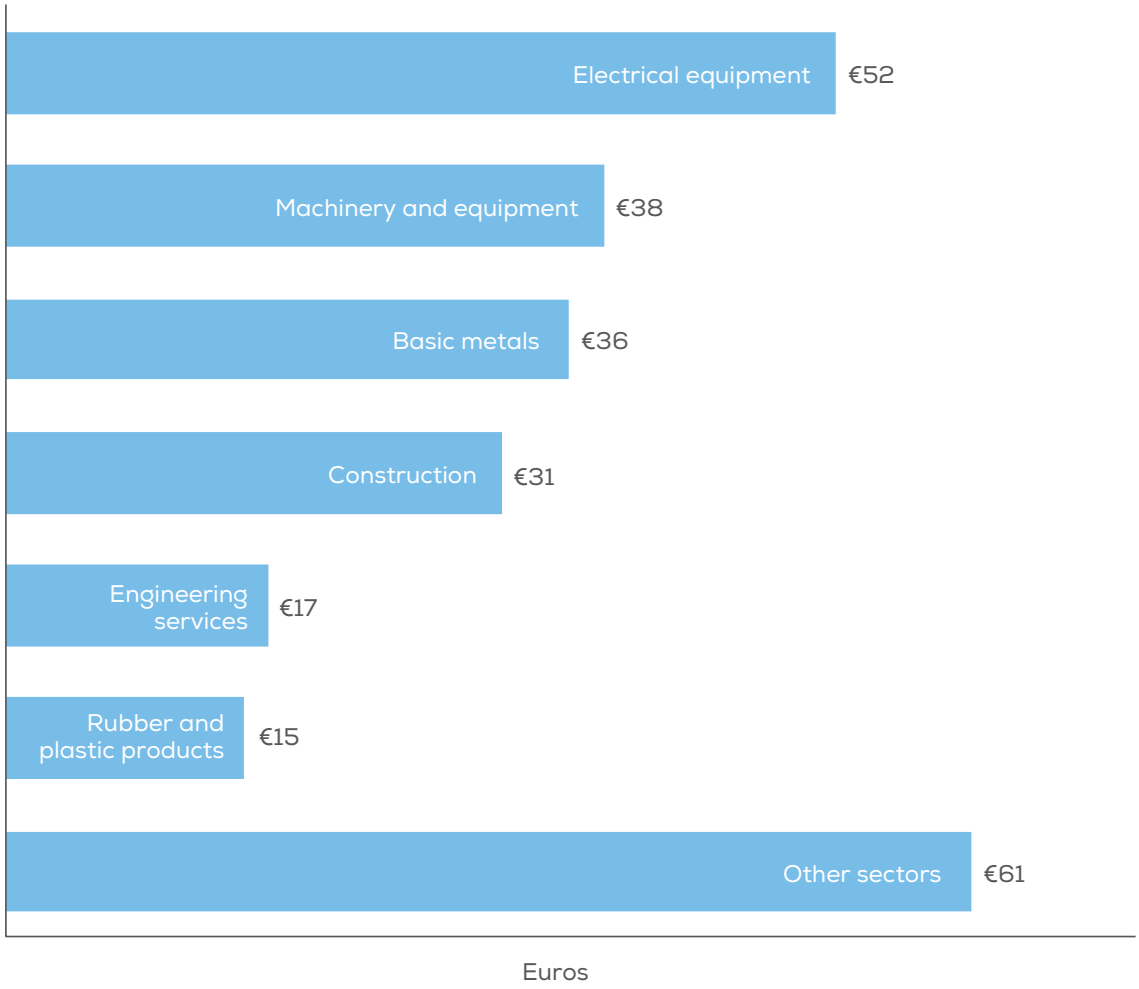
9. Please refer to the methodology in the Annexes for more information.

The electrical equipment sector benefits the most from investments in the wind energy sector. Wind energy created a total of €2.9bn in economic activity in the electrical equipment sector in 2016. Every € spent in the wind energy sector generates € 0.121 in this sector.

The second biggest beneficiary is the machinery and equipment sector, which in 2016 received €2.1bn as a result of wind energy deployment. Basic metals and engineering services follow with €2bn and €0.9bn respectively of economic activity in 2016.

Overall, for every €1,000 of revenue in the wind energy sector, there is €250 worth of economic activity generated in other industrial sectors. Figure 26 shows the indirect value of wind energy to different sectors of the economy.

FIGURE 26
Indirect value added to the economy by the wind industry in 2016: impact of €1,000 on the rest of the economy



Source: Deloitte for WindEurope

HULL BLADE FACTORY

SIEMENS GAMESA RENEWABLE ENERGY

Siemens Gamesa Renewable Energy was created in April 2017, following the merger of Gamesa Corporación Tecnológica and Siemens Wind Power.

The new company employs 27,000 employees globally. It has a combined installed capacity of 80 GW in more than 90 countries, across five continents. The company ranks second in global installations, second in global onshore wind, and first in offshore wind with 8.7 GW installed across Europe.

In January 2015 the company started the construction of a blade manufacturing plant in Hull (Yorkshire and the Humber) in the UK. The plant became operational in 2016. The location was a strategic choice given the importance of the UK in offshore wind, in particular the region of Humber and Alexandra Docks.

The centre covers 540,000 square meters, with the blade manufacturing plant alone occupying 40,000 square meters. The factory had an investment cost of £310m (€400m). Siemens provided £160m, the remaining £150m was provided by Associated British Ports (ABP).

The manufacturing site produces 75-metre turbine blades. All production at the plant during the first two years of operation will serve the domestic market in the UK. In the future, the company expects to export part of the production to supply new projects in the North Sea region as well as international markets.

Since the first day of operation 1,000 direct jobs have been created at the manufacturing site. Almost all these employees (97%) were directly recruited from the region of Hull or within a 30 mile radius. In the first phases of the development of the plant, the initial workforce reached 650 employees, after more than 23,000 professionals had applied for a post. Significant employment has also been created indirectly through the procurement of goods and services from local sub-contractors.

Besides boosting the economy and jobs in the region, the company engages in a range of social initiatives to support the local community. Siemens Gamesa Renewable Energy collaborates with the Ron Dearing University Technical College, which teaches 14-19-year-old students through practical lectures. Pathway Plus is another charitable initiative the company actively participates in to help people with learning disabilities to live independently and find a job.

It is estimated that the use of the turbines produced by Siemens Gamesa Renewable Energy in Hull's blade manufacturing plant can cut CO_2 emissions by over 1 million tonnes per year.

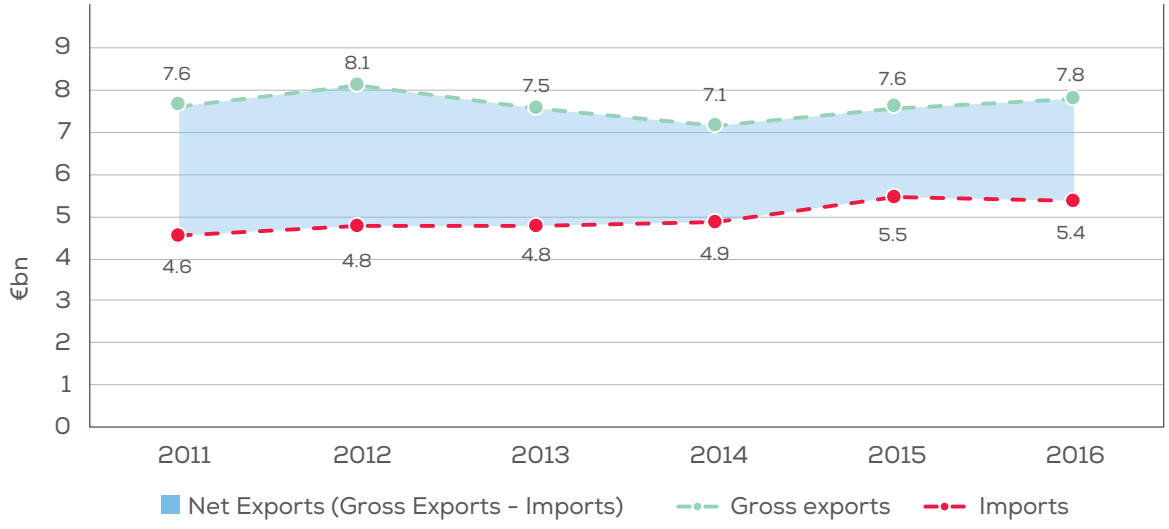
Photo: Siemens Gamesa Renewable Energy

4.

WIND ENERGY EXPORTS AND IMPORTS

The export activity of European wind energy companies has also been important in powering wind energy growth in global markets. Decades of experience, as well as the offering of top quality products and services, have placed the European wind industry at the centre of worldwide value creation. Today, Europe is a global net exporter with a positive trade balance of €2.4bn.

FIGURE 27
Gross exports and imports of the wind energy industry (real prices, constant 2010)



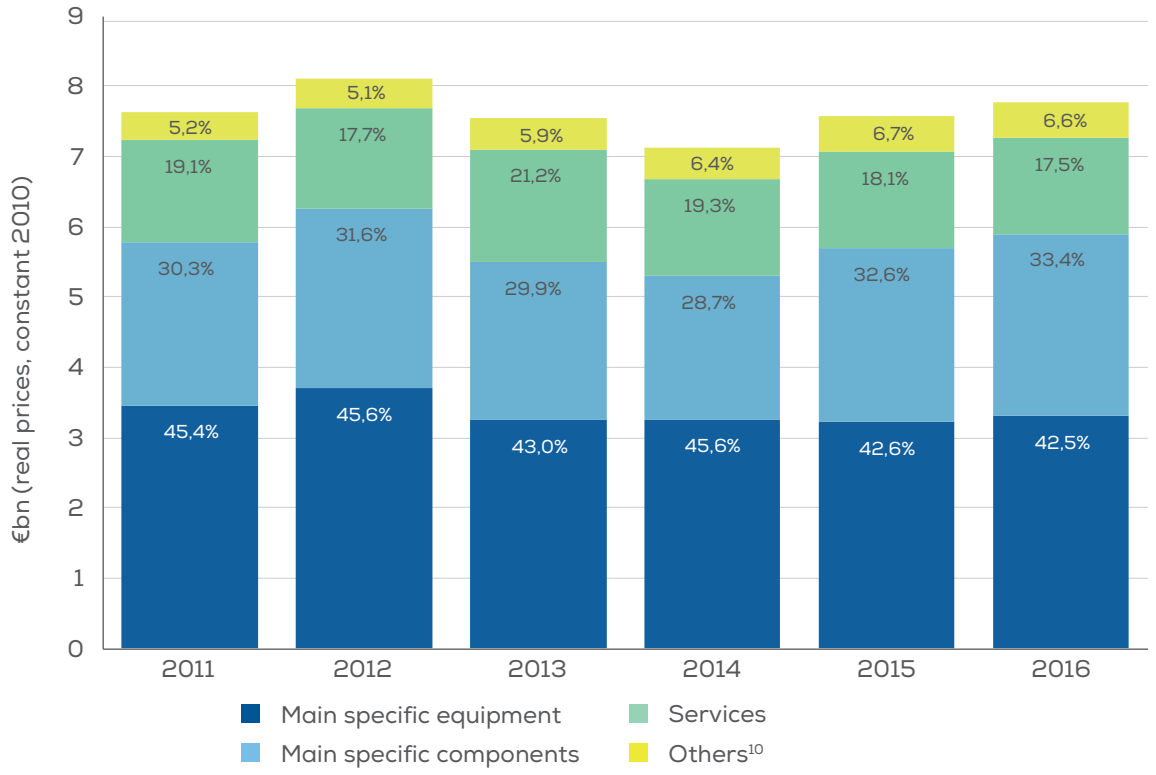
Source: Deloitte for WindEurope

Over the last six years the European wind industry has exported goods and services worth €45.7bn.

Wind turbine manufacturers are responsible for the largest share of exports, ranging from 42% to 45%. Component manufacturers generate the second largest share, with their weight varying from 28% to 32%.

FIGURE 28

EU wind industry exports in absolute terms and their weight within the sector (in constant prices 2010 and percentage)



Source: Deloitte for WindEurope

On average the EU has consistently exported between €7bn and €8bn of wind energy goods and services between 2011 and 2016. Over 75% of these exports are specifically for wind energy components and equipment and in 2016 this equated to €5.9bn (Figure 29).

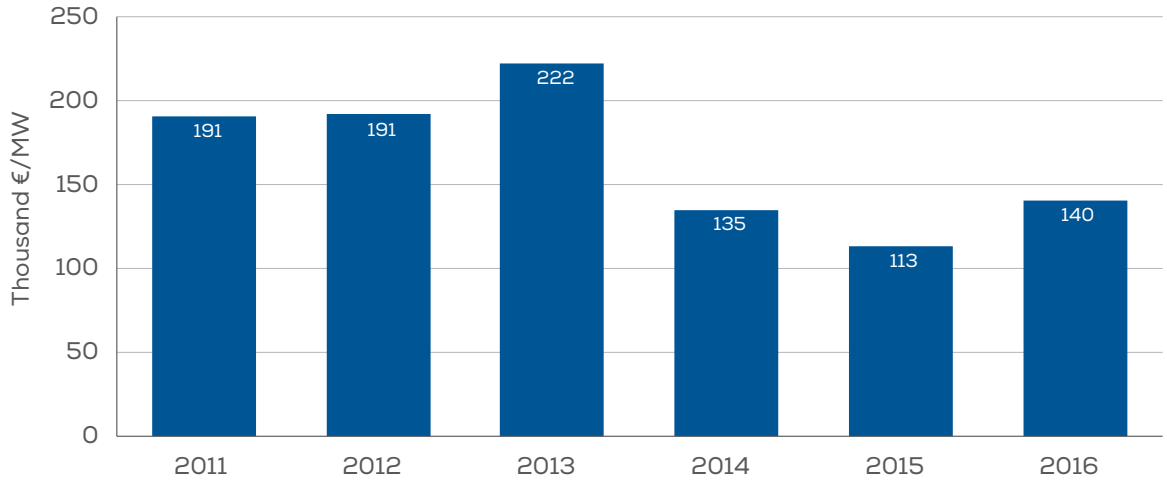
Export revenues of the industry have been stable, but the European content in the installed wind power capacity outside of the EU has declined. This trend can be calculated by dividing the amount of exports for wind energy components and equipment with the amount of wind power installed capacity outside of the EU in a given year.

Figure 29 shows that in 2011 there was approximately €200,000 of EU content in every MW of installed capacity outside of the EU. But in 2016 this number was down to €140,000, mainly due to local content requirements and supply chain constraints. As a result EU wind turbine and component manufacturers have been unable to fully tap the growth potential in markets outside of the EU.

10. Wind energy electricity exports have been included in *Other exports*

FIGURE 29

EU exports of wind energy equipment and components per annual capacity additions outside the EU (in thousand €/MW, constant prices 2010)[11]



	2011	2012	2013	2014	2015	2016
EU exports of specific wind energy equipment and components (€bn, constant prices 2010)	5.8	6.3	5.5	5.3	5.7	5.9
Annual global installed capacity excluding EU (GW)	30	33	25	39	50	42
EU exports of specific wind energy equipment and components ÷ Annual global installed capacity excluding EU capacity (Thousand €/MW, constant prices 2010)	191	191	222	135	113	140

Source: Deloitte for WindEurope

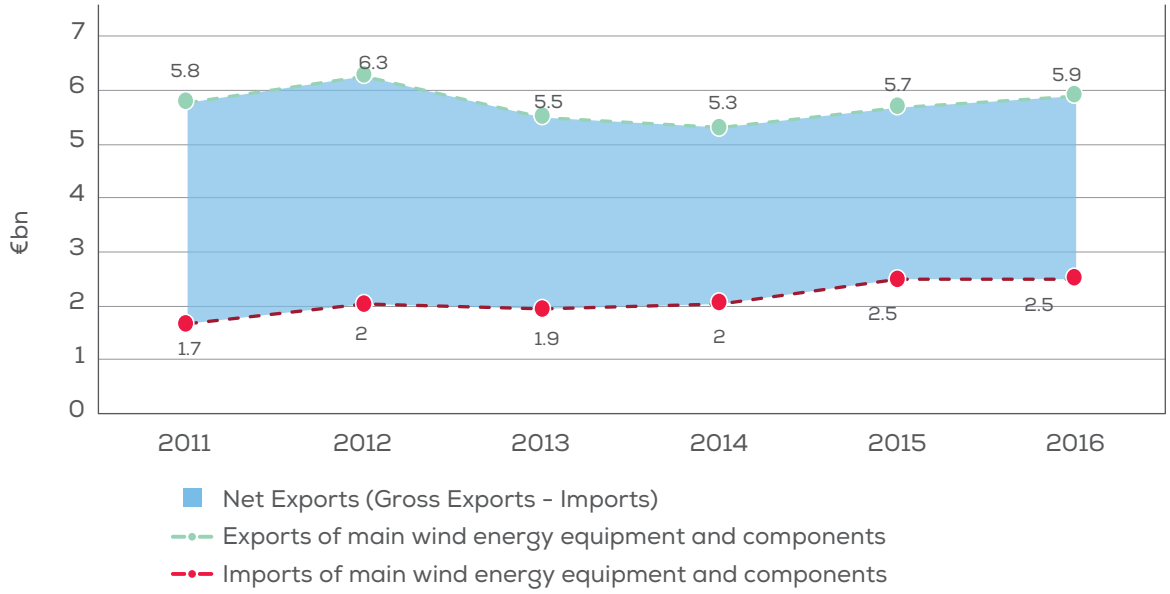
Other regions of the world have increasingly been deploying wind power over recent years. As a result, they have developed their own industry and their local supply chain for wind energy components and equipment. So Europe has been importing as well as exporting equipment. Total imports in the wind energy industry increased by 18% between 2011 and 2016.

