GLOBAL WIND REPORT

ANNUAL MARKET UPDATE 2015

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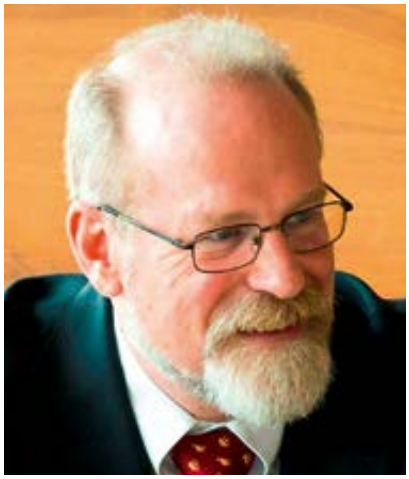


FOREWORD

2015 was a stellar year for the wind industry and for the energy revolution, culminating with the landmark Paris Agreement in December. An all too rare triumph of multilateralism, 186 governments have finally agreed on where we need to get to in order to protect the climate for future generations. Now the question is whether or not they're going to take the actions in the short and medium term to get us there.

There are a lot of positive signals: decadal low fossil fuel prices have had no appreciable affect on the growth of wind and solar; the Financial Stability Board's pronouncements on the climate related risks to the global financial system; China's State Grid calling for first a regional and then a global grid to transport clean energy around the world – a new Silk Road; the growing divestment from fossil fuels by institutional investors; and of course, the rapidly growing installation levels and record low prices of both wind power and solar PV.

Wind power had *yet another* record-breaking year. After passing the 50 GW mark for the first time in a single year in 2014, we reached yet another milestone in 2015 as annual installations topped 63 GW, a 22% increase. By the end of last year, there were about 433 GW of wind power spinning around the globe, a cumulative 17% increase; and wind power *supplied more new power generation than any other technology* in 2015, according to the IEA.

China led the way, as usual, with a record 30.8 GW of new installed capacity, breaking the previous record it had set (in 2014) for installations in a single year. China now has more than 145 GW of wind power installed, more than in all of the European Union; and last year it was the first country ever to invest more than USD 100 billion in renewables in a single year.

Elsewhere in Asia, India is the main story, which has now surpassed Spain to move into 4th place in the global cumulative installations ranking, and had the fifth largest market last year. Pakistan, the Philippines, Viet Nam, Thailand, Mongolia and now Indonesia are all ripe for market growth.

Europe had a surprisingly good year, led by Germany's record-setting 6 GW of installations, bolstered by more than 2 GW of offshore wind; and the US market had a remarkable 4th quarter, ending the year with an 8.6 GW market, much higher than most had expected.

Brazil, Canada, Mexico and South Africa also had strong years, and we saw the first commercial wind farms in Jordan, Guatemala and Serbia. Perhaps the most encouraging sign of all is the continued proliferation of new markets across Africa, Asia and Latin America, spurred by the need for competitive, clean, and indigenous energy sources to fuel development.

Looking ahead, we see a period of steady growth. Asia will continue to lead, and Europe will move steadily towards its 2020 targets, although there may be some bumps in the road. In North America, both Canada and the US seems poised for another round of growth, and as Mexico's energy reform gets bedded down we should be looking at a period of rapid development in that newly liberalized market.

In Latin America, Brazil will continue to lead, although Chile, Peru, Uruguay and now Argentina will make a contribution. In Africa and the Middle East, besides market leader South Africa, both Morocco and Egypt seem poised for solid growth in the next five years, and smaller markets in Kenya, Ethiopia and elsewhere are moving. All told, wind capacity should nearly double in the next five years.

Other than climate, two other major trends are having a major positive impact on the wind business:

Cratering prices: while very low wind prices have characterised the US market for some time, and the Brazilian and South African tendering systems have also generated low prices for the last several years, we have recently seen a spate of tender results in Egypt, Morocco, Peru and elsewhere at what up until now were unheard of prices outside the US plains states – in the vicinity of EUR 40/MWh or below, and in the case of Morocco, below EUR 30/MWh. Is this the new normal? Time will tell.

US Market Stability: The United States, as a pioneer in the global wind industry as well as having some of the best wind resources in the world, has had much lower prices than most of its OECD competitors for some time, but the difficulty was always the on-again, off-again nature of the US market, as it was subjected to short term policy frameworks which left policy gaps every few years and hampered the growth of the industry.

