





**Wind
Power**

Wind power is one of the fastest growing industrial segments in the world. Being once a niche market in Europe, wind has added more capacity than any other technology over the last decade. Now, wind power nears the 500 GW milestone, providing jobs and power to regions across the globe.

Wind energy is the most efficient solution to reduce emissions in the power sector. Onshore wind is now the cheapest form of new power generation on average across Europe. Its costs fell 60% in the last 10 years. And offshore wind costs fell 50% in just the last two years. Wind power emits no greenhouse gases or air pollutants during its operation and uses minimal water. Wind power is a scalable and reliable renewable energy source on- and offshore, which allows for hedging against fuel price fluctuations.

9 out of 10 Europeans are in favour of wind power in their country. This is because wind mitigates climate change and contributes to energy security and economic growth. With community ownership, wind also gives people a stake in their own energy. In 1985, wind turbines were under 1 MW with rotor diameters of around 15 meters. Today, 7.5 MW onshore turbines are the largest with a rotor diameter of 127 meters. And offshore, the industry installs 8 MW turbines with a rotor diameter of over 160 meters and a tip height of nearly 190 meters.

Grid operators can integrate large amounts of wind power. Wind covered 37% of Denmark's electricity demand last year and generates more than 100% on windy days. To make the energy transition work, governments need to reinforce and better connect the power grid, which would bring down prices for consumers.

More and more companies are turning green. Investors seek long-term, stable revenues in a low interest rate environment. The European wind sector has long been open to overseas investors, who look at Europe as a major infrastructure hub for onshore and offshore technologies alike. And industrial consumers are hungry for more wind energy as they look for green electricity that comes at stable and competitive prices. Europe today has over 1.2 GW of renewables capacity contracted through corporate power purchase agreements, 90% of which is in wind energy.

Europe still leads the world in wind technology. Three out of the top five global turbine manufacturers are European. Wind is an asset for Europe with €11bn exported in 2015 and €27.5bn invested in 2016. In comparison with the rest of the world, European wind energy markets are, however, slowing down. Regulatory factors, bad design or slow adaptation to market dynamics, are the main problem. The transition is not self-running but a difficult road leading to a prosperous destination.

DID YOU KNOW?

Check how much wind power was generated in your country with one click. See Europe's electricity mix and hourly wind power generation here: windeurope.org/daily-wind