It is possible to calculate the overall value of imports to the industry by dividing the total imports by the level of total industry expenditure in a given year. In 2016 the wind energy industry imported 16% of its inputs: the wind energy industry's direct total expenditure was €35.8bn and direct imports of €5.8bn. The equivalent figure in 2011 was only 13% in 2011.

Wind turbine and component manufacturers are the largest importing sub-sectors in the wind energy industry. While exports in these sub-sectors have remained steady, imports have increased by 51%, from €1.7bn in 2011 to €2.5bn in 2016. These figures do not account for the substantial amount of products and services sold by European-owned companies and subsidiaries located outside of the EU.

11. Exports of wind energy developers and services providers are not included in this calculation.

FIGURE 30
Exports and imports of specific wind energy equipment and components (constant prices 2010)



Source: Deloitte for WindEurope


Photo: ENERCON

VIANA DO CASTELO, PORTUGAL MANUFACTURING SITE

ENERCON

ENERCON, one of the world's leading companies in the wind energy industry, established the manufacturing cluster in Viana do Castelo and Lanheses in Portugal in 2006. The company has since been an important contributor to the infrastructure, employment and the economy of the region.

ENERCON invested €200m in the facility, which also included the transformation of an old shipyard into a modern construction plant.

The first factories started production in 2008, and the whole centre was fully operational by 2010. Covering an area of 250m^2, the sites focus on the integral production of two wind turbine models as well as components for other turbine models. These include blades, generators, mechatronics, and concrete towers. They have a maximum yearly production capacity of 400 generators, 300 concrete towers and 1,000 blades.

Direct and indirect employment as a result of these activities is around 2,500 jobs. Out of this, 1,500 are directly employed by ENERCON as either engineers for the manufacturing and assembly of turbines and components, technicians for the servicing and maintenance of wind farms, or administration staff. ENERCON has invested in demonstration and training to transfer know-how to its local employees and other companies which serve the wind industry's supply chain in the region.

The plant generates further benefits to the local economy, in particular by stimulating the industrial activity in the Port of Viana.

To facilitate logistics and transport, ENERCON has improved the local infrastructure in Viana do Castelo and Lanheses. New roads and new roundabouts have been built that not only allow direct access to the factory, but also easier access to Praia Norte and Lanheses.

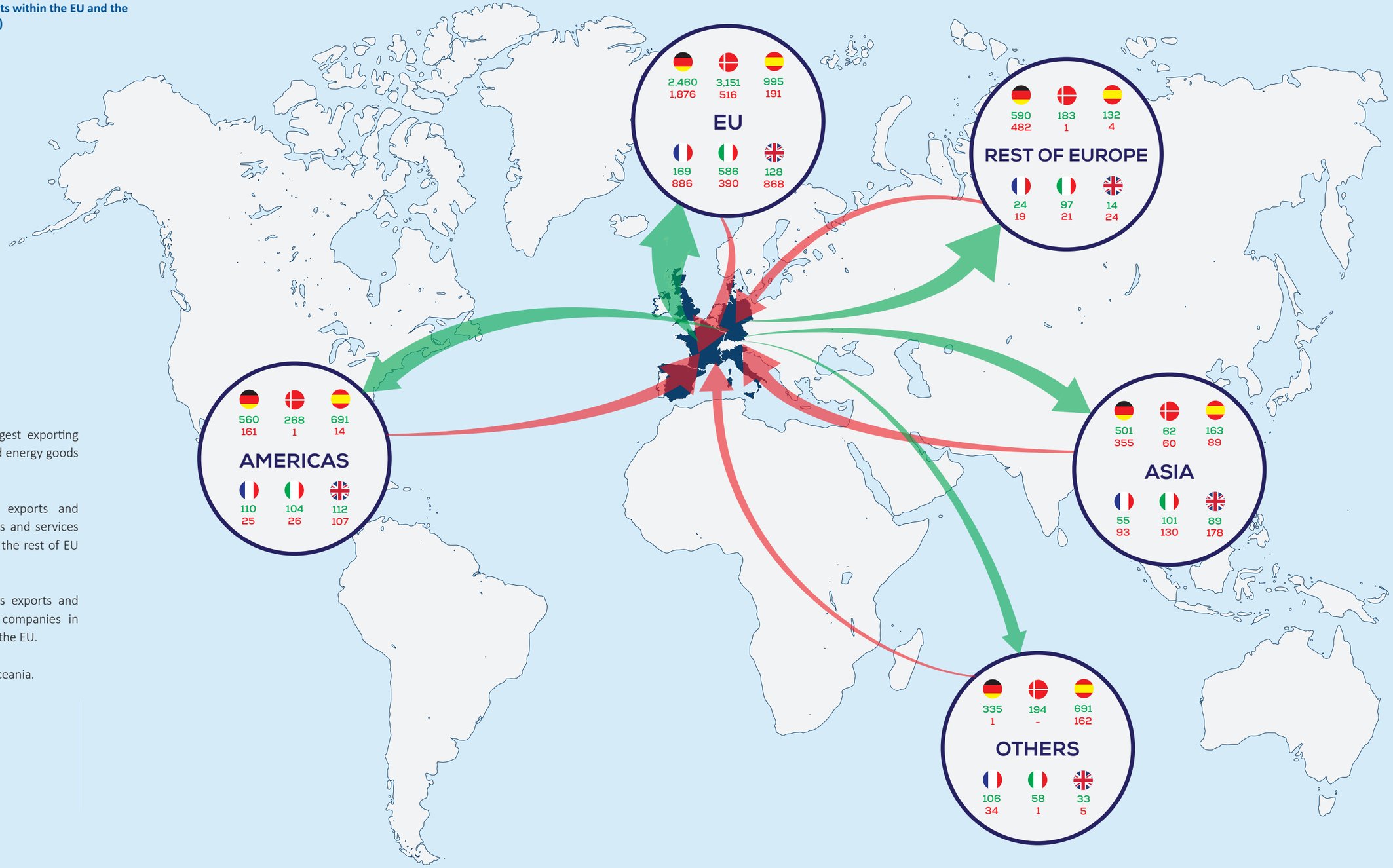
Initially the manufacturing cluster mainly served domestic activity in the country. Portugal is a great resource for renewables and wind energy, for the region as well as the whole of Europe. ENERCON turbines today provide around 11% of Portugal's total electricity consumption.

However, today the ENERCON factory relies almost entirely on wind power potential in other markets. Since 2014, all production is exported, mainly to South America, Canada, and EU markets.

While this makes ENERCON one of the biggest contributors to the Portugese exports and trade balance, a revival of domestic activity is also essential for tapping the country's wind energy potential.

Wind sector exports and imports

FIGURE 31
Wind energy exports and imports within the EU and the rest of the world in 2016 (in €m)



The map includes the six biggest exporting countries in the EU-28 for wind energy goods and services.

The "EU" includes intra-EU exports and imports for wind energy goods and services (i.e from one country towards the rest of EU Member States).

The "Rest of Europe" includes exports and imports of EU wind energy companies in European countries outside of the EU.

"Others" includes Africa and Oceania.

Export
Import
(mEur)

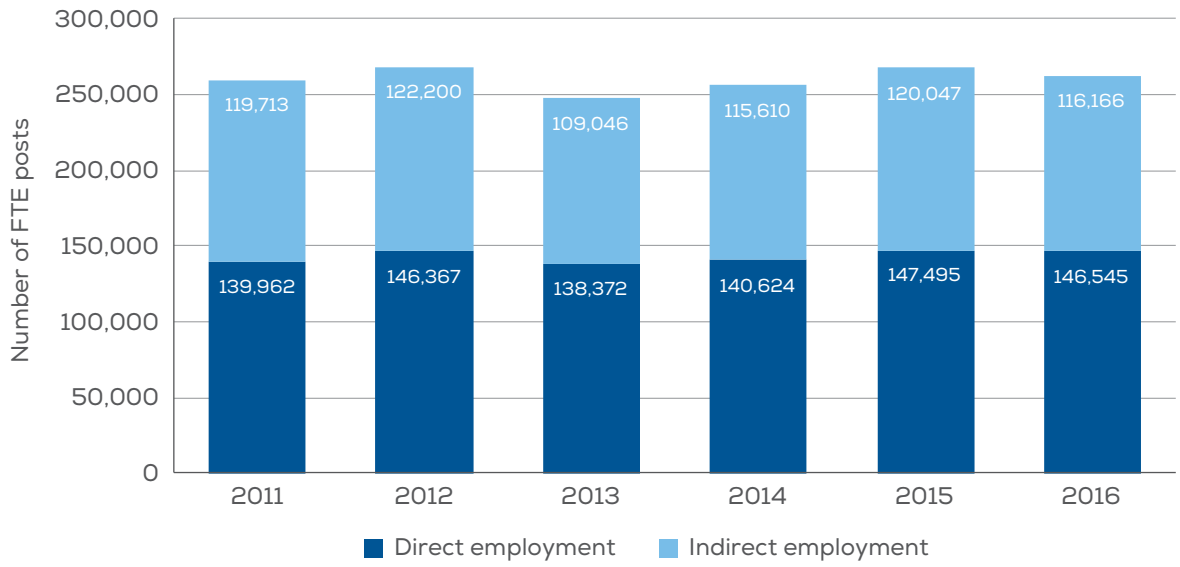
5. IMPACT OF THE EU WIND ENERGY INDUSTRY ON JOBS

Investments in wind energy have driven growth and employment in a wide range of sectors. The industry has created jobs, not only in turbine manufacturing and electricity production (direct employment) but also in many different economic sectors and activities (indirect employment).

Direct employment is calculated by adding together the number of jobs reported in each wind energy company's financial statement. Indirect employment has been estimated taking into account the economic activity generated by wind energy in other sectors using indices of productivity per MW installed and serviced. The imports and exports activity of the wind energy industry and the impact it has on related economic sectors has also been included in the estimation of indirect jobs.

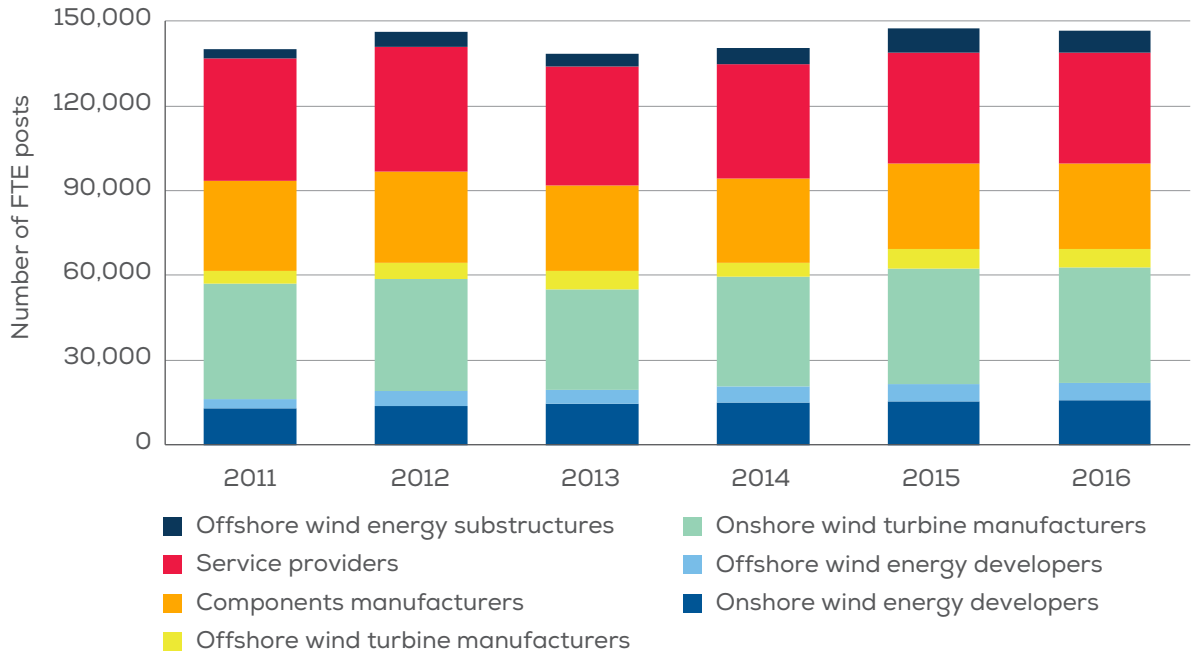
In 2016 wind energy was responsible for 262,712 jobs in the EU, both directly and indirectly. The majority of these, 146,545 jobs, were generated by companies directly involved in the wind energy industry. In 2016 indirect jobs created by the wind industry in other sectors of the economy reached 116,166 jobs.

FIGURE 32
Direct and indirect jobs in the wind energy industry in number of Full Time Equivalent (FTE) posts



Source: Deloitte for WindEurope

FIGURE 33
European wind energy direct jobs by sub-sector (in number of FTE posts)



Source: Deloitte for WindEurope

In 2016 the wind energy industry directly employed 146,545 full time professionals, up 4.7% on 2011 or 6,583 more employees.

A majority of these, representing 82% of the professionals working in the wind sector are qualified workers: i.e university graduates or those bearing other technical qualifications.

Within the industry offshore wind-related sub-sectors had the biggest increase over the last six years, up by 94% from 2011. Over 10,000 extra jobs were created, bringing the total number of posts for the sub-sector to just over 20,500 in 2016.

The number of jobs in the services sub-sector and component manufacuters declined between 2011 and 2016. This is mainly due to better operational efficiency in the EU and a decline in export activity due to increased competition in third countries.

The split of jobs in the wind energy industry in 2016 was:

77,756 jobs in wind energy turbine and component manufacturers

- The wind energy turbine and component manufacturers employed 77,756 professionals in 2016, over half of the sector's total direct employment;
- Turbine manufacturers supported almost 33% of the total direct jobs in the industry, with 40,951 full time posts for onshore and 6,628 full time posts for offshore wind;
- Component manufacturers employed an additional 30,177 full time professionals.

39,316 jobs in service providers

- Service providers support the second highest number of jobs, or 27% of the industry's total direct employment in 2016.
- This includes jobs in transportation of equipment, engineering and construction of wind farms, operation and maintenance, research institutions, consultancy firms, universities, financial services and other similar organisations.

21,824 jobs in project developers

- Project developers – both onshore and offshore wind – supported 21,824 full time posts in 2016.
- This is equivalent to 15% of the total direct employment in the industry for that year.

Photo: Siemens Gamesa Renewable Energy

VESTAS BLADE FACTORY

DAIMIEL, CIUDAD REAL, SPAIN

At Vestas the production of wind turbines started in 1979. With 83 GW of installed wind power capacity in more than 70 countries around the globe, Vestas has gained a market-leading position in wind energy. Alongside world-class turbine technology, the company also offers specific components as well as services for project developers related to the construction, installation and maintenance of wind farms.