So it was very welcome news in December when the US Congress passed a long term extension and phase out of the Production Tax Credit (PTC), which has been the main federal policy support for wind energy. The US wind industry now embarks on its longest-ever period of policy stability, and five years from now the US industry will be a very different and much stronger force.

This report is the 11th annual report on the status of the global wind industry by the Global Wind Energy Council. It provides a comprehensive overview of the global industry at a moment in time; an industry now present in more than 80 countries, 26 of which have more than 1 GW installed, and 8 with more than 10 GW. The information contained in this report – market data, profiles and analysis, have been collected primarily through GWEC's member associations and companies around the world, as well as from governments and independent analysts. We thank all our contributors and look forward to continuing our collaboration in the future.

April 2016

Steve Sawyer
Secretary General
GWEC

Klaus Rave
Chairman
GWEC

> In 2015, increase in wind generation was equal to almost half of global electricity growth…for the second successive year, global CO_2 emissions remained stable despite growth in the world economy. This was due to industrial restructuring, improved energy efficiency and the substantial growth of renewables – led by wind <

PREFACE

Dr. Fatih Birol
Executive Director of the International Energy Agency

In 2015, increase in wind generation was equal to almost half of global electricity growth. This surprising but welcome news became apparent from new IEA analysis revealing that, for the second successive year, global CO_2 emissions remained stable despite growth in the world economy. This was due to a number of factors – industrial restructuring, improved energy efficiency and the substantial growth of renewables – led by wind.

We estimate a new record renewable power capacity of more than 140 GW was installed last year - equivalent to more than the total cumulative installed power capacity of Canada or France. And more than 40% of that capacity came from wind. That deployment was accompanied by record low prices for forthcoming renewable electricity in countries that combined excellent renewable resources and appropriate policies and market frameworks. In some cases, wind onshore is already the cheapest electricity generation option and costs are continuing to decline: contracted prices for wind onshore coming online in the next few years are now as low as 30 USD/MWh.

This is all good news as renewables must play a central role in achieving climate goals. The landmark COP21 agreement in Paris was a historic milestone. But now the focus needs to be on implementation, raising ambition and translating the agreement into concrete results. This is especially true when it comes to the energy sector. In our 2 °C Scenario, an overwhelming majority of investment in the energy sector will have to be in renewables and electricity networks; with 2 out of every 3 dollars invested in new power plants being in renewable technologies. Overall, we estimate that investment in wind will total USD 3.6 trillion between 2014 and 2040, or more than one third of total investment in renewable power capacity. There will also have to be another USD 7.1 trillion of investment to expand and enhance transmission and distribution networks.

It is clear that wind is now a mainstream source of energy supply and will play a leading role in de-carbonisation. But becoming mainstream means also assuming new responsibilities, including ensuring the reliable and cost-effective functioning of the overall energy system and contributing to energy security. The wind industry will need to continue playing its part – using technical and financial innovation to drive costs down, improve project reliability and predictability and to make it easier to integrate wind power into electricity systems.

The continued ascent of wind will not materialize without good and predictable policies. A number of barriers to delivering the needed deployment remain – record low fossil fuel prices, grid integration issues and high levels of curtailment in some countries and regions and lack