WIND TURBINE

Rotor
blade

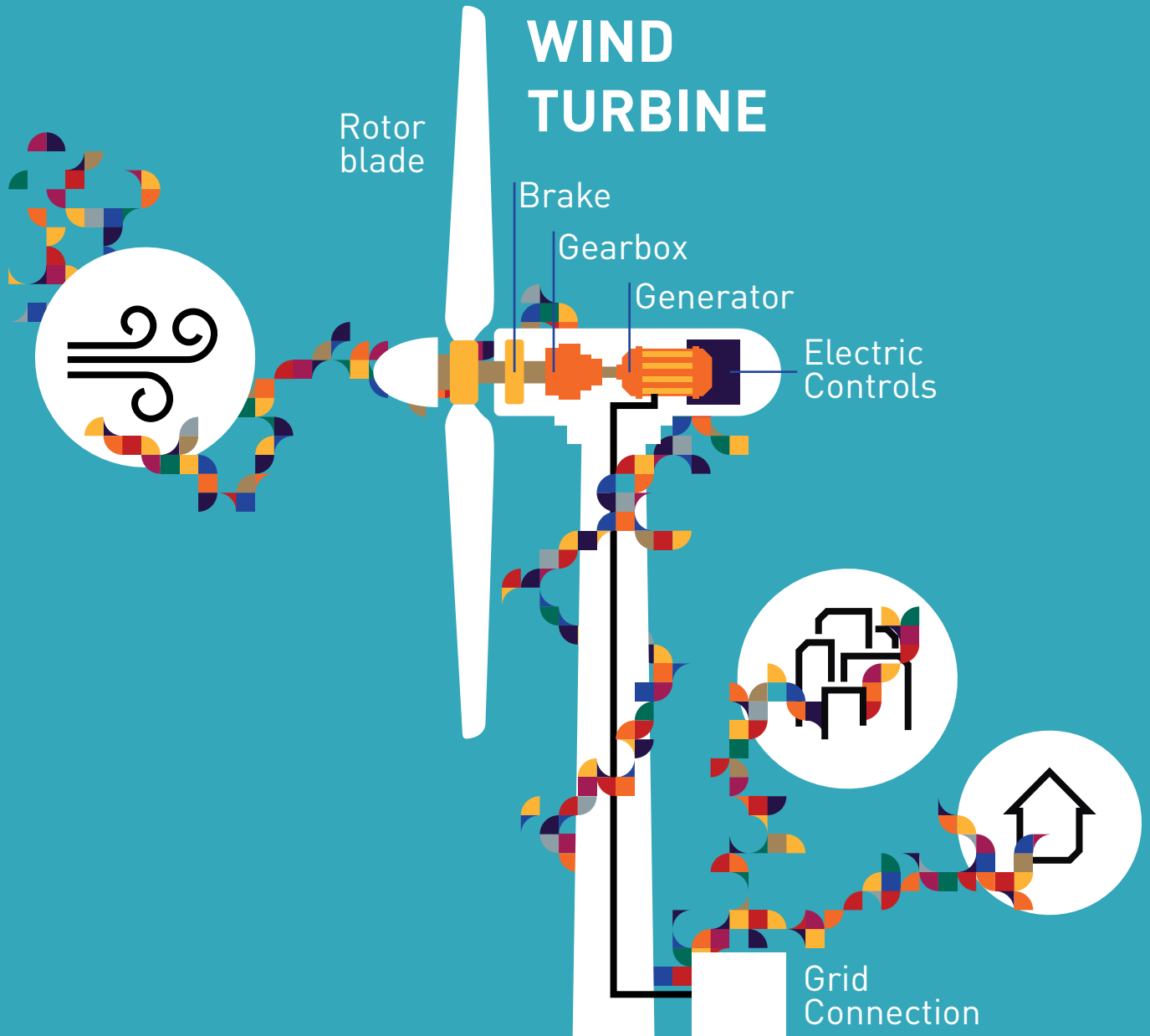
Brake

Gearbox

Generator

Electric
Controls

Grid
Connection



1. Wind accounted for **51%** of the EU's new power capacity in 2016.
2. **154 GW** of wind power is installed in the EU today, which makes wind the second largest power generator by capacity in the EU.
6. Europe's wind industry's turnover grew to **€72.5bn** in 2015 and it invested €27.5bn in 2016.
7. In the run-up to Paris CoP21, **70 non-EU countries** highlighted wind power as a climate mitigation tool in their national determined contributions.

In 2016, wind power saved Europe an estimated 191 million tons of carbon dioxide emissions.

3. In Europe, the average onshore turbine produces enough electricity for 1,500 households; the average offshore wind turbine can power over **4,500 households**.
4. Onshore wind is already the cheapest form of new power generation in many parts of the world. By 2025, IRENA sees a global cost reduction potential of **35%** for offshore wind and **26%** for onshore wind.
5. Almost every second turbine in the world is made in the EU. European manufacturers have exported **77 GW** or over **25,000 wind turbines** to other parts of the world so far.
8. Europe's wind industry employs more than **300,000** people today.
9. A single blade of the biggest wind turbine is **88.4 m** long and exceeds the wingspan of an Airbus 380.
10. Wind turbines in the EU met **10.4%** of the EU's electricity demand by generating almost 300 TWh in 2016.

Sources: WindEurope, IRENA.



1. Show more ambition on renewables.

The 2015 Paris Climate Agreement was a landmark achievement but just a first step. The indicated deployment of renewable energy does not yet suffice to prevent a 2°C temperature rise. EU policy makers should therefore adopt an EU-wide binding renewable energy target of at least 35%. National governments should also provide clarity on future volumes to speed up the energy transition and slow down climate change.

2. Modernize our grid and make the market fit.

Energy is Europe's last commodity that cannot be freely traded and faces software and hardware problems. The rules governing grid and electricity markets were tailored to the power systems of the past, made up of centralised fossil fuel production with national boundaries. Europe's market design should become more flexible and fit a large share of renewables. Eventually, the existing grid infrastructure has to shift from old, fragmented grids to a smart, Europe-wide network.

3. Cut red tape and attract investors.

The investment climate in the European power sector is deteriorating. Projects become riskier and struggle to attract affordable capital as they lack visibility on their long-term revenues. This is particularly relevant for wind energy projects, which require large upfront investment and are highly sensitive to financing conditions. Governments can increase visibility with easier permitting and mechanisms that prevent abrupt policy changes. Fully implementing the guarantees of origin tracking and facilitating power purchase agreements would attract more investors.

4. Decarbonise transport, heating and cooling.

Transport, heating and cooling consume three quarters of EU's energy and account for the lion's share of emissions. By 2015, renewables grew fast to 29% in the power sector. But the others lag behind with an 19% share of energy from renewable sources in heating and cooling, and only 7% in transport. In order to further the energy transition, EU institutions should set trajectories for renewables in all sectors and promote electrification and hydrogen powered by green energy.