Vestas started the construction of this blade factory in Daimiel, Spain in 2007. By 2008 the factory was already operational and had created 500 direct jobs in Daimiel. Since then, approximately 6,000 blades have been produced at the Vestas factory.

In 2015 Vestas extended the production capacity to include turbine blades for newer turbine models. This meant more jobs, with Vestas doubling the number of direct posts on site from 500 to 950. New technologies also required additional training for the workers, with a budget for training and development amounting to around €700,000. Approximately 1,500 blades of the new model have been produced since then.

The factory initially served the domestic market as well as international markets. However, with the stagnation of the Spanish wind energy market over recent years, the factory currently exports 100% of its production.

Vestas has been an important contributor to the region's economy. The economic crisis over recent years has left Spain with double digit unemployment rates, in particular amongst the young. Apart from the professionals that the factory employs directly on site, 1,000 more jobs have been created indirectly in related industries and economic sectors as a result of the blade factory.

In addition to the investment on site and the improved road infrastructure surrounding the factory, Vestas spends on average €0.5m on training and education for its employees, with safety of equipment and processes being the top priorities.

Photo: Vestas

Photo: Vestas

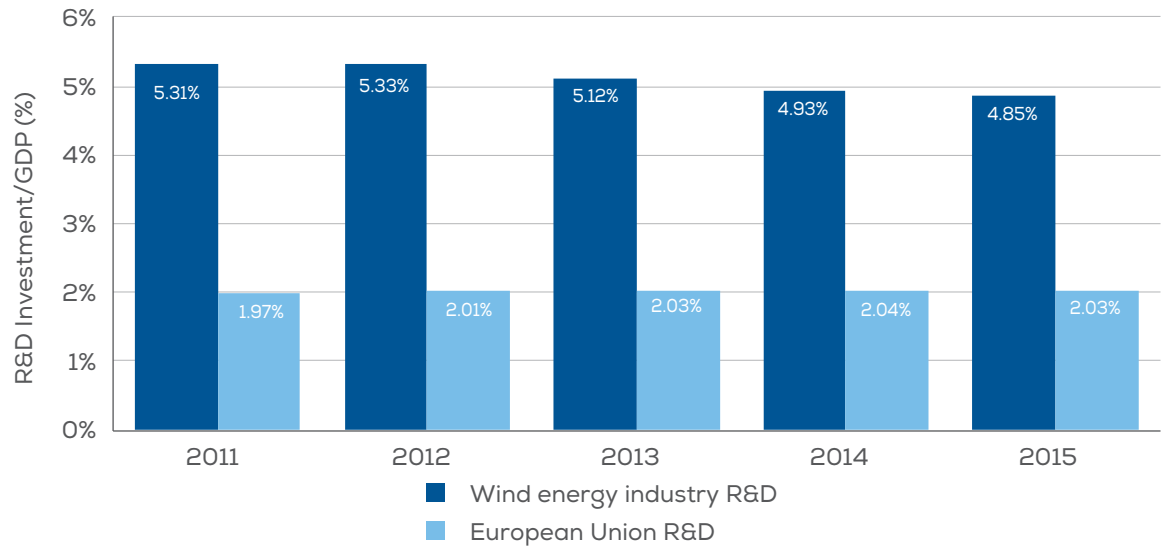
6. INVESTMENT IN R&D ACTIVITIES

6.1. EU WIND ENERGY SECTOR R&D INVESTMENT

Technology has been one of the main drivers of the wind industry's growth in the last two decades. Its importance is relevant in particular in the context of international competition emerging from China, US, India, and Japan. Along with a robust market, research and development in cutting edge technology and advances in system integration will be the cornerstone of the future health the European wind energy industry.

The amount invested in research and development (R&D) by the sector is very stable and considerably higher than the amount invested, on average, by other sectors of the EU economy. It is also considerably higher than the EU's 2020 goals for R&D spend as a percentage of GDP. R&D expenditure was 4.85% of the industry's GDP in 2016. At EU level, R&D expenditure was 2.03% of the European economy's GDP.

FIGURE 34
R&D of the wind energy industry and the EU economy-wide as a percentage of GDP[12]



Source: Deloitte for WindEurope

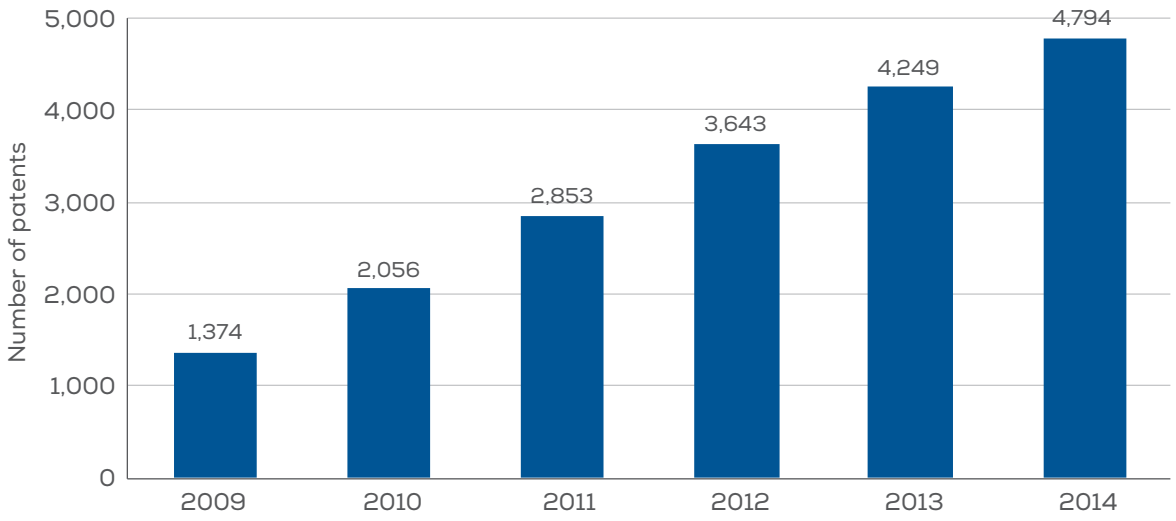
12. EU data for 2016 not available at the time of publication.

6.2. EU WIND ENERGY SECTOR PATENTS

According to the EU patent office, the number of patents issued in the wind industry by 2014 was 4,794. Many existing patents were still undergoing the registration process over the following two years. Due to current delays in the procedure, full data for 2015-2016 is not available.

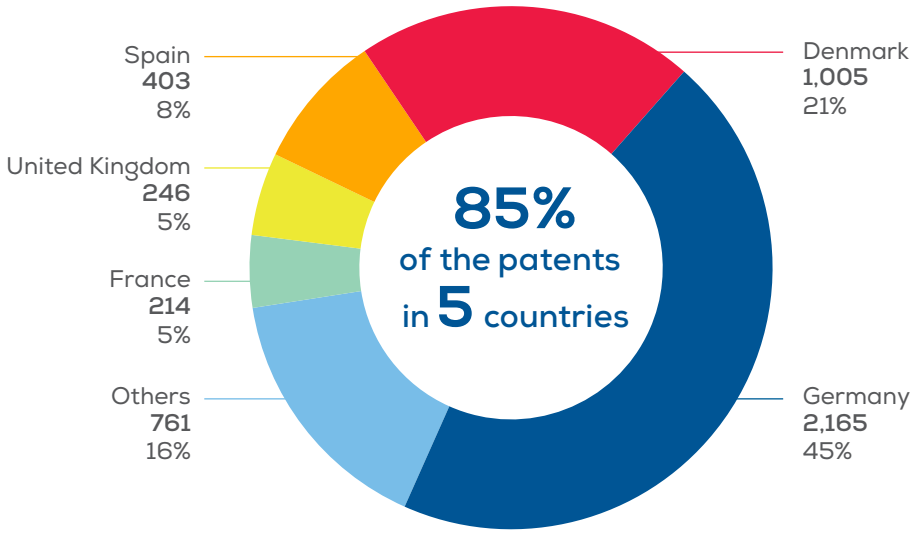
85% of the industry patents over the last decade are owned by only five countries: Germany, Denmark, Spain, France and the UK. Germany holds the largest number of issued patents, just over 45% of the total number of industry patents.

FIGURE 35
Cumulative number of wind energy patents in the EU



Source: Deloitte for WindEurope

FIGURE 36
Registered number of patents in the EU Member States and European Economic Area from 2006-2014



Source: Deloitte for WindEurope

Photo: Vattenfall

7.

AVOIDING CO_2 EMISSIONS AND REDUCING FOSSIL FUEL IMPORTS

Wind energy is the most cost competitive climate mitigation technology to reduce greenhouse gas emissions and deliver on the EU's commitment under the Paris Climate Agreement.

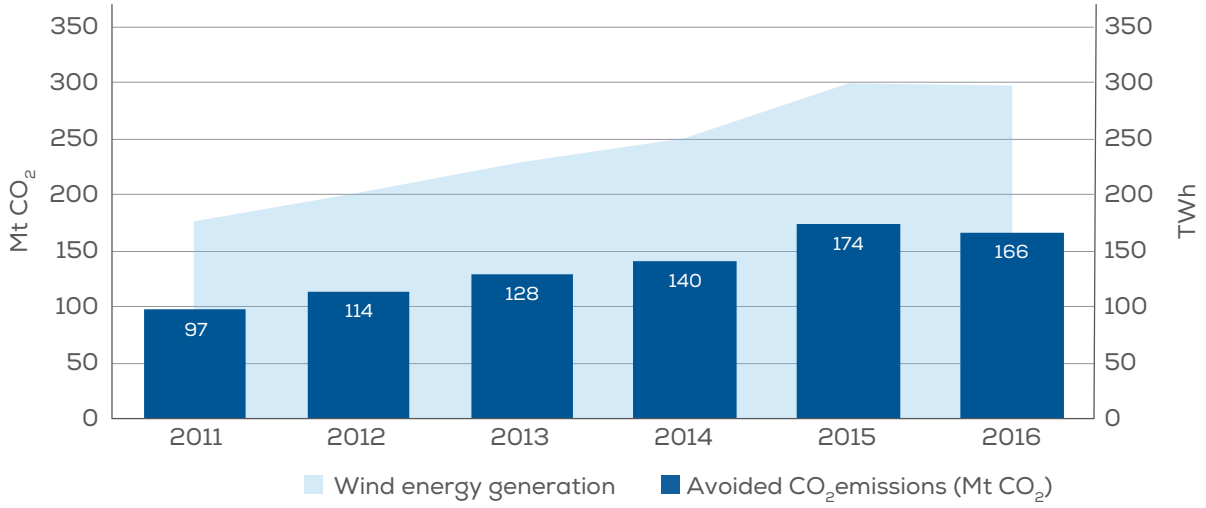
In 2016 wind energy generated 296 TWh of electricity in the EU, avoiding at least 166 million tons of CO_2 (Mt CO_2) emissions. More wind electricity generation has displaced oil, gas, and coal-power. Between 2011 and 2016 wind energy generated a total 1,451 TWh, avoiding over 819 mt CO_2. This is equivalent to 22 million average cars taken off the roads each year.

To calculate the CO_2 emissions that have been avoided using wind energy, the yearly average CO_2 emission factor of the total EU energy mix has been taken into account[13].

Replacing power generation from combustion fired plants with wind not only saves CO_2 but other pollutants too, particularly from large combustion plants[14], which are responsible for a significant proportion of sulfur dioxide (SO_2), nitrogen oxides (NO_x) and particulate matter (PM) pollution. Between 2011 and 2015 large combustion plants produced around 8,200 ktonnes of SO_2, around 6,400 ktonnes of NO_x and close to 465 ktonnes of dust[15].

13. Data from European Environmental Agency. Please refer to the methodology in Annex X for the yearly average emission factors.
14. Large Combustion Plants are those bigger than 50 MW capacity according to the Directive 2010/75/EU of the European Parliament and of the Council, for large combustion plants
15. European Environmental Agency, 2016

FIGURE 37
Avoided CO_2 emissions due to wind energy for the period 2011-2016



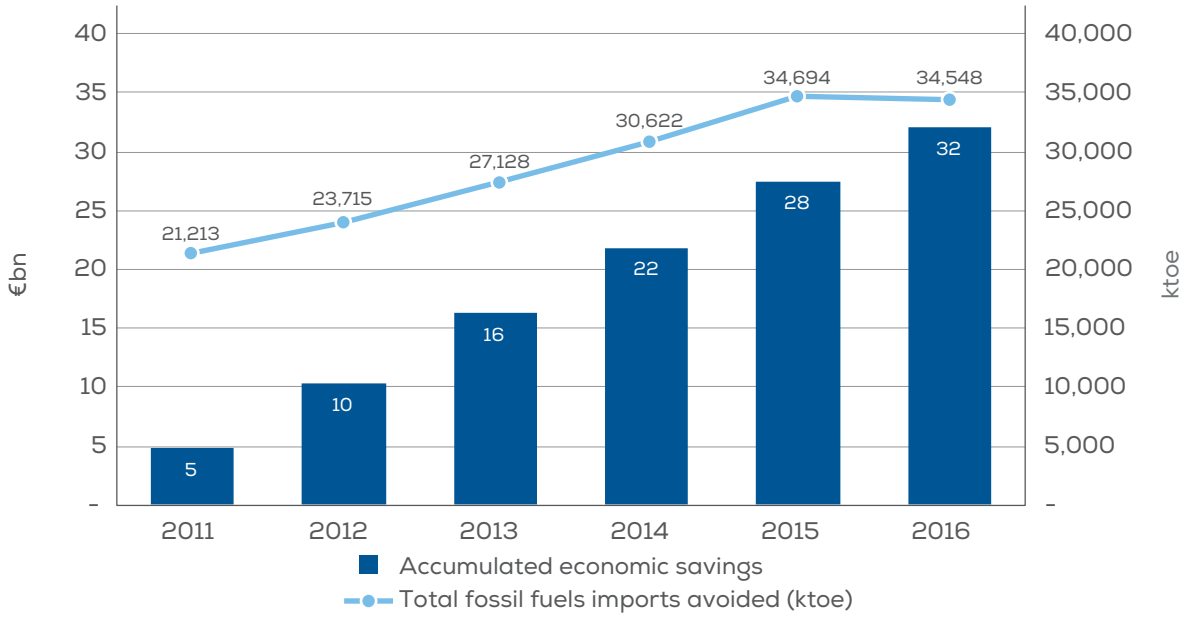
Source: Deloitte for WindEurope

Beyond its direct economic benefits, the wind energy industry also contributes to the European economy via the significant fuel costs it avoids. The EU imports more than half of its energy needs today. Wind power reduces energy dependence and thereby delivers significant macroeconomic benefits.

In the short term, it is mostly natural gas – imports of which amount to 70% of the EU's total gas demand – that is displaced by wind energy production. However, in the long term, wind energy will displace a combination of technologies in the energy mix, including coal, oil and natural gas.

In 2016 wind energy avoided 34,578 ktoe fossil fuel imports in the EU, and a total of 171,951 ktoe between 2011 and 2016. The expansion and growth of wind energy over the last six years has reduced the EU import bill by €32bn. This is calculated taking into account all the displaced sources (coal, oil and natural gas) and their price in the spot market.