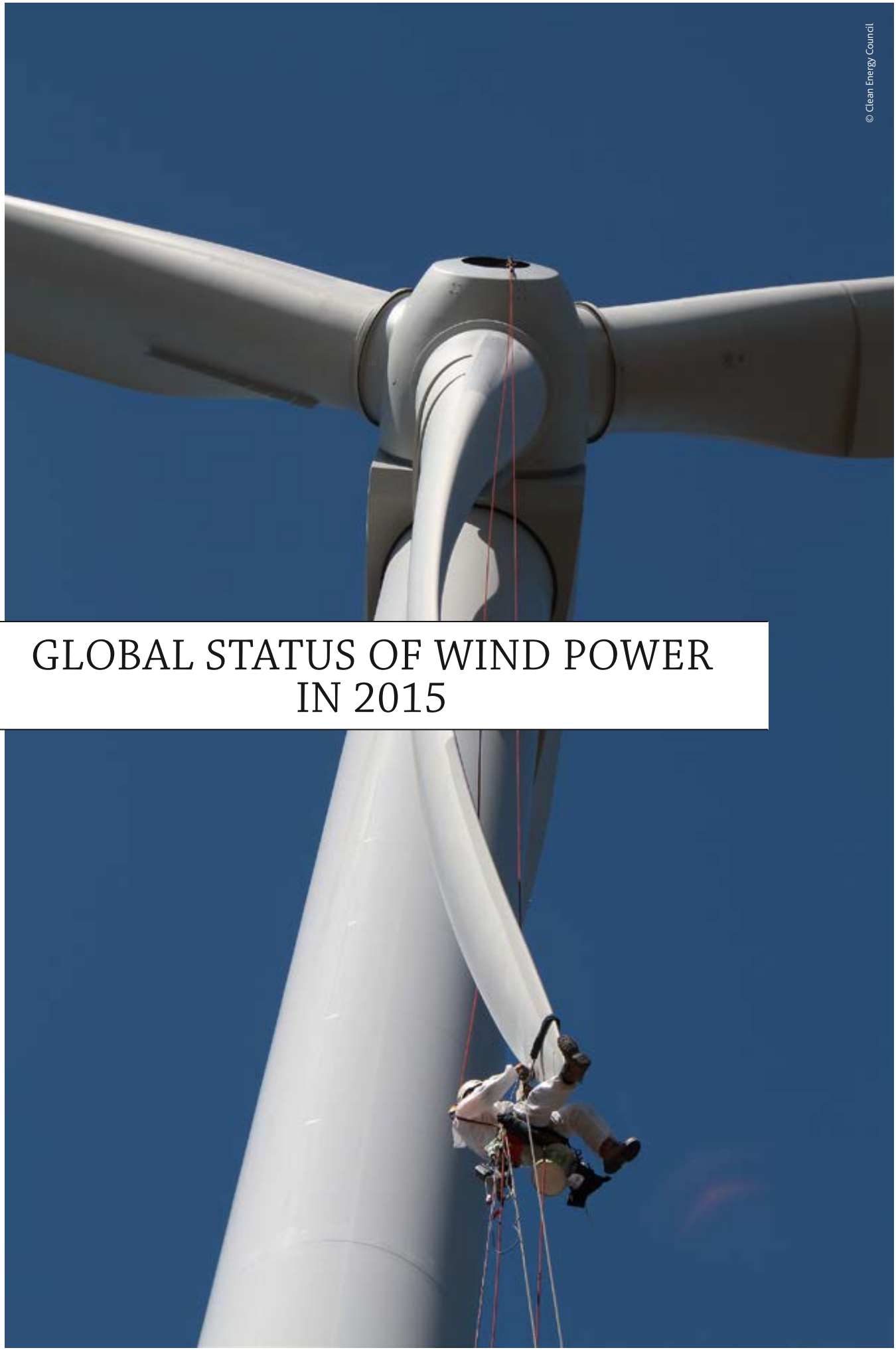
of public acceptance. So despite progress in reducing wind generation costs, there is still an essential need for appropriate market and regulatory frameworks. Policy makers must play their role.

The days of wind being costly and technologically immature are over. The main goal of policies for these technologies has thus been shifting: *away* from bridging a large cost gap, *towards* de-risking capital-intensive investments. Appropriate market designs are needed to promote flexible electricity systems adapted to large shares of wind and other renewable generation. Above all governments must take a long-term and predictable approach, in particular if fossil fuel prices remain low. This includes creating a level playing field –for which low fossil fuel prices provide a good window of opportunity: the time to introduce robust carbon pricing and phase out fossil fuel subsidies is now.

GWEC has played a critically important role in support of the development of the wind industry by providing authoritative data on its expansion in all parts of the world and insightful analysis on what the industry needs to do to adapt to the international and increasingly competitive nature of energy markets. The IEA benefits greatly from its strong working relationship with GWEC and I feel pleased and honoured to preface its Annual Report for 2016.

The IEA, as the only global organisation which covers the entire energy system, is changing as well. We are taking a more global approach – opening our doors to key emerging economies, and increasing our focus on clean energy, including energy efficiency and renewables. We are further strengthening our holistic system-analysis to be ready to tackle the challenge of system integration of large shares of wind and other variable renewables, while ensuring security of electricity supply. We are also increasing our direct engagement with the private sector and industry. Through these changes, we will be better positioned to take on the challenges of the global energy transition towards a de-carbonised energy mix. I look forward to continuing our excellent cooperation with GWEC in the years to come.