5. Facilitate world-class innovations.

The EU wants to strengthen its industrial base and become number one in renewables. This mission requires ongoing innovations and is at risk if Europe continues with business as usual. A dedicated EU strategy for research and innovation and aligning funding with the climate and energy targets leads to success, strengthens the industrial base and sustains the EU's leadership in both on- and offshore wind energy.





Giles Dickson

Chief Executive Officer of WindEurope

Why does the energy transition matter to Europe?

Europe is still recovering from an economic crisis and has entered uncharted territory. The energy transition is a tangible solution to kick-start the economy and mitigate climate change, one of humanity's most serious threats. The average global temperature in 2016 was almost 1.4°C higher than in the 19th century, and Europe is warming faster than other parts of the world. Energy accounts for al-

most 2/3 of greenhouse gas emissions but modernising our energy system brings more than environmental benefits.

Replacing fossil fuels with wind power and other renewables modernises our economy, renews business models, strengthens Europe's competitiveness and creates new jobs. Wind power is on a journey to modernise regions and make Europe a global leader in clean technologies.

What are the main challenges?

Information, technology and policies.

Plugging the economic benefits and busting myths is essential to ditch the fossil fuel addiction. A large number of people still perceives wind power as a nice add-on although 90% of Europeans want wind power because they care about their environment. Wind power is an indispensable mainstream industry, employing more than 300,000 people in Europe alone and producing enough electricity for 90 million European households. Thanks to ongoing innovations, wind is ready to become central to Europe's power system and continues to drive down costs.

Onshore wind is the cheapest form of new power generation in many parts of Europe, and offshore wind power is maturing fast. In 2015, the biggest offshore wind players issued a united pledge to make the technology fully competitive within a decade. Recent strike prices of €50-73 per MWh confirmed that we are on track in prime locations in Denmark, Germany and the Netherlands. Unleashing wind power's full potential, however, depends on a robust pipeline and supportive policies post-2020.



All EU Member States still import and subsidise fossil fuels at a high cost, and thereby risk a carbon lock-in. Policy-makers have started to modernise the existing energy infrastructure and make the market fit for renewables. These first steps should not lead to complacency but a momentum to decarbonise the economy further.

Wind power is on a journey to modernise regions and make Europe a global leader in clean technologies.

How important is electrification?

Europe will not accomplish a competitive, low-carbon economy with business as usual. Electricity accounts for less than a quarter of Europe's energy demand, and the EU's reference scenario indicates that it will not change significantly over the next decade unless electrification increases.

Electrifying transport, heating and cooling is good for the economy and environment if powered by wind energy. Air pollution costs the European economy €1.4 trillion a year, which is why Member States need to step up their efforts on electro-mobility. The Dutch Parliament, for example, supports electric vehicles and voted for a motion to ban the sales of new petrol and diesel cars by 2025.

At the same time, the Netherlands aims at 6,000 MW onshore wind by 2020 and 4,500 offshore wind by 2023. Dutch wind turbines could then produce enough electricity to power 1,000,000 Tesla S in a clean way.

How do Europeans benefit from the energy transition?

Wind power re-energises regions, even those in decline. Like many seaports, Hull has a proud history. Shifts in the global economy however led to deindustrialisation and rising unemployment. This changed a decade later.

In March 2014, Siemens and Associated British Ports announced that they would jointly invest £310m into two wind turbine production facilities in the region. The Green Port Hull takes advantage of the offshore wind opportunities in the North Sea and established a world-class centre for emerging renewable industries.

The Green Port Growth Programme supported over 300 local companies, 400 employees and 600 apprentices in getting a skilled job with energy, manufacturing and engineering firms. The number of green jobs in the region climbed to 1,000, turning one of the UK's poorest towns into a bustling hive of commercial activity. The operation of the Hull plant began in December 2016 and recruitment is ongoing. ➤

Wind[•]
E U R O P E



MONKS TURN TO WIND ENERGY

Romania

The turbines of the largest onshore wind farm in Europe (600 MW), Fantanele–Cogealac, are everywhere around Casian, a village in south-east Romania. Father Iustin was the first monk in the Constanța region to power his monastery with renewable technology and now he gladly advises other monasteries to do the same. The renewable energy system at Casian supports the lives of the five monks at the monastery, powering their fridges, washing machine, stove, lights and one laptop computer, and perhaps most importantly, it powers the water pump that is responsible for pumping water from the 150 meter well. 10 monasteries in the Casian area have followed in the footsteps of Casian and have some sort of renewable energy system.