FIGURE 38
Avoided fossil fuel imports from wind energy production between 2011-2016



Source: Deloitte for WindEurope

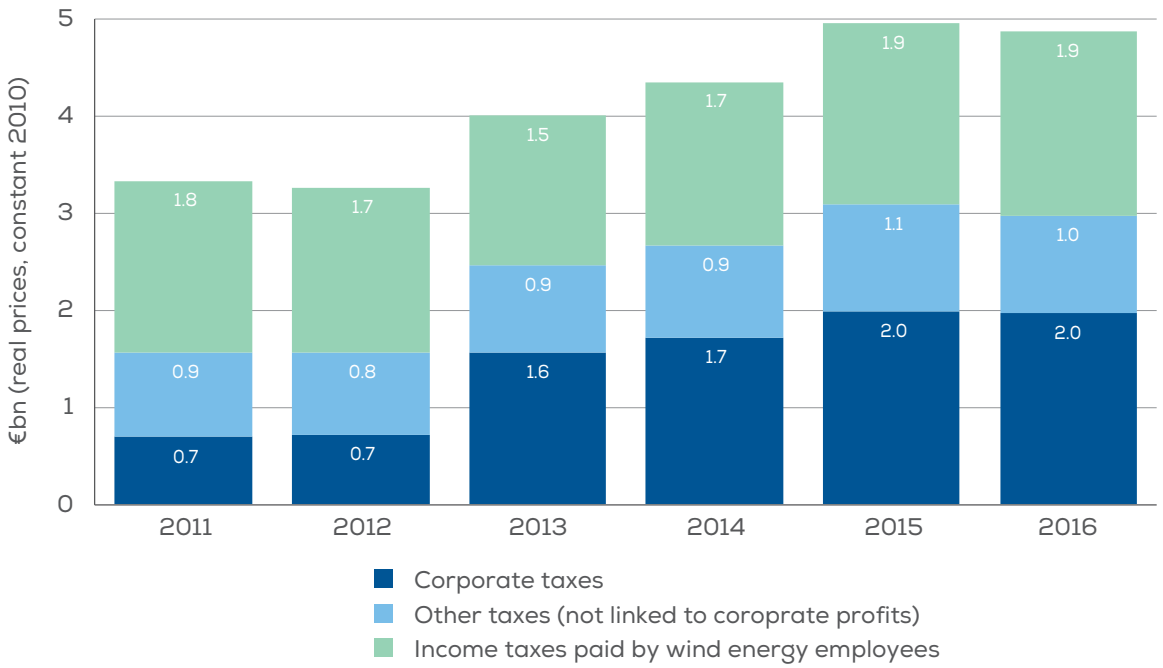

Photo: ENERCON

8. TAX BALANCE

In 2016 the wind energy industry paid €4.9bn in taxes. Of this €2bn was corporate tax. Overall corporate taxes paid by the wind industry have increased by 90.5% from 2011 to 2016 (from €1.6bn to €3bn). €1.9bn came from people directly employed by the wind sector.

Overall, between 2011 and 2016, taxes paid by the wind sector have grown by 46% and have provided almost €24.8bn in contribution to the EU's GDP.

FIGURE 39
Taxes paid by the EU wind energy industry (real prices, constant 2010)



Source: Deloitte for WindEurope

Photo: Vestas

9.

WIND ENERGY'S CONTRIBUTION TO THE EU ECONOMY IN 2020 AND 2030

The contribution that wind energy will make to EU GDP in 2020 and 2030 will depend on which of the different scenarios for the future expansion of wind energy will materialise. The difference between the *Central* and the *Low Scenarios* for 2030 shows that unambitious government policies would have signifcant opportunity costs for jobs, the environment and the economy.

CONTRIBUTION TO GDP

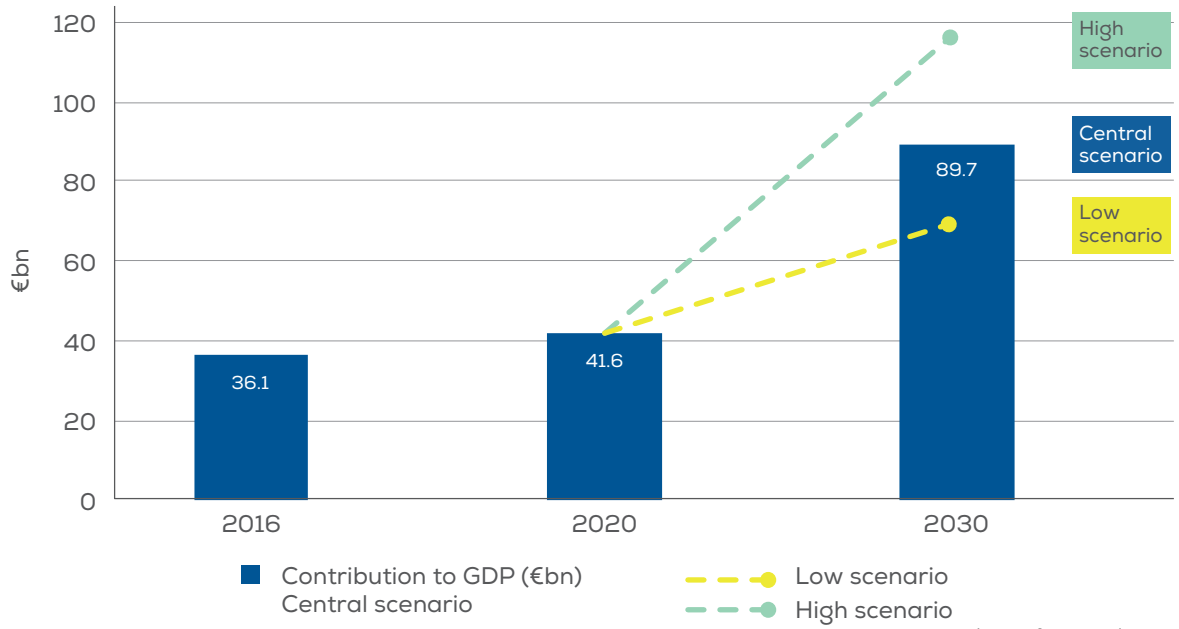
Wind energy is expected to reach 204 GW of installed capacity by 2020. If this is achieved, the industry could bring a net positive value of €41.6bn to the EU's GDP in 2020, a 15% increase on 2016.

WindEurope *Central Scenario* for 2030 would see a doubling of installed wind capacity compared to today, which would more than double the industry's contribution to EU GDP. There would be 323 GW of wind power installed, producing a GDP contribution of €89.7bn, up from €36.1bn in 2016. With more deployment of wind energy, the sector's weight within the economy could also rise from 0.26% in 2016 to 0.51% in 2030.

The WindEurope *High Scenario* for 2030 would see an ambitious deployment of wind energy which would produce further macro-economic benefits. A 23% additional deployment of wind in the *High Scenario* compared to the *Central Scenario* would create an additional 30% net positive for the EU economy. With supportive policies in place and regulatory certainty, wind energy could provide 0.66% of the EU's GDP in 2030, or €116.5bn. In contrast, a lack of ambitious policies in WindEurope's *Low Scenario* could cost the EU economy in 2030 €23.2bn compared to the *Central Scenario*.

FIGURE 40

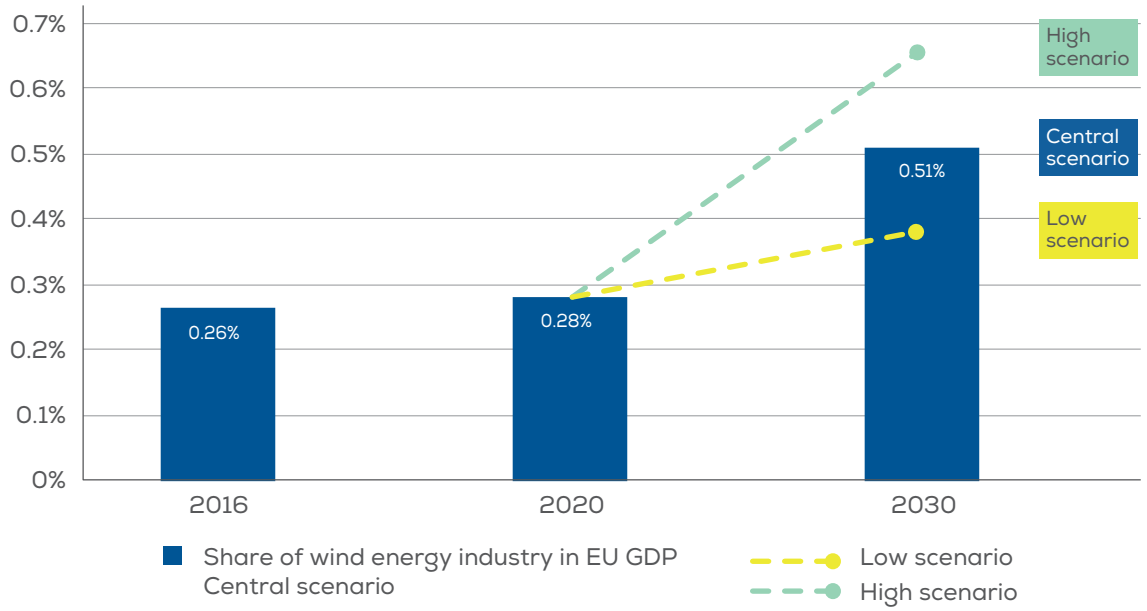
Forecast of the wind energy industry's contribution to the EU's GDP in 2020 and 2030 in €bn



Source: Deloitte for WindEurope

FIGURE 41

Forecast of the wind energy industry's contribution to the EU's GDP in 2020 and 2030 as a % of EU GDP



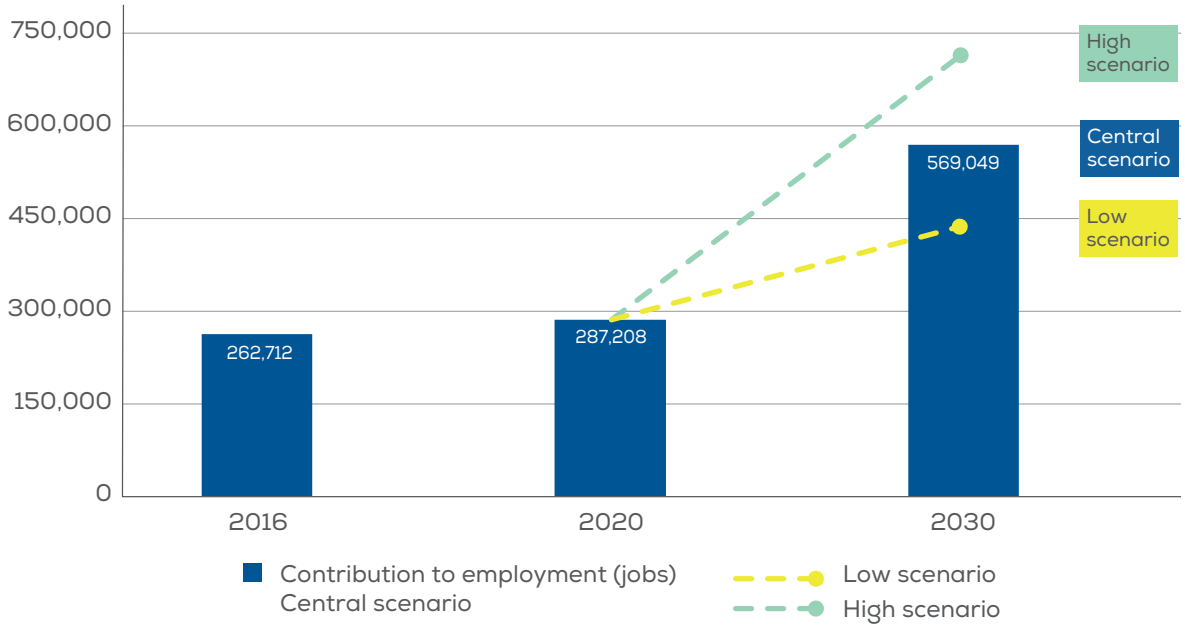
Source: Deloitte for WindEurope

CONTRIBUTION TO EMPLOYMENT

In 2020 the forecasted 204 GW cumulative wind power capacity could result in 287,208 jobs (direct and indirect). This would be a 9.3% increase over the 2016 employment numbers. By 2030 wind industry jobs could double and reach 569,049 posts under WindEurope's *Central Scenario*. Direct jobs will continue to be the largest share of wind energy-related employment in both 2020 and 2030.

Employment levels will be linked to wind energy deployment but they will also depend on the EU's ability to maintain a competitive wind energy supply chain in a context of international competition and cost reduction. This will hinge on the EU's ability to sustain high levels of investment in research and innovation. Leading in technology development and on solutions to ensure system integration with large shares of wind energy will help maintain the momentum of job creation in the European wind industry.

FIGURE 42
Forecast of direct and indirect employment in wind energy sector in 2020 and 2030



Source: Deloitte for WindEurope

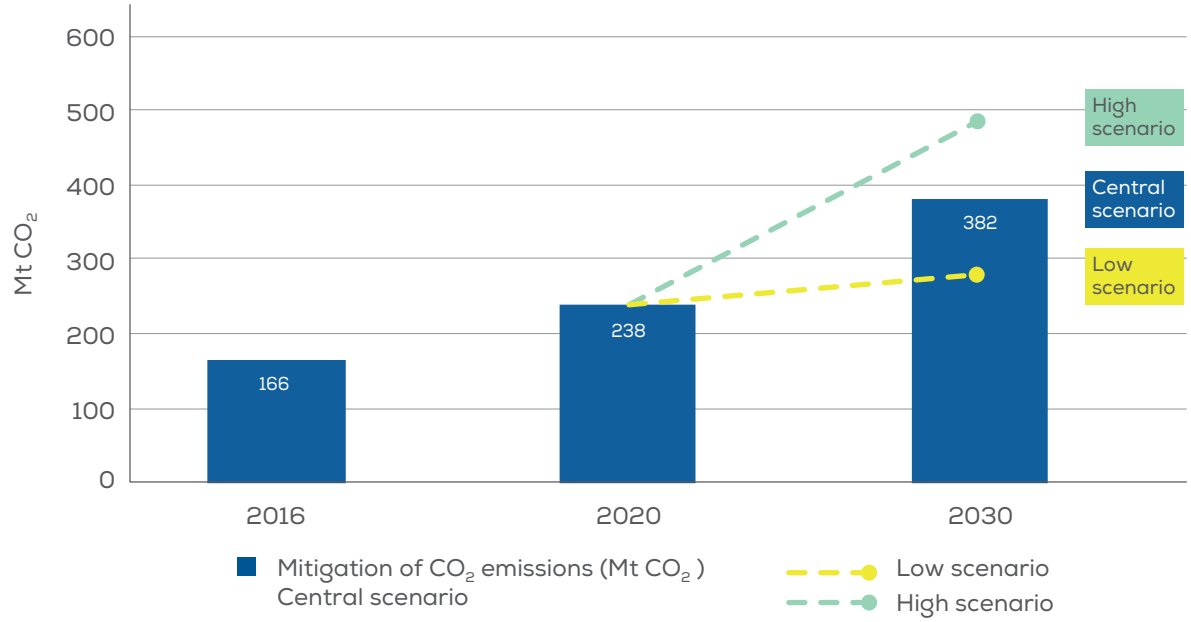
MITIGATING GREENHOUSE GAS EMISSIONS

By 2020 the forecasted 204 GW wind capacity could generate enough electricity to reduce CO_2 emissions by 238 million tons. In WindEurope's 2030 Central Scenario, the electricity generated by wind energy would reduce CO_2 emmissions by 382 million tonnes.

Under WindEurope's *High Scenario*, the deployment of wind energy could be accelerated in 2030, contributing to 485 million tonnes of CO_2 emission reductions in the power sector – three times more than the levels of today.

FIGURE 43

Forecast of the avoided CO_2 emissions due to wind power production in 2020 and 2030



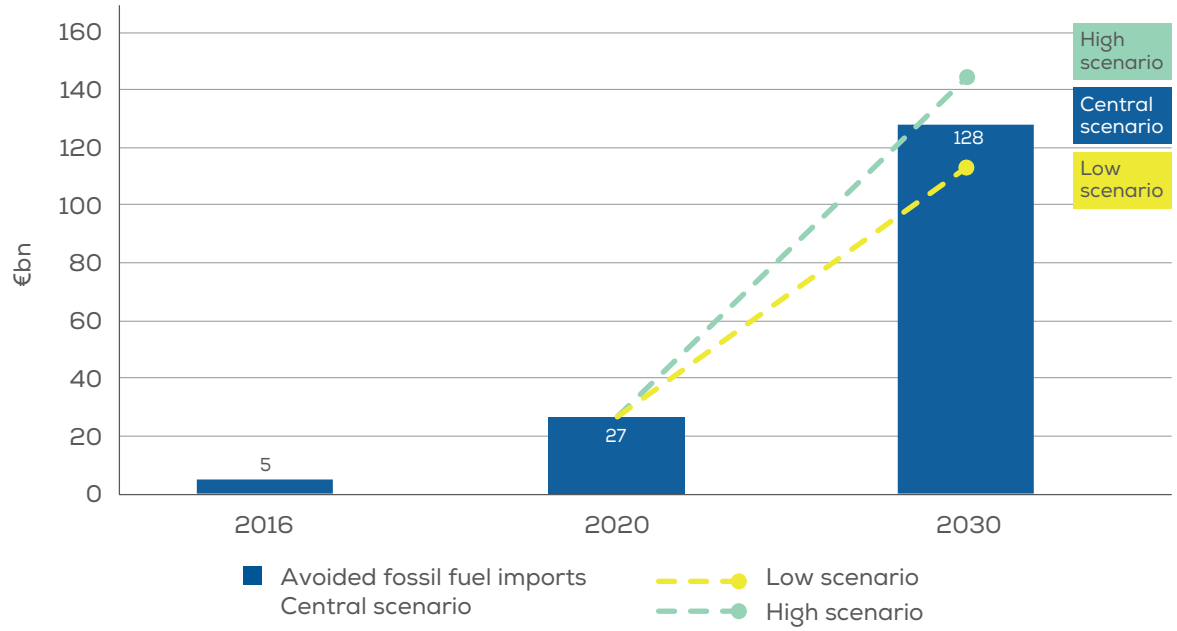
Source: Deloitte for WindEurope

REDUCING THE EU'S ENERGY DEPENDENCY

Between 2016 and 2020 wind energy will avoid €27bn in fossil fuel imports. This is the amount of fossil fuels that would not be imported from other countries if the EU reaches an installed wind energy capacity of 204 GW.