Dr. Fatih Birol
Executive Director
International Energy Agency



GLOBAL STATUS OF WIND POWER IN 2015

2015 was an unprecedented year for the wind industry as annual installations crossed the 60 GW mark for the first time in history, and more than 63 GW of new wind power capacity was brought on line. The last record was set in 2014 when over 51.7 GW of new capacity was installed globally.

In 2015 total investments in the clean energy sector reached a record USD 329 billion (EUR 296.6 bn). 2015 figures were up 4% from 2014's investment of USD 316 billion (EUR 238.1 bn) and beating the previous record set in 2011 by 3%[1].

The new global total for wind power at the end of 2015 was 432.9 GW, representing cumulative market growth of more than 17%. This growth was powered by an astonishing new installations figure of 30,753 MW in China; the global wind power industry installed 63,467 MW in 2015, representing annual market growth of 22%.

In early 2015, expectations for growth in the wind power market were not excessive, as continued economic slowdown in Europe and some emerging markets, and the political uncertainty in the US, made it complex to make projections for 2015, which we called at 53.5 GW. Apparently, once again we were not factoring in the ability of China to surpass all projections with exceptional wind power development numbers.

China, the largest overall market for wind power since 2009, retained the top spot in 2015. True to form, installations in Asia again led global markets, with Europe in the second spot, and North America closing the gap with Europe, in third place.

A result of this was that in 2015, as in 2014 and in 2013, the majority of wind installations globally were outside the OECD once again. This has been the case since 2010, with the exception of 2012. This trend will continue for the foreseeable future.

By the end of last year the number of countries with more than 1,000 MW installed capacity was 26: including 17 in Europe; 4 in Asia-Pacific (China, India, Japan & Australia); 3 in North America (Canada, Mexico, US), 1 in Latin America (Brazil) and 1 in Africa (South Africa).

By the end of last year eight countries had more than 10,000 MW of installed capacity including China (145,362 MW), the US (74,471 MW), Germany (44,947 MW), India (25,088 MW), Spain (23,025 MW), UK (13,603 MW), Canada (11,205 MW), and France (10,358 MW).

China crossed the 100,000 MW mark in 2014, adding another chapter to its already exceptional history of renewable energy development since 2005. This year it made history again and strengthened its position on the leaderboard.

Europe and North America both had strong years in 2015, led by Germany and the US respectively. Guatemala, Jordan and Serbia each added their first large commercial wind farms, and South Africa became the first African market to pass the 1 GW mark.

ASIA: REMARKABLE YEAR FOR CHINA

For the seventh year in a row, Asia was the world's largest regional market for new wind power development, with capacity additions totaling nearly 33.9 GW.

In terms of annual installations **China** maintained its leadership position. China added 30.8 GW of new capacity in 2015, once again the highest annual number for any country ever. This is almost twice the 2013 figure, when China installed 16 GW of new capacity.

In 2015, wind power generation reached 186.3 TWh, accounting for 3.3% of total electricity generation[2]. This follows a pattern of steady increase in wind based electricity generation despite heavy curtailment. In 2012, wind-generated electricity in China was just over a 100 TWh, accounting for 2% of the country's total electricity output. Wind provided almost 135 TWh of electricity in 2013, contributing 2.6% of the country's total electricity generation[3]. Total wind power generation reached over 153 TWh in 2014, 2.78% of total electricity generation[4].

The Chinese wind market almost doubled its capacity from 75 GW in 2012 to reach 145 GW by the end of 2015, reinforcing China's lead in terms of cumulative installed wind power capacity.

All observers continue to be surprised by the astonishing track record for growth of the wind sector in China over the last decade. The current pace of growth in the Chinese wind power market may see a slowdown in 2017. However, we have often been positively surprised when time and again China's installation figures surpass expectations.

Curtailment on wind farms in China worsened in 2015, as grid companies kept almost 34 billion kWh from being delivered to the grid. According to the National Energy Administration (NEA), the country wasted 15% of wind power generated in 2015[5].

On-going curtailment of electricity generation is a challenge for wind power projects. However, the NEA and State Grid are working to solve the transmission bottlenecks and other grid issues, and the situation is expected to improve.

India continues to be the second largest wind market in Asia, and in 2015 passed Spain to attain 4th place in terms of cumulative installations. The Indian wind sector has struggled over the years to repeat the strong market performance of 2011 when over 3 GW was installed. 2015 seems to signal the onset of a recovery phase given the government's desire to address some of the structural bottlenecks in the market.