GIVING POWER TO THE PEOPLE

Germany

In June 2016, the Südliche Ortenau civic wind farm, about 50km south of Strasbourg, emerged on the territories of the municipalities of Ettenheim, Schuttertal and Seelbach. The wind farm comprises seven modern 2.75 MW GE wind turbines with a hub height of 139 meters. In a normal wind year, each of these turbines can power 2,000 households, and together they produce enough electricity to cover 30% of the demand in all three municipalities. Independent from volatile fossil fuel prices, locals can buy the generated power directly at a stable price. Ownership and information are the cornerstones of a strong community. In September 2016, The Bürgerwindpark Southern Ortenau won the Best Community Project Award of WISE Power.

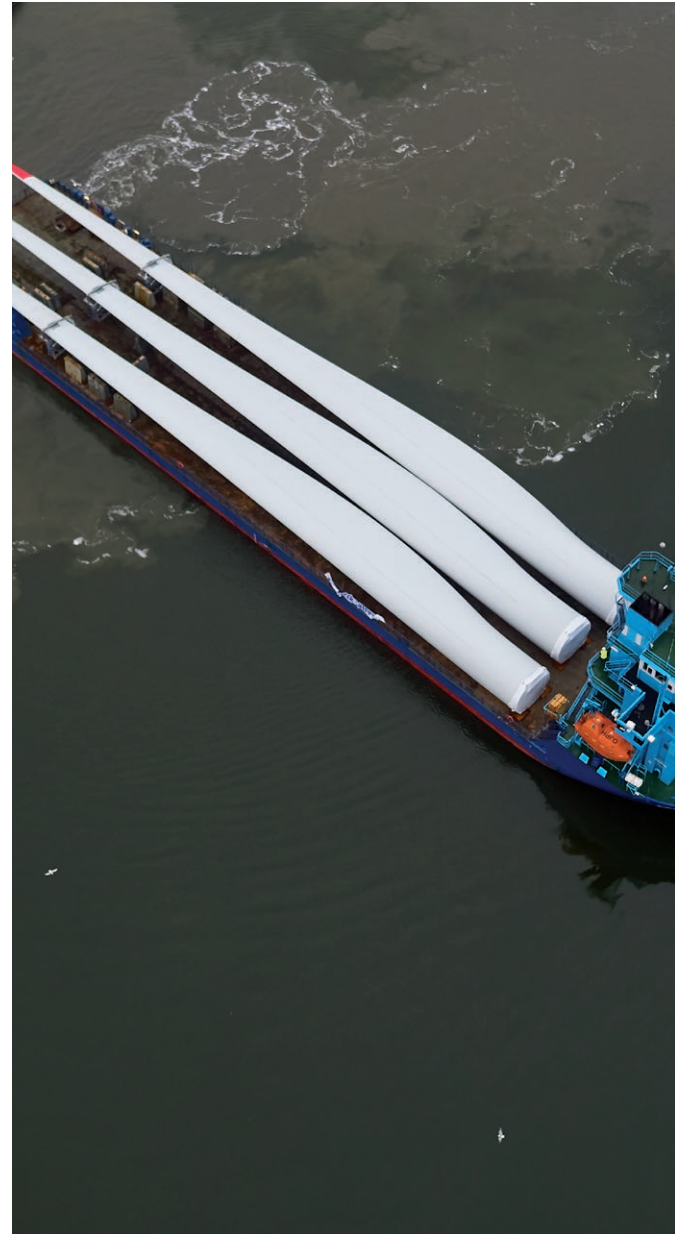




LM WIND POWER OFFSHORE BLADE PLANT

France

The scale of offshore wind turbine blades requires special facilities and a location close to the sea. That was part of the reason for LM Wind Power to start construction on March 23 in the presence of French Prime Minister, Bernard Cazeneuve, in Cherbourg, Normandy, for its first dedicated offshore blade plant. The Cherbourg plant is LM Wind Power's 15th plant worldwide, and the company brings an initial investment of more than €100 million to the project including factory, equipment and start-up. The factory will serve all customers in the global offshore wind blades market. The plant is expected to grow to a capacity between 1.2 and 2.0 GW and employ around 550 people. LM Wind Power was acquired by GE for \$1.65 billion in April 2017.



(Left) Fântânele-Cogealac Wind Farm, Romania.

Source: Sandri Alexandra Buzatu

(Middle) The Bürgerwindpark Southern Ortenau.

Source: Roland-Geisheimer

(Right) Source: LM Wind Power