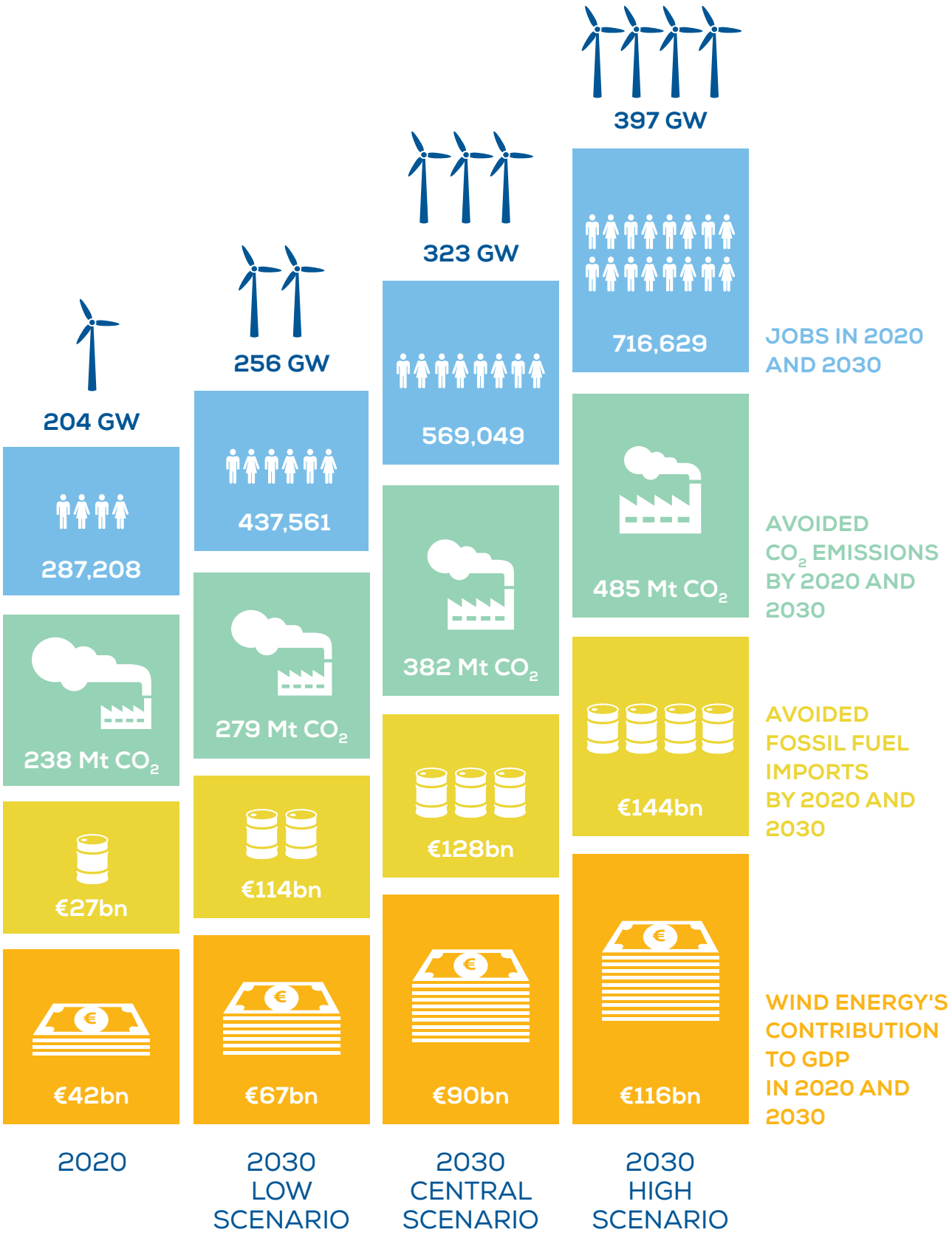
By 2030 wind power could help the EU save €128bn by reducing the import bill on fossil fuels. This could go up to €144bn with increased deployment of wind energy under the *High Scenario* in 2030.

FIGURE 44
Forecast of the avoided fossil fuel imports in 2020 and 2030



Source: Deloitte for WindEurope

FIGURE 45
Macro-economic benefits of wind energy in 2020 and 2030



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ANNEXES

ANNEX I.

DATA SOURCES

Following are the most important information sources used to evaluate the impact of the wind sector and its subsectors in the European economy:

- Annual statements of the relevant companies in the sector and its sub-sectors: onshore wind energy developers, offshore wind energy developers, onshore wind turbine manufacturers, offshore wind turbine manufacturers, components manufacturers, services providers and offshore wind energy infrastructures.

- Questionnaires and interviews with relevant EU stakeholders in the wind industry.

- Public available information from reputed entities, including:

  - Eurostat
  - WindEurope
  - International Energy Agency
  - The International Monetary Fund
  - European Union Member States foreign trade statistical bodies
  - The Wind Energy Barometer from EurObserver
  - The BP Statistical Review of World Energy
  - Patent Offices from different European Union countries

ANNEX II.

METHODOLOGY

DIRECT CONTRIBUTION TO GDP

To calculate the wind energy sector's contribution to EU GDP, Deloitte used three equivalent approaches – recognised by the European System of National and Regional Accounts (ESNRA)[16] were used: expenditure, added value and income.

The wind energy sector is made up of companies that carry out a wide range of different activities integrated in the value chain of the industry. Therefore, the sector was divided into seven sub-sectors:

- Onshore wind energy developers
- Offshore wind energy developers
- Onshore wind turbine manufacturers
- Offshore wind turbine manufacturers
- Component manufacturers
- Service providers
- Offshore wind turbine substructures

Over 400 EU companies active in wind energy were identified and their financial statements analyzed for the period between 2011 and 2016.

The value added and income approaches were used to estimate the sector's contribution to GDP, using the information companies disclosed in their financial statements. Additional information, such as tax balance and R&D expenditure, was gathered by surveying wind industry players. Combining these two data sets, it was possible to calculate the total direct impact on GDP.

INDIRECT CONTRIBUTION TO GDP

The different sub-sectors of the wind energy industry purchase from, and provide services to, other sectors of the economy. This has an indirect impact on GDP.

This impact is quantified using input-output models from the EU[17]. However, these tables do not consider the wind energy sector as a separate industry. It was, therefore, necessary to add the information of this sector to the evaluation scheme. To do this the information was completed with sectoral data collected directly from relevant industry players.

Based on this input-output table, income multipliers containing information on the wind energy sector's impact on the rest of the economy were calculated. For full details of the methodology, please refer to Annex II.

16. Definitions as given by Eurostat: http://epp.eurostat.ec.europa.eu/statistics_explained/index.php/National_accounts_%E2%80%93_GDP
17. An input-output model is a quantitative economic technique that captures the correlations between different branches of an economy or among branches of different and even competing economies.

ANNEX III.

CALCULATING THE WIND ENERGY SECTOR'S DIRECT CONTRIBUTION TO GDP

Three equivalent approaches, recognised by the European System of National and Regional Accounts (ESNRA), can be used to calculate an economic sector's contribution to GDP:

EXPENDITURE APPROACH

GDP is defined as what individuals spend on final consumption, plus what the government spends on final consumption, plus gross capital formation, plus exports and minus imports. In the system of national accounts, only households, non-profit institutions serving households (NPISH)[18] and governments have final consumption, whereas corporations have intermediate consumption.

Private final consumption expenditure is defined as expenditure on goods and services for the direct satisfaction of individual needs, whereas government consumption expenditure includes goods and services produced by the government, as well as the purchase of goods and services by the government to supply households as social transfers in kind.

Gross capital formation is the sum of gross fixed capital formation and the change in inventories (stocks). The external balance is the difference between exports and imports of goods and services. Depending on the size of exports and imports, it can be positive (a surplus) or negative (a deficit).

VALUE ADDED APPROACH

The gross value added of various sectors, plus taxes, minus subsidies on products. The output of the economy is measured using gross value added. Gross value added is defined is the value of all newly generated goods and services minus the value of all goods and services consumed in their creation; the depreciation of fixed assets is not included. When calculating value added, output is valued at basic prices and intermediate consumption at purchasers' prices. Taxes minus subsidies on products have to be added to value added to obtain GDP at market prices.

INCOME APPROACH

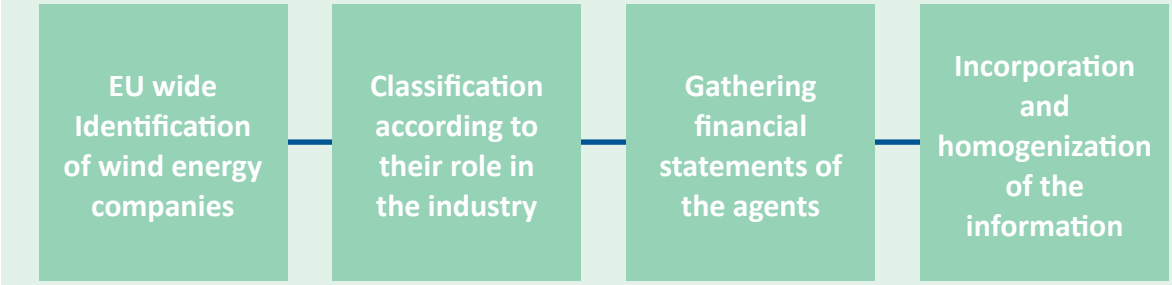
Includes salaries and other money spent on employees, net taxes on production and imports, gross operating surplus and mixed income. The income approach shows how GDP is distributed between different participants in the production process, as the total of:

- compensation of employees: the total remuneration, in cash or in kind, payable by an employer to an employee in return for work done by the latter during the accounting period; the compensation of employees is broken down into: wages (in cash and in kind); employers' social contributions (actual social contributions and imputed social contributions);
- gross operating surplus: the surplus (or deficit) on production activities before account has been taken of the interest, rents or charges paid or received for the use of assets .

The wind energy sector is made up of companies that carry out a wide range of different activities integrated in the value chain of the industry.

18. Eurostat definition: non-profit institutions are not mainly financed or controlled by governments and they provide goods or services to households for free or at prices that are not economically significant. Examples include churches and religious societies, sports and other clubs, trade unions and political parties.

FIGURE III.1
Information collection for the value added and income approaches



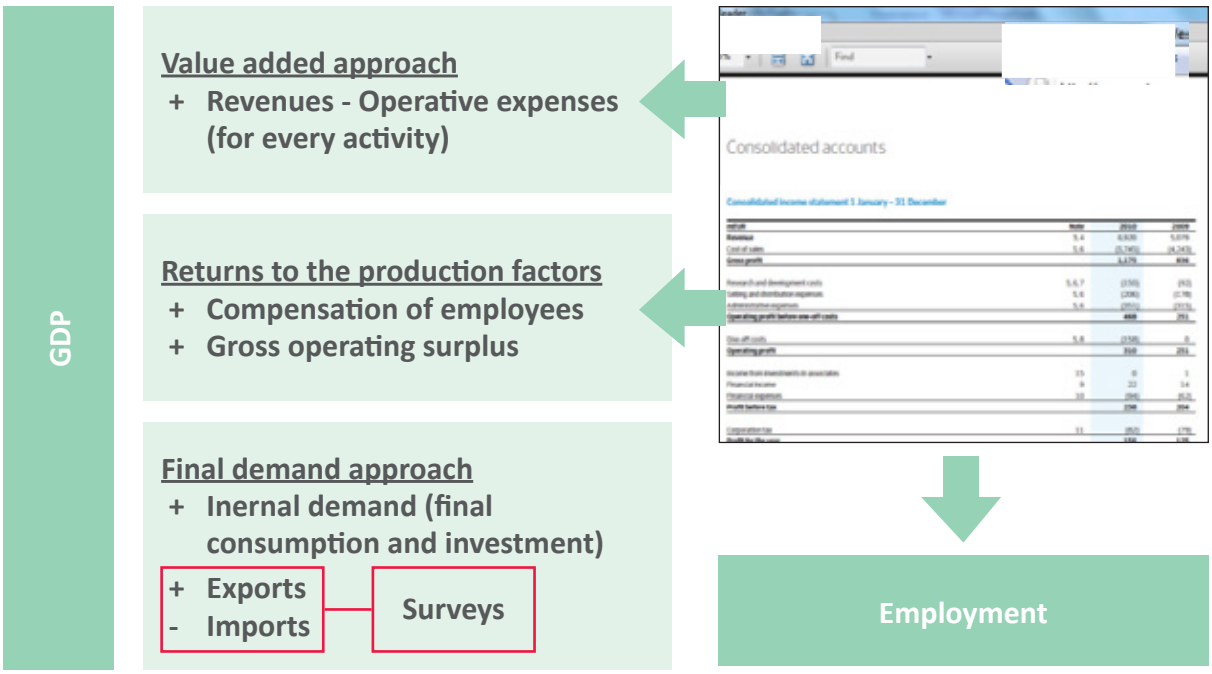
Source: Deloitte for WindEurope

Over 400 companies active in wind energy were identified and their financial statements analysed for the period between 2011 and 2016.

The financial statements gathered include information that allows the sector's contribution to GDP to be estimated using two of the three methods this report is based on: the value added approach and the income method. The information collected from a survey of over 400 EU wind energy players was extrapolated to the total size of the sector.

The calculation based on the Expenditure Approach requires to estimate the sector exports and imports: this estimation has been carried out based on the information available in the financial statements about export and imports, the public statistics and a EU sector survey.

FIGURE III.2
Estimation of direct GDP contribution using three ENSRA recognised methodologies



Source: Deloitte for WindEurope

ANNEX IV.

CALCULATING THE WIND ENERGY SECTOR'S INDIRECT CONTRIBUTION TO GDP

Input-output analysis methodology was developed by Wassily Leontief in 1936. It is a quantitative economic technique that shows the interdependencies between different branches of a national economy or between branches of different, even competing economies.