1 http://www.bloomberg.com/company/clean-energy-investment/form
2 http://www.nea.gov.cn/2016-02/02/c135066586.htm
3 http://www.chinadaily.com.cn/bizchina/greenchina/2014-02/26/content17306185.htm
4 http://www.reuters.com/article/2015/02/12/china-power-windpower-idUSL4N0VM3XJ20150212
5 http://www.nea.gov.cn/2016-02/02/c135066586.htm

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India's new wind energy installations totaled 2,623 MW in 2015, for a total of 25,088 MW. This kept the Indian wind power market for 2015 at #5 globally. The total grid connected renewable energy installations in the country reached approximately 39,411 MW[6].

The Indian government has committed to a target of 175 GW of renewables by 2022, including 100 GW of solar capacity and 60 GW of cumulative wind power capacity. The government has also indicated its support for rapidly growing the power sector, renewables being a core part of this strategy.

While the rest of Asia did not make much progress in 2015, there are some favourable signs on the horizon. The **Japanese** market installed almost 245 MW in 2015 to reach a cumulative capacity of 3,038 MW. This represents around 0.5% of the total power supply, and Japan is slowly moving towards a transformation of its energy system to allow for a more diverse energy mix including more wind power and other renewables. However, removing existing barriers will still take time. Offshore wind development, in particular on floating platforms, is a promising prospect for the future.

Although **South Korea** still has "green growth" as one of its national development priorities, wind power is still a relatively small energy generation technology, with 225 MW of new installations in 2015, bringing total installed capacity to just over 835 MW.

Taiwan added 14 MW of new capacity, bringing its total installed capacity to 647 MW. As for the rest of Asia, we expect new projects to come online in Pakistan, Thailand and Vietnam in 2016.

NORTH AMERICA: RESURGENCE IN THE US

2015 ranks as the third highest year for wind installations for the **US,** the single largest market in terms of total installed capacity after China. The US added 4,000 new turbines for a total market of 8,598 MW last year, a 77% increase over 2014, and total installed capacity reached 74,471 MW.

Wind produced over 190 TWh in the US last year, which was 4.7% of the total electricity generated in the US.

Wind energy accounted for almost 31% of all new generating capacity installed over the last 5 years. Wind energy provided more than 25% of the electricity in Iowa and South Dakota, and 12% or more of the generation in a total of nine states[7].

In terms of annual capacity additions, Texas led the 2015 market with 3,615 MW, followed by Oklahoma (1,402 MW), Kansas (799 MW), Iowa (524 MW) and Colorado (399 MW).

At year-end, wind developers reported more than 9.4 GW of construction activity across 72 projects in 22 states (plus Guam). This included over 1.8 GW of new construction announcements made towards the end of 2015.

The five year extension and phase out of the PTC provides the greatest degree of long term policy stability the US wind industry has ever seen. This, combined with a

6 http://www.mnre.gov.in/mission-and-vision-2/achievements/
7 http://www.ferc.gov/CalendarFiles/20150213081555-Gramlich,percent20AWEA.pdf

GLOBAL INSTALLED WIND POWER CAPACITY (MW) – REGIONAL DISTRIBUTION

		End 2014	New 2015	Total End 2015
AFRICA & MIDDLE EAST				
	South Africa	570	483	1,053
	Morocco	787	-	787
	Egypt	610	200	810
	Tunisia	245	-	245
	Ethiopia	171	153	324
	Jordan	2	117	119
	Other[1]	151	-	151
	Total	**2,536**	**953**	**3,489**
ASIA				
	PR China	114,609	30,753	145,362
	India	22,465	2,623	25,088
	Japan	2,794	245	3,038
	South Korea	610	225	835
	Taiwan	633	14	647
	Pakistan	256	-	256
	Thailand	223	-	223
	Philippines	216	-	216
	Other[2]	167	-	167
	Total	**141,973**	**33,859**	**175,831**
EUROPE				
	Germany	39,128	6,013	44,947
	Spain	23,025	-	23,025
	UK	12,633	975	13,603
	France	9,285	1,073	10,358
	Italy	8,663	295	8,958
	Sweden	5,425	615	6,025
	Poland	3,834	1,266	5,100
	Portugal	4,947	132	5,079
	Denmark	4,881	217	5,063
	Turkey	3,738	956	4,694
	Netherlands	2,865	586	3,431
	Romania	2,953	23	2,976
	Ireland	2,262	224	2,486
	Austria	2,089	323	2,411
	Belgium	1,959	274	2,229
	Rest of Europe[3]	6,564	833	7,387
	Total Europe	**134,251**	**13,805**	**147,771**
	of which EU-28[4]	129,060	12,800	141,578
LATIN AMERICA & CARIBBEAN				
	Brazil*	5,962	2,754	8,715
	Chile	764	169	933
	Uruguay	529	316	845
	Argentina	271	8	279
	Panama	35	235	270
	Costa Rica	198	70	268
	Honduras	126	50	176
	Peru	148	-	148
	Guatemala	-	50	50
	Caribbean[5]	250	-	250
	Others[6]	285	-	285
	Total	**8,568**	**3,652**	**12,220**
NORTH AMERICA				
	USA	65,877	8,598	74,471
	Canada	9,699	1,506	11,205
	Mexico	2,359	714	3,073
	Total	**77,935**	**10,817**	**88,749**
PACIFIC REGION				
	Australia	3,807	380	4,187
	New Zealand	623	-	623
	Pacific Islands	12	0,6	13
	Total	**4,442**	**380,6**	**4,823**
	World total	**369,705**	**63,467**	**432,883**

Source: GWEC

1 Algeria, Cape Verde, Iran, Israel, Kenya, Libya, Nigeria
2 Bangladesh, Mongolia, Sri Lanka, Vietnam
3 Bulgaria, Cyprus, Czech Republic, Estonia, Finland, Faroe Islands, FYROM, Hungary, Iceland, Latvia, Liechtenstein, Lithuania, Luxembourg, Malta, Norway, Romania, Russia, Switzerland, Slovakia, Slovenia, Ukraine
4 Austria, Belgium, Bulgaria, Cyprus, Croatia, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, UK
5 Caribbean: Aruba, Bonaire, Curacao, Cuba, Dominica, Guadalupe, Jamaica, Martinica, Granada, St. Kitts and Nevis
6 Bolivia, Colombia, Ecuador, Nicaragua, Venezuela

Note: Project decommissioning of approximately 290 MW and rounding affect the final sums
** Projects fully commissioned, grid connections pending in some cases*

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broader range of customers, and an on-going "wind rush" driven by technological improvements is setting the stage for more years like 2015 in the US.

In **Canada** 1,506 MW of new wind capacity came online, making it the sixth largest market in 2015. Canada finished the year with over 11.2 GW of total installed capacity making it the seventh largest market globally, in cumulative terms. Canada's new wind energy projects in 2015 represent over CAD 3 billion in investment. At the end of 2015, wind power was supplying approximately 5% of Canada's electricity demand. The Canadian wind industry has demonstrated a five-year annual average growth rate of 23% per annum.

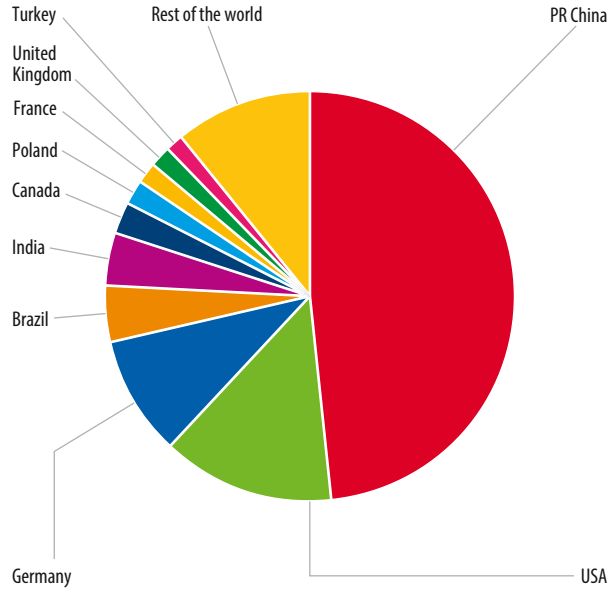
Canada added new wind capacity through the commissioning of 36 projects, 23 of which involved Aboriginal Peoples, municipal or local ownership. For comparison, in 2014 of the 37 new wind energy projects installed, 15 projects also included significant ownership stakes from Aboriginal Peoples, municipal or local ownership. This is a sign that local communities are taking a keen interest in wind energy.

Most of the growth was centered in the provinces of Ontario (871 MW), Quebec (397 MW), and