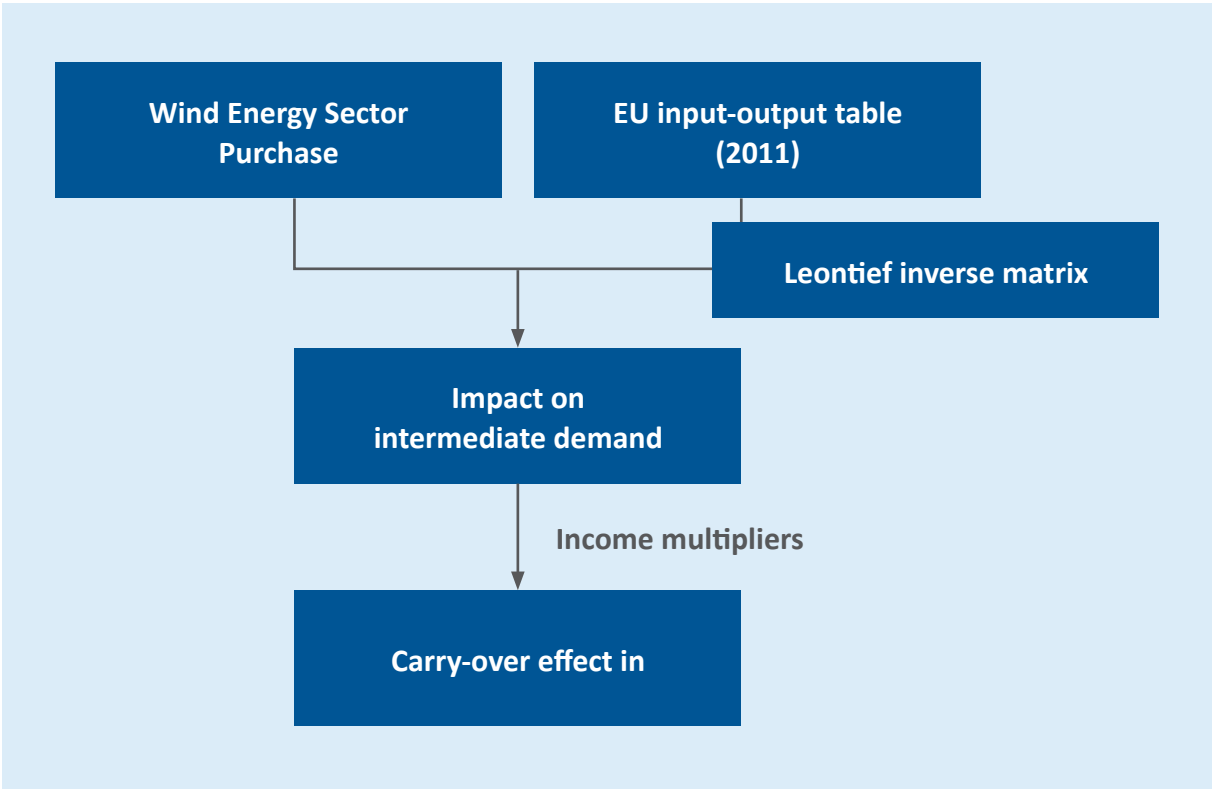
The different sub-sectors of the wind industry require products and services from other sectors. Therefore, the sector has an additional economic impact on other economic sectors that can be evaluated from input-output tables.

The input-output tables show all the production and distribution that takes place in the different sectors of the economy. The indirect effects of an industry on other sectors of the economy can be quantified from the matrix of technical coefficients and the Leontief inverse matrix.

Currently, the European account tables do not break the wind sector into sub-sectors, so it is necessary to evaluate the interrelationships with other economic sectors separately. In order to achieve this, a questionnaire was prepared and completed by industry players on the supply structure of the different subsectors of the industry.

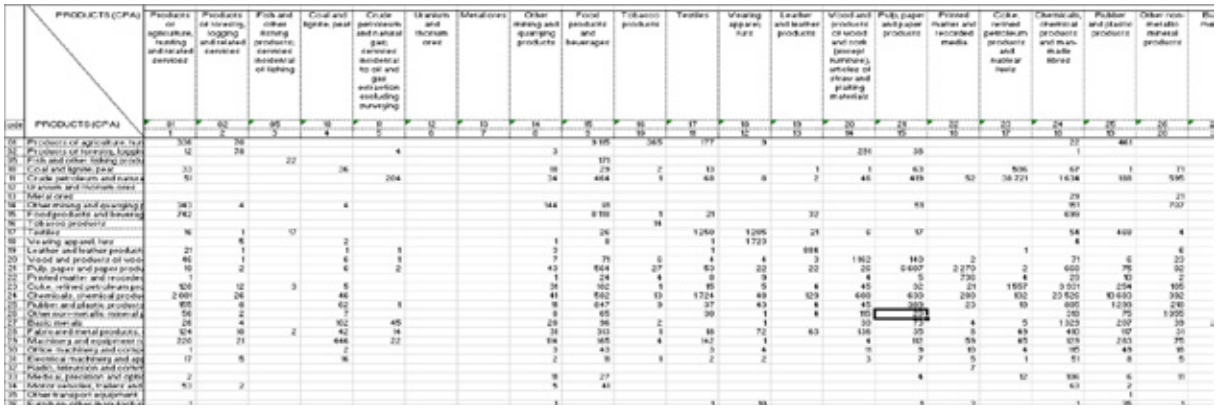
Therefore, based on latest tables published and the information gathered via the questionnaires, a new type of table was built containing the broken down sub-sectors identified by the wind energy sector.

FIGURE IV.1
Outline of the analytical methodology used



Source: Deloitte for WindEurope

FIGURE IV.2
Symmetric input-output table for domestic output at basic prices



Source: Deloitte for WindEurope

HOW TO CALCULATE THE INDIRECT IMPACT ON GDP:

1. Obtain the latest EU Input-Output tables (2007) from Eurostat and access the "Symmetric Input-Output Table for domestic output at basic prices".

2. Questionnaires were developed to incorporate the breakdown of the wind sector. The intermediate consumption flows between the sub-sectors (developers, developers, turbine manufacturers, component manufacturers and services) and other economic activities were then quantified.

3. Questionnaires were completed by industry players.

4. Based on the information collected via the questionnaires, transactions between the wind energy sector and the other economic sectors were introduced into the matrix.

    a. A technical coefficients matrix was drawn up. This measures the relative importance of each industry in the total production of another sub-sector.

    b. A Leontief inverse matrix was drawn up. This measures the indirect impact of a sector on another economic activity through the multiplier effect that a sector has on the intermediate production of another.

    c. Income multipliers were calculated. These measure the existing relation between gross added value (contribution to GDP) and total production. This set of indicators, multiplied by the intermediate production, quantifies the indirect impact that an increase of €1 in the wind energy sector's contribution to the EU's GDP has on the GDP of the rest of the economy.

5. Indirect impact of wind energy sector is estimated by multiplying the expenses in goods and services by the multipliers of each economic activity.

FIGURE IV.3
Income multipliers for wind energy sector

SECTOR	INCOME MULTIPLIER
Electrical equipment	0.197393
Machinery and equipment n.e.c	0.332911
Basic metals	0.197393
Fabricated met products, except machinery and equipment	0.379759
Construction and construction works	0.409822
Architectural and engineering services: technical testing and analysis services	0.491369
Rubber and plastic products	0.333805
Land transport services and transport services via pipelines	0.466469
Telecommunication services	0.466723
Real estate services (excl imputed rents)	0.690398
Chemical products	0.243617
Postal and courier services	0.573793
Scientific research and development services	0.468310
Other professional, scientific and technical services	0.533838

ANNEX V.

GDP CONTRIBUTION OF THE WIND INDUSTRY IN REAL AND CURRENT PRICES

TABLE 1

Wind energy industry's contribution in real and current prices calculated based on three different approaches (in bnEUR): a) demand approach; b) value added approach; c) income approach

EU-28		Internal final demand	Net exports	Gross exports	Imports	Intermediate inputs demand	Demand approach	Total revenue	Total expenditures	Production or value added approach	Compensation of employees	Gross operating surplus	Income approach
2016	Current prices	51,5	2,6	8,4	5,8	30,0	**24,0**	59,8	35,8	**24,0**	7,0	17,0	**24,0**
	% Y-o-Y change	-4%	14%	3%	-1%	-5%	**0%**	-3%	-4%	**0%**	1%	-1%	**0%**
	Constant prices	47,8	2,4	7,8	5,4	27,9	**22,3**	55,6	33,3	**22,3**	6,5	15,8	**22,3**
2015	Current prices	53,1	2,2	8,1	5,9	31,4	**24,0**	61,2	37,2	**24,0**	6,9	17,1	**24,0**
	% Y-o-Y change	8%	-7%	6%	12%	4%	**11%**	7%	5%	**11%**	10%	12%	**11%**
	Constant prices	49,5	2,1	7,6	5,5	29,2	**22,4**	57,1	34,7	**22,4**	6,4	15,9	**22,4**
2014	Current prices	49,3	2,4	7,6	5,2	30,2	**21,6**	57,0	35,4	**21,6**	6,3	15,3	**21,6**
	% Y-o-Y change	8%	-18%	-6%	2%	4%	**9%**	6%	4%	**9%**	1%	13%	**9%**
	Constant prices	46,0	2,3	7,1	4,9	28,2	**20,1**	53,2	33,0	**20,1**	5,9	14,3	**20,1**
2013	Current prices	45,4	2,9	8,0	5,1	28,8	**19,6**	53,5	33,9	**19,6**	6,2	13,4	**19,6**
	% Y-o-Y change	-6%	-17%	-7%	0%	-13%	**4%**	-6%	-11%	**4%**	-10%	13%	**4%**
	Constant prices	42,7	2,7	7,5	4,8	27,0	**18,4**	50,3	31,8	**18,4**	5,8	12,6	**18,4**
2012	Current prices	47,5	3,5	8,5	5,0	32,5	**18,5**	56,0	37,5	**18,5**	6,8	11,7	**18,5**
	% Y-o-Y change	3%	8%	6%	5%	2%	**6%**	3%	2%	**6%**	5%	6%	**6%**
	Constant prices	45,4	3,3	8,1	4,8	31,1	**17,7**	53,5	35,9	**17,7**	6,5	11,2	**17,7**
2011	Current prices	45,3	3,1	7,8	4,7	31,3	**17,1**	53,1	36,0	**17,1**	6,3	10,8	**17,1**
	Constant prices	44,2	3,1	7,6	4,6	30,5	**16,7**	51,8	35,1	**16,7**	6,2	10,5	**16,7**

ANNEX VI.

LEGAL ESTABLISHMENTS OF EU COMPANIES ABROAD

The following table includes the main wind energy sector companies in the European Union and its international presence.

COMPANY	INTERNATIONAL PRESENCE	
	EUROPEAN UNION	OUTSIDE OF EUROPEAN UNION
A. Silva Matos – Energía	Hungary, Portugal, Romania, Spain	United States of America
A2SEA	Denmark, Germany, United Kingdom	-
3E	Denmark	United States of America, Canada, Japan
ABB	European Union	Africa and Asia, Middle East, North America, South America
ABO Wind	Belgium, Bulgaria, France, Germany, Ireland, Spain, United Kingdom	Argentina
ABS Group	United Kingdom	United States of America, United Arab Emirates, Singapore
ABT	Netherlands, Belgium, Germany	-
Acciona	France, Germany, Greece, Hungary, Italy, Portugal, Spain	Australia, Canada, Chile, China, India, Mexico, Morocco, South Korea, United States of America
Actiflow BV	Belgium, Netherlands	-
ACOEM	France, Hungary, Germany, Italy,	United States of America, Brazil, Australia, Thailand, Malaysia,
Advantech Europe	Netherlands	Brazil, China, Israel, Japan, Korea, Singapore, Thailand, Turkey, United States of America
Adwen	Germany, France	
AES Wind Generation, Europe	Bulgaria, Czech Republic, France, Hungary, Netherlands, Spain, United Kingdom	Asia, Africa, Central America, Middle East, Nigeria, South America, North America
AGY	France	China, Japan, Korea, United States of America
Aibel	Norway, Denmark	Thailand, Singapore
Air energy	Belgium, United Kingdom	Asia-Pacific, Middle East,
North America		
Allianz Capital Partners	United Kingdom, Germany	United States of America, Singapore
Alnmaritec	Belgium, Cyprus, Germany, Greece, Italy, Luxembourg, Netherlands, Portugal, United Kingdom	Algeria, Australia, Barbados, Indonesia, Israel, Kuwait, Malaysia, Norway, Pakistan, Singapore, Venezuela
Alpha Wind	Ireland, Denmark, Poland, Romania, United Kingdom,	Egypt, Norway, United States of America

COMPANY	INTERNATIONAL PRESENCE	
	EUROPEAN UNION	OUTSIDE OF EUROPEAN UNION
Alstom Wind	Belgium, Germany, Greece, Hungary, Ireland, Italy, Netherlands, Portugal, Spain, United Kingdom	Asia, South Pacific, Middle East, North Africa, North America, South Africa, South America
Altahullion Wind Farm	Ireland, United Kingdom	-
Ammonit Measurement	Austria, Czech Republic, France, Germany, Italy, Portugal, Spain	Asia, South Pacific North America, South Africa, South America
Aplicaciones de Energías Sustitutivas	Greece, Spain	Colombia
AQ-System	Finland, Italy, Spain, Sweden, United Kingdom	Canada
Aristoncavi	Italy	China, Dubai, Singapore
ASJA Ambiente Italia	Italy	Argentina, Brazil, China
Atlas Professionals	Netherlands, Cyprus, Germany, Latvia, Norway, Spain, United Kingdom	Algeria, Singapore, Kazakhstan, Russia, Ukraine, Australia, Brazil
Availon	Germany, Italy, Spain	United States of America
Avancos	Germany, Netherlands, Spain, United Kingdom	China, India, United States of America
Avanti Wind Systems	Denmark, Germany, Spain, United Kingdom	Australia, China, India, South Korea, United States of America
Avantis Europe	Germany	Australia, Hong Kong
AVL List	Austria, Benelux, Czech Republic, Finland, France, Germany Hungary, Italy, Poland, Portugal, Romania, Slovenia, Spain, United Kingdom	Asia-Pacific, Australia, Americas Northern Europe
AWS Truepower	Spain	India, United States of America
Axys Technologies	Belgium	Canada
Bachmann electronic	Austria, Denmark, Germany, Netherlands	China, India
Bakker Magnetics	Belgium, Netherlands	-
Bard	European Union	Africa, Americas, Asia Pacific, Asia, Middle East
Barlovento Recursos Naturales	Romania, Spain	Brazil, Peru
Baxenergy	Germany, Italy	Turkey, South Africa, India
Bernecker + Rainer Industrie-Elektronik	European Union	Americas, Africa, South Pacific, Middle east
Beten International	France	Kazakhstan, Russia, Ukraine
Bladefence	Finland	Canada
Blue H Technologies	Cyprus, Italy, Netherlands, United Kingdom	-
Bonfiglioli Riduttori	France, Germany, Italy, Spain, United Kingdom	Australia, Canada, India, South Africa

COMPANY	INTERNATIONAL PRESENCE	
	EUROPEAN UNION	OUTSIDE OF EUROPEAN UNION
Boskalis Offshore International	European Union	Americas, Africa, South Pacific, Middle east
Brookfield Renewable Europe Services	Spain, Ireland	Canada, United States of America, Brazil, Colombia
Bureau Veritas	European Union	Americas, Africa, South Pacific, Middle East
Campbell Scientific	France, Germany, Spain, United Kingdom	Australia, China, Brazil, Costa Rica, Canada, South Africa
Capital Safety Group	Sweden, United Kingdom	Asia, South Pacific, Latin America, North America
Carlisle Industrial Brake & Friction	Netherlands, United Kingdom	China, India, Japan, United States of America
Cathie Associates	Belgium, France, United Kingdom	-
CD-adapco	France, Germany, Greece, Italy, Netherlands, United Kingdom	Africa, Brazil, India, Israel, Japan, Korea, Russia, Singapore, United States of America
CEZ Obnovitelne zdroje sro	Czech Republic, Germany, Hungary, Netherlands, Poland, Romania	Albania, Serbia
CG POWER SYSTEMS BELGIUM	Belgium, Denmark, France, Germany, Hungary, Ireland, Netherlands, Spain, Sweden, United Kingdom	Australia, China, India, Indonesia, Malaysia, New Zealand, Singapore, Algeria, Kuwait, Saudi Arabia, UAE, Brazil, United States of America
Chapin International	France	United States of America
Clipper Windpower Europe	United Kingdom	United States of America
CMI Maintenance Hainaut	France, Belgium, Hungary, Luxembourg, Germany	India, China, Congo, Mexico, United States of America, Russia, New Caledonia, Brazil, Morocco
Consolidated Contractors Company	Greece, Italy, United Kingdom	Africa, Asia, Middle East, North America
Converteam UK	Austria, Denmark, France, Germany, Italy, United Kingdom	Brazil, Canada, China, India, Norway, Russia, Singapore, South Korea, United Arab Emirates, United States of America
Corrosion & Water-Control	Cyprus, Denmark, Finland, France,	
Germany, Greece, Italy, Netherlands, Spain, United Kingdom	China, Iceland, India, Iran, Norway, Singapore, South Korea, Taiwan, Turkey, Ukraine, United Arab Emirates, Vietnam	
COWI	Denmark, Germany, Lithuania, Norway, Sweden, Poland, United Kingdom	Bahrain, Canada, China, Hong Kong, India, Mozambique, Oman, Qatar, South Korea, Tanzania, Turkey, Uganda, UAE, United States of America
Cresto	Denmark, Sweden	-
Croon Elektrotechniek	Netherlands, Poland	-
CTE Wind Civil Engineering	France, Portugal, Spain, Poland, Ireland	Brazil, Vietnam
Cummins Generator Technologies	Austria, Germany, Italy, United	

COMPANY	INTERNATIONAL PRESENCE	
	EUROPEAN UNION	OUTSIDE OF EUROPEAN UNION
Kingdom	Canada, China	
C-Ventus Offshore Windfarm Services	Netherlands, United Kingdom, Belgium	Singapore
DANOBAT GROUP	Austria, Belgium, Czech Republic, Denmark, Estonia, Finland, France, Germany, Hungary, Ireland, Italy, Lithuania, Romania, Spain, Sweden, United Kingdom	Argentina, Australia, Bahrain, Belarus, Brazil, Canada, Chile, China, India, Jordan, Kazakhstan, Lebanon, Mexico, New Zealand, Oman, Paraguay, Peru, Qatar, Russia, Saudi Arabia, Switzerland, Syria, Turkey, UAE, Uruguay, United States of America, Yemen
Davi – Promau	Italy	Australia, Brazil, China, India, Norway, South Africa, United States of America
David Brown Gear Systems	France, United Kingdom	Australia, Brazil, Chile, China, India,
Indonesia, South Africa, United States of America		
DCNS Energies	France, Ireland	Canada, Chile, Japan, Malaysia, India, Singapore
Delta Energy Systems	Czech Republic, Finland, France,	
Germany, Italy, Netherlands, Poland, Romania, Slovakia, Spain, Sweden, United Kingdom	Australia, Brazil, China, India, Japan, Russia, Singapore, Switzerland, Thailand, United States of America	
DEWI– Deutsches Windenergie Institut	France, Germany, Italy, Spain	Brazil, Canada, China, Turkey
Dexia	Belgium, France, Luxembourg	Turkey
DHI	Bulgaria, Czech Republic, Denmark, France, Germany, Hungary, Italy, Poland, Portugal, Romania, Slovak Republic, Spain, Sweden	Australia, Brazil, Canada, China, India, Malaysia, New Zealand, Norway, Singapore, South Africa
DHL Global Forwarding	European Union	Africa, Asia, North America, Oceania, South America
DONG Energy Wind Power	Denmark, France, Germany, Netherlands, Poland, Sweden, United Kingdom	Norway
Doosan Power Systems	Czech Republic, Germany, United	
Kingdom	United States of America	
Draka	European Union	Asia-Pacific, Americas
Du Pont Iberica	European Union	Asia-Pacific, Americas
E.ON Climate & Renewables	Germany, Italy, Spain, Sweden, United Kingdom	United States of America
EarthStream	France, Germany, Poland, Spain, United Kingdom	Brazil China, Dubai, Malaysia, Singapore, South Africa, United States of America, Vietnam
Eaton MEDC	United Kingdom	United States of America, Singapore, Australia, South Korea
Ecofys Investments	Germany, Netherlands, United Kingdom	China, United States of America

COMPANY	INTERNATIONAL PRESENCE	
	EUROPEAN UNION	OUTSIDE OF EUROPEAN UNION
EDF Energies Nouvelles	France	Canada, United States of America
EDP Renewables	Belgium, France, Italy, Portugal,	
Romania, Spain, United Kingdom	Brazil, Canada, United States of America	
EFLA Consulting Engineers	Iceland, France, Poland, Sweden	Turkey, Norway
Eickhoff Wind Power	Bulgaria, Germany, Poland, United	
Kingdom	Australia, Belarus, China, Russia, South Africa, United States of America	
EGS	United Kingdom	Australia, Brazil, Hong Kong, Indonesia, Malaysia, Philippines, Singapore, Taiwan, United States of America, Vietnam
Element Power Northern Europe Developments	United Kingdom, Ireland, Finland, Poland	-
Elos Fixturlaser	Germany, Netherlands, Sweden	Australia, Brazil, Canada, China, Russia, Taiwan, United States of America
EMD International	Denmark, France, Germany, Spain, United Kingdom	Canada, Middle East, Norway, United States of America
EMEK	Bulgaria, Greece	-
Emerging Energy Research	Spain	Singapore, United States of America
EMU	United Kingdom	Middle East, North Africa
ENEL Green Power	France, Greece, Italy, Portugal, Romania, Slovakia, Spain	Latin America, North America, Russia
Enerpac	Austria, Belgium, Denmark, France, Germany, Greece, Iceland, Ireland, Netherlands, Portugal, Spain, Sweden, United Kingdom	Australia, Brazil, Canada, China, India, Japan, Latin America, Middle East, New Zealand, North Africa, Norway, Russia, Singapore, South Africa, South Korea, United States of America
ENERCON	All EU Member States	Argentina, Brazil, Canada, Turkey, Vietnam, Taiwan, Japan, New Zealand, Australia, South Korea, Central America, South America, Norway and Switzerland
Energiekontor	Germany, Portugal, United Kingdom	-
Enerpac	Austria, Belgium, Denmark, France, Germany, Greece, Iceland, Ireland, Netherlands, Portugal, Spain, Sweden, United Kingdom	Australia, Brazil, Canada, China, India, Japan, Latin America, Middle East, New Zealand, North Africa, Norway, Russia, Singapore, South Africa, South Korea, United States of America
EnerVest	Belgium, Germany	-
Enfinity	Belgium, Czech Republic, France, Italy, United Kingdom	Brazil, Canada, China, India, Israel, United States of America
ENGIE	United Kingdom, Germany, France	United States of America, Brazil, India
Ensto Finland	European Union	-
Eolfi	France, Greece, Poland	United States of America

COMPANY	INTERNATIONAL PRESENCE	
	EUROPEAN UNION	OUTSIDE OF EUROPEAN UNION
Eolia Renovables	France, Germany, Poland, Portugal, Spain	Canada, Mexico
E.ON Climate & Renewables	Germany, United Kingdom, Sweden, Italy	North America
EP Global Energy	Cyprus, Greece, Romania	Albania, United Arab Emirates
ERM – Environmental Resources Management	Austria, Belgium, France, Germany, Hungary, Italy, Poland, Portugal, Spain, Sweden, United Kingdom	Argentina, Brazil, Canada, China, Colombia, Hong Kong, India, Indonesia, Japan, Kazakhstan, Korea, Malaysia, Mexico, New Zealand, Panama, Peru, Puerto Rico, Russia, Singapore, South Africa, Taiwan, Thailand, United Arab Emirates, United States of America, Vietnam
ETA	United Kingdom	Nigeria
European Wind Farms Ewp Windtower Production	Bulgaria, Denmark, France, Germany, Greece, Italy, Poland, Sweden	Bosnia, Croatia
EWT (Emergya Wind Technologies)	Netherlands, Sweden, United Kingdom	India, United States of America
Faccin	Germany, Italy, Spain	China, United States of America
FairWind	Denmark, Poland, Germany, Sweden, United Kingdom	South Africa, Turkey, Ukraine, United States of America
Falck Safety Services	Denmark, Germany, Netherlands, United Kingdom	Azerbaijan, Brazil, Indonesia, Malaysia, Nigeria, Norway, Russia, Singapore, Thailand, Trinidad and Tobago, United Arab Emirates, United States of America, Vietnam
Fersa	Estonia, France, Italy, Poland, Spain	China, Montenegro, Panama
Fibox	European Union	Australia, Canada, China, Hong Kong, Indonesia, Israel, Japan, Korea, New Zealand, Russia, South Africa, Taiwan, United States of America
Firetrace International	United Kingdom	United States of America, UAE
FLEXTRONICS INTERNATIONAL	European Union	Asia, North America, Brazil, Australia
FORCE Technology	Denmark, Sweden	China, Norway, Russia, United States of America
Fred. Olsen Windcarrier	Denmark, United Kingdom, Germany, Netherlands, Malta	Norway
Freudenberg Sealing Technologies	Austria, Belgium, Denmark, Finland, France, Germany, Hungary, Italy, Poland, Portugal, Romania, Spain, Sweden, United Kingdom	Australia, Brazil, Canada, China, India, Japan, Mexico, Norway, Russia, Switzerland, Turkey, United States of America
FTI Consulting	Belgium, Denmark, Finland, France, Germany, Ireland, Netherlands, Spain, United Kingdom	North America, South America, Asia, South Pacific
Fuhrländer	Bulgaria, Germany, Poland, Portugal, Spain	Azerbaijan, Brazil, China, Japan, Ukraine, United States of America, Vietnam

COMPANY	INTERNATIONAL PRESENCE	
	EUROPEAN UNION	OUTSIDE OF EUROPEAN UNION
GAMESA ENERGÍA	France, Germany, Greece, Italy, Portugal, Romania, Spain, United Kingdom	China, Mexico, United States of America
Garrad Hassan and Partners	France, Germany, Ireland, Italy, Netherlands, Poland, Portugal, Spain, United Kingdom	Australia, Brazil, Canada, Chile, China, Egypt, India, Japan, Korea, Mexico, New Zealand, South Africa, Turkey, United States of America
GDF SUEZ	European Union	Africa, Asia-Pacific, North America, South America
GE Renewable Energy	European Union	Africa, Asia-Pacific, North America, South America
GeoSea	Belgium	Australia
GeoSea	Belgium	Australia
Gerber Technology	Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Italy, Lithuania, Netherlands, Portugal, Romania, Spain, Sweden, United Kingdom	Africa, Asia-Pacific, Americas
Gerken	Belgium, Finland, Italy, Poland, Spain, United Kingdom	Australia, China, Croatia, Dubai, Ecuador, India, India, Indonesia, Iran, Japan, Korea, Mexico, Morocco, Norway, Pakistan, Philippines, Singapore, South Africa, Switzerland, Thailand, Turkey, United States of America
Gestamp Eolica	Belgium, Bulgaria, Poland, Romania, Spain	Brazil, Turkey, United States of America
Gexpro Services / Rexel	France, Hungary, Italy	Chile, China, United States of America
Global Energy Services	France, Germany, Greece, Hungary, Ireland, Italy, Portugal, Spain, United Kingdom	Chile, Egypt, Mexico, Morocco, Turkey, United States of America
Global Marine Systems	United Kingdom	China, Dubai, Singapore, United States of America
Global Maritime Vryhof	Netherlands, United Kingdom, France, Sweden	Singapore, United States of America, Australia, Brazil, Norway
Global Steel Service	Latvia, Poland	-
Global Tech I Offshore Wind	Denmark, Germany	-
Global Wind Power	Bulgaria, Denmark, France, Germany, Romania	Turkey
Goldwind Windenergy	Germany	Australia, China, South Africa, United States of America
Green Giraffe	Germany, United Kingdom, Netherlands, France	-
Green Power Development Holding	Netherlands, Poland	United States of America
Greensolver	France, United Kingdom, Netherlands	-
Grupo Apia XXI	Poland, Spain	Bahrain, Bolivia, Chile, Mexico, United States of America
Guascor Wind	Spain	Argentina

COMPANY	INTERNATIONAL PRESENCE	
	EUROPEAN UNION	OUTSIDE OF EUROPEAN UNION
Hailo Wind Systems	Germany	South America, North America, Asia
Hansen Transmissions International	Belgium, France, Germany, Sweden	Asia, South Pacific, Latin America, Africa, North America
HBM	Austria, Belgium, Denmark, Germany, Italy, Netherlands, Poland, Portugal, Spain, Sweden, United Kingdom	Asia, South Pacific, Latin America, Middle East, Africa
HEATEX	Sweden	North America, China
HELLENIC CABLES	Greece, Ireland, United Kingdom	-
Hg Capital	United Kingdom, Germany	-
Hibernian Wind Power	Ireland, United Kingdom	-
Hine Renovables	Spain	United States of America, China, India, Brazil
Holmatro	Netherlands, United Kingdom, Poland	China, United States of America
Horizon Geosciences	United Kingdom	India, UAE
Hytorc UNEX	European Union	North America, South America, Asia
IBERDROLA RENOVABLES ENERGIA	France, Germany, Hungary, Italy, Poland, Portugal, Spain, United Kingdom	United States of America
I-care	Belgium, France, Poland, Italy, Germany	United States of America, Switzerland, South Korea
I.L.M.E.	Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Malta, Netherlands, Portugal, Slovakia, Slovenia, Spain, Sweden, United Kingdom	Australia, Canada, Chile, China, Colombia, India, Israel, Japan, Korea, Malaysia, Mexico, Peru, Russia, Singapore, South Africa, Switzerland, Thailand, Turkey, Ukraine, United States of America, Venezuela
Impax Asset Management	United Kingdom	United States of America, Hong Kong
IMT	Belgium, Germany, Italy, Netherlands, Poland	Abu Dhabi, Dubai, Malaysia, Singapore, United Arab Emirates
InControl	Luxembourg, France	-
Ingeteam	Czech Republic, France, Germany, Spain	Brazil, China, Mexico, United States of America
Intellifast	France, Germany, Italy, Netherlands, Spain, United Kingdom	China, Israel, Malaysia, United States of America
International Paint	European Union	Americas, Asia Pacific, Middle east, Africa
Isolux	Italy, Portugal, Spain, United Kingdom	Algeria, Angola, Bangladesh, Gabon, Guinea, India, Jordan, Kenya, Kuwait, Morocco, Mozambique, Oman, Qatar, Saudi Arabia, Syria, United States of America
James Walker Sealing Products and Services	Belgium, France, Germany, Ireland, Italy, Netherlands, Spain, United Kingdom	Asia, Americas, South Pacific, Africa,
Jan DE NUL Group	Luxembourg, Belgium	Mauritius

COMPANY	INTERNATIONAL PRESENCE	
	EUROPEAN UNION	OUTSIDE OF EUROPEAN UNION
Janneniska	Finland, Germany, Spain, Sweden	Norway
JDR Cable Systems	United Kingdom	Norway, Singapore, Thailand, United States of America
juwi Holding	Bulgaria, Czech Republic, France,	
Germany, Greece, Italy, Poland, Spain, United Kingdom	Chile, Costa Rica, India, South Africa, United States of America	
K2 Management	Denmark, Germany, United Kingdom	United States of America, Brazil, South Africa, Taiwan, South Korea, Thailand
KDE Energy	Belgium, France, Netherlands, Poland, United Kingdom	-
KENERSYS EUROPE	Germany	India, United States of America
Kintech Ingenieria	Denmark, Spain	Chile, China, United States of America
Kloosterboer Vlissingen	France, Netherlands	Canada, United States of America
Kongsberg Digital	European Union	Americas, South Pacific, Middle east, Africa
KR Wind	Denmark, Germany, Italy, Romania, United Kingdom	Australia, Canada, United States of
America		
Kvaerner	Finland, United Kingdom	Norway, Russia, United States of America, China, Canada
Labkotec	Finland, Sweden, Germany	China
Lafert	France, Germany, Italy, Slovenia,	
Spain, United Kingdom	Australia, North America, Singapore	
Latchways	France, Spain, United Kingdom	South Africa, United States of America
Leitwind	European Union	Belarus, Canada, Georgia, Norway,
Turkey, Ukraine, United States of		
America		
LEOSPHERE	France	Brazil, China, India, Korea, United States of America
Lloyd's Register Group Services	European Union	Americas, Asia, Oceania, Africa
LM Wind Power	Denmark, Netherlands, Poland	Canada, China, India, United States of America
Logic Energy	Finland, France, Germany, Ireland, Italy, Poland, Spain, United Kingdom	Australia, India, Japan, Malaysia, Russia, Turkey, United States of America
LS Cable	France, United Kingdom	Australia, Brazil, China, Egypt, India, Indonesia, Japan, Korea, Malaysia, Russia, Singapore, South Africa, United States of America, Vietnam

COMPANY	INTERNATIONAL PRESENCE	
	EUROPEAN UNION	OUTSIDE OF EUROPEAN UNION
Maersk Broker	Denmark, Germany, United Kingdom, Greece	United States of America, China, South Korea, India, Hong Kong, Japan, Singapore, Taiwan, Vietnam
MAINA Organi di Trasmissione	Italy	China
Mainstream Renewable Power	Germany, Ireland, United Kingdom	Canada, Chile, South Africa, United
States of America		
MAKE	Denmark, Germany	United States of America, China
Mammoet Europe	Netherlands	Australia, Qatar, Saudi Arabia, United Arab Emirates
MARTIFER ENERGY SYSTEMS	Belgium, Czech Republic, France, Greece, Italy, Portugal, Slovakia, Spain, United Kingdom	United States of America
MCPS	United Kingdom	Argentina, Brazil, China, Dubai, Singapore, United States of America
MCT Brattberg	European Union	Asia-Pacific, Americas
Mecal Wind Turbine Design	Netherlands	Japan, United States of America
MEGAJOULE II, Consultoria em Energias Renováveis	Portugal, Poland	Brazil
Mekanord	Denmark, France, Greece, Ireland, Italy, Netherlands, Spain, United Kingdom	Argentina, Brazil, China, Croatia, Indonesia, Malaysia, Peru, Russia, Singapore, South Africa, Turkey, United Arab Emirates
MENCK	France, Germany, Netherlands	China, United States of America
MERSEN France Amiens	Austria, Belgium, Denmark, Finland, France, Germany, Italy, Luxembourg, Netherlands, Spain, Sweden, United Kingdom	Americas, Asia, South Pacific, Africa
METEODYN	France, Spain	Argentina, Australia, China, Peru, Switzerland, United States of America
MeteoGroup	Austria, Belgium, France, Germany, Ireland, Italy, Netherlands, Poland, Spain, United Kingdom	Switzerland, United States of America
METEORAGE	France, United Kingdom, Ireland, Spain, Portugal, Belgium, Netherlands, Luxembourg	Switzerland
Mitsubishi Power Systems Europe	Austria, Germany, Italy, Spain, United Kingdom	Egypt, Turkey
Meventus	Denmark, Sweden	Norway
MHI Vestas Offshore Wind	Denmark, Sweden, France, United Kingdom	-
MLS Intelligent Control Dynamics	Spain, United Kingdom	China, Korea, United States of America
MME Group	Netherlands, United Kingdom	China

COMPANY	INTERNATIONAL PRESENCE	
	EUROPEAN UNION	OUTSIDE OF EUROPEAN UNION
Moog	Germany, Italy, United Kingdom	Australia, China, India, Japan, United States of America
Morgan Carbon Europe	Belgium, Czech Republic, France, Germany, Hungary, Italy, Luxembourg, Netherlands, Poland, Spain, Sweden, United Kingdom	Russia, South Africa, Switzerland, Turkey
Mott MacDonald	France, Hungary, Ireland, Netherlands, Poland, United Kingdom	Australia, China, India, Russia, South Africa
Mtorres	Spain	Chile
MTS Systems	European Union	Americas, Asia, Oceania,
Nabtesco	Germany	Japan
Natixis	European Union	Americas, Asia, Oceania
Natural Power Consultants	France, United Kingdom	Chile, Turkey, United States of America
Nexans Norway	France	Norway
Nord-Lock	Sweden, United Kingdom	United States of America
Nordex	Austria, Denmark, France, Germany, Greece, Ireland, Italy, Poland, Spain, Sweden, United Kingdom	China, Japan, Turkey, United States of America
Nordic Wind Solutions	Denmark, Sweden	-
Norton Rose Fulbright	European Union	North America, South America, Africa, Asia Pacific
N-Sea Offshore	Netherlands, United Kingdom	India, UAE
NSSLGlobal	United Kingdom, Germany, Denmark, Poland	Singapore, United States of America, South Africa
Offshore Marine Management	Germany, United Kingdom	Dubai, Mexico, New Zealand, Thailand, United States of America
Open Ocean	United Kingdom, Sweden, Finland	-
Orga Aviation	Netherlands	United States of America
ORMAZABAL	France, Germany, Poland, Spain	Asia, Oceania, Latin America,
OST Energy	United Kingdom, France, Italy	South Africa, India, Australia, United States of America, Mexico
OutSmart	Germany, Netherlands	-
Palfinger Marine	European Union	Asia, Americas
Pall Corporation	European Union	Africa, Asia-Pacific, Middle East, Americas
Parsons Brinckerhoff	European Union	Americas, Asia, Africa, Australia
Peikko Group	Austria, Czech Republic, Denmark, Estonia, Finland, Finland, France, Germany, Greece, Hungary, Italy, Latvia, Lithuania, Netherlands, Poland, Slovakia, Spain, Sweden, United Kingdom	Canada, China, Norway, Russia, Switzerland, Turkey, United Arab Emirates, United States of America
PEKKANISKA GROUP	Estonia, Finland, Latvia, Lithuania,	

COMPANY	INTERNATIONAL PRESENCE	
	EUROPEAN UNION	OUTSIDE OF EUROPEAN UNION
Sweden	Russia, Ukraine	
Phoenix Contact	European Union	Asia-Pacific, Americas
Platina Energy Partners	United Kingdom, France, Italy, Luxembourg	-
PM Renewables	France, Germany, Italy, Netherlands, Spain	Asia, Africa, South Pacific, Americas
POWER Engineers	United Kingdom	United States of America, South Africa
PoweratSea	Italy	United States of America
Power Climber Wind	Belgium	United States of America
Power One	Italy	United States of America
Powernet	Finland, Germany, Sweden	-
PPG Protective and Marine Coatings	European Union	Middle east and Africa, North America, Asia Pacific
Procovent	Germany, Sweden	-
PRÜFTECHNIK	European Union	Asia-Pacific, Americas
PRYSMIAN Powerlink	France, Germany, Italy, Netherlands, Spain, United Kingdom	Asia-Pacific, Americas
Principle Power	France, Portugal	United States of America
RAPID-TORC	Belgium	United States of America
Raycap	Germany, Greece	United States of America
Reichhold	Czech Republic, Finland, France, Germany, Italy, Netherlands, United Kingdom	Africa, Asia-Pacific, Middle East, Americas
Renovalia	Spain	Canada, Mexico, Chile, Italy, Hungary
REpower Systems	Belgium, France, Germany, Italy, Poland, Portugal, Spain, Sweden, United Kingdom	Australia, Canada, China, United States of America
RES	France, Ireland, Sweden, United	
Kingdom	Australia, South Africa, Turkey	
RG Renovatio Group	Austria, Bulgaria, Cyprus, Greece, Italy, Poland, Portugal, Romania	-
Ricardo UK	Czech Republic, Germany, Italy, United Kingdom	China, India, Japan, Korea, Russia, United States of America
Rockwell Automation European	European Union	Asia-Pacific, Americas
Romax Technology	France, United Kingdom	China, India, Japan, South Korea, United States of America
ROMO Wind	Denmark, Germany, Spain, Italy, France	Switzerland
Roxtec International	European Union	Asia-Pacific, Americas
Royal Wagenborg	Netherlands	Kazakhstan, Middle east
RSA / Codan	Denmark, Sweden	Norway

COMPANY	INTERNATIONAL PRESENCE	
	EUROPEAN UNION	OUTSIDE OF EUROPEAN UNION
S&C Electric Europe	United Kingdom	United States of America
Safety	France, Germany, Italy, Spain	China
Sandvik	European Union	Africa, Asia-Pacific, Americas
Sapa Profiler	Austria, Belgium, Denmark, Estonia, Finland, France, Germany, Italy, Latvia, Lithuania, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, United Kingdom	Bosnia, Canada, China, Croatia, Mexico, Norway, Switzerland, United States of America, Vietnam
Savino del Bene Global Logistics and Forwarding Company	Bulgaria, France, Germany, Italy, Poland, Portugal, Slovenia, Spain, United Kingdom	Argentina, Australia, Bosnia, Brazil, Canada, Chile, China, Colombia, Costa Rica, Croatia, El Salvador, Ghana, India, Indonesia, Japan, Libya, Malaysia, Mexico, Montenegro, Nicaragua, Panama, Peru, Russia, Serbia, Singapore, South Africa, South Korea, Switzerland, Thailand, Turkey, Ukraine, United States of America, Uruguay, Venezuela, Vietnam
SC CONTINENTAL WIND RO	Bulgaria, Poland, Romania, United Kingdom	Croatia, Monaco, Serbia, United States of America
Schneider Electric	European Union, France	Africa, Asia-Pacific, Americas
Schuler Pressen	France, Germany, Italy, Poland, Slovakia, Spain, United Kingdom	Brazil, China, India, Mexico, United States of America
Schunk Electrographite	European Union	Africa, Asia-Pacific, Americas
SEaB Energy	France, United Kingdom	South Africa, United States of America
Seajacks UK	United Kingdom	Bermuda
Seaway Heavy Lifting Engineering	Netherlands, Cyprus, France, Germany, United Kingdom	United States of America
Senergy Alternative Energy	United Kingdom	Australia, Indonesia, Malaysia, New Zealand, Norway, United Arab Emirates, United States of America
Senvion	Austria, Belgium, France, Germany, Italy, Netherlands, Portugal, Romania, Poland, Sweden, United Kingdom	Australia, Canada, Chile, China, India, Japan, Turkey, United States of America
SgurrEnergy	France, Germany, Ireland, Romania, United Kingdom	Switzerland, Norway, Russia, South Pacific, Africa, Americas
SICME MOTORI	Austria, Belgium, Czech Republic, France, Germany, Greece, Italy, Netherlands, Poland, Slovakia, Spain, Sweden, United Kingdom	Africa, Asia, Australia, Americas
SIEMENS Wind Power	Denmark, Finland, Germany, Netherlands	Denmark, Finland, Germany, Netherlands
SKF	Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Hungary, Iceland, Italy, Latvia, Netherlands, Poland, Portugal, Romania, Spain, Sweden, United Kingdom	Africa, Asia-Pacific, Americas
Smalley Europe	France, Sweden	Panama, United States of America

COMPANY	INTERNATIONAL PRESENCE	
	EUROPEAN UNION	OUTSIDE OF EUROPEAN UNION
Smart Manufacturing Technology	Portugal, United Kingdom	China, Japan
SOCOMORE Ireland	France, Ireland, Germany	Canada, United States of America, Brazil, China
Sparrows Group	United Kingdom	Angola, United States of America, UAE, Singapore, Brazil, Indonesia
Spectro \ Jet-Care	United Kingdom	United States of America, Switzerland
SPERIAN PROTECTION EUROPE	Czech Republic, France, Germany, Hungary, Italy, Poland, Slovakia, United Kingdom	Brazil, Canada, Norway, Russia, United States of America
SPX Flow Hydraulic Technologies	Finland, France, Germany, Italy, Netherlands, Spain, United Kingdom	Australia, Canada, China, India, Indonesia, Malaysia, Norway, Philippines, Singapore, South Africa, Sri Lanka, Switzerland, Taiwan, Thailand, United States of America, Vietnam
SSE Renewables	Ireland, Netherlands, Sweden, United Kingdom	-
Statoil	United Kingdom, Germany	Norway
STE GLOBAL	France, Spain	-
Sterr-Kölln & Partner	France, Germany	-
Stork Gears & Services	Belgium, Germany, Italy, Netherlands	Mexico, Singapore, United Arab
Emirates		
StormGeo	The European Union	Americas, South Pacific, Middle east
Stromag France	European Union	Australia, Canada, Chile, China, Egypt, India, Korea, Mauritania, Morocco, Singapore, South Africa, Thailand, United States of America
Svendborg Brakes	Czech Republic, Denmark, Germany, Poland, Spain	Australia, Brazil, Chile, China, Korea, South Africa, United States of America
Sword CTSpace	France, Germany, United Kingdom	United Arab Emirates, United States of America
Taiga Mistral	Poland, Spain	-
Technip Offshore Wind	European Union	Africa, Asia-Pacific, North America, South America
Tekmar Energy	United Kingdom, Germany	China, South Korea, Singapore, UAE, United States of America
Tele-Fonika Kable	European Union	Africa, China, North and South America, Serbia, Turkey, Ukraine
Telvent	Portugal, Spain, Sweden	Argentina, Australia, Brazil, Canada, Chile, China, Libya, Mexico, Peru, Qatar, Switzerland, Thailand, Turkey, United Arab Emirates, United States of America, Uruguay, Venezuela
Tensar International	European Union	Africa, Asia, Central and South America, North America

COMPANY	INTERNATIONAL PRESENCE	
	EUROPEAN UNION	OUTSIDE OF EUROPEAN UNION
TER Tecno Elettrica Ravasi	The European Union	Americas, South Pacific, Asia, Middle East
The Switch Engineering	Denmark, Finland, Germany, Spain	China, India, Korea, United States of America
Total Wind	Denmark, France, Germany, Netherlands, Poland, Spain	Brazil, Canada, Morocco
Tractebel Engineering	Belgium, Czech Republic, France, Italy, Poland, Romania	Brazil, Chile, India, Panama, Thailand, Turkey, United Arab Emirates
Tractel Group	European Union	Africa, Asia-Pacific, Middle East, Americas
Trelleborg Ridderkerk	Netherlands, Spain	China, Russia
Turbowinds	Belgium, Bulgaria, Italy, Netherlands, United Kingdom	Canada, China, Israel, United States of America
TUV SUD Industrie Service	The European Union	South Pacific, Americas, Africa, Middle east
Uniline Safety Systems	United Kingdom	Australia
Vaisala	United Kingdom, Sweden, Finland, Germany, France	Americas, South Pacific, Australia, UAE
Vattenfall Aktiebolag	Belgium, Denmark, Finland, France, Germany, Netherlands, Poland, Sweden, United Kingdom	Norway
VBMS	United Kingdom, Germany, Denmark, Netherlands	-
VDL Klima	Netherlands, Scandinavia, United Kingdom	Canada, Singapore, Turkey, United States of America, Vietnam
Ventyx	France, United Kingdom	Japan, North America, South Africa
Verbrugge Zeeland Terminals	Netherlands	Northern Europe
Vergnet	France, Italy, Lithuania	Australia, Caribbean islands, Chile, Eritrea, Ethiopia, Japan, Kenya, Mauritania, Nigeria, Taiwan, United States of America
Vestas Wind Systems	European Union	Argentina, Australia, Brazil, Canada, Chile, China, India, Japan, Korea, Mexico, New Zealand, Singapore, South Africa, Taiwan, United States of America
Viktech	Denmark, Germany	-
Vinson & Elkins	United Kingdom	United States of America, China, UAE, Hong Kong, Russia, Taiwan, Japan
Visser & Smit Marine Contracting	Germany, Netherlands, United Kingdom	-
VITEC ENERGY	Finland, Sweden	Norway
Wind Power	Denmark	Japan
WIND PROSPECT GROUP	France, Ireland, Poland, United Kingdom	Australia, Canada, China, Singapore, South Africa, Turkey
Windtest Grevenbroich	Germany	India, South Korea, United States of America
WIND TO POWER SYSTEMS	Germany, Italy, Portugal, Spain	China

COMPANY	INTERNATIONAL PRESENCE	
	EUROPEAN UNION	OUTSIDE OF EUROPEAN UNION
Windfarm Development	European Union	-
windhunter-serwis	Bulgaria, Estonia, Finland, France, Germany, Greece, Hungary, Italy, Netherlands, Poland, Romania	Argentina, Chile, Costa Rica, North America
WINDKRAFT ALSLEBEN	Germany, United Kingdom	-
WINDPARKSERVICE	Germany, Ireland	Norway
WINDPOWER MONTHLY NEWS MAGAZINE	Denmark, United Kingdom	-
WindPro	France, Germany, Spain, United Kingdom	Canada, China, Middle East, United States of America
Windstar	Greece, Italy, Sweden	Latin America
Windtechnics	Belgium, Bulgaria, France, Germany, Greece, Ireland, Italy, Poland, Romania, United Kingdom	Switzerland, Turkey
WindVision Holding	Belgium, Cyprus, France, Netherlands	-
Winergy	Germany	China, India, United States of America
Winwind	Denmark, Estonia, Finland, Portugal, Sweden	India
WKN Windkraft Nord	Bulgaria, France, Germany, Italy, Poland, Sweden	South Africa, Ukraine, United States of America
wpd think energy	Bulgaria, Finland, France, Germany, Greece, Italy, Poland, Romania, Spain, Sweden	Argentina, Canada, Chile, Croatia, Panama
XEMC Darwind	Netherlands	China
ZF Friedrichshafen	European Union	Algeria, Argentina, Australia, Brazil, Canada, China, Egypt, India, Japan, Jordan, Mexico, Russia, South Africa, Syria, United Arab Emirates, United States of America

WindEurope is the voice of the wind industry, actively promoting wind power in Europe and worldwide. It has over 450 members with headquarters in more than 40 countries, including the leading wind turbine manufacturers, component suppliers, research institutes, national wind energy associations, developers, contractors, electricity providers, financial institutions, insurance companies and consultants. This combined strength makes WindEurope Europe's largest and most powerful wind energy network.

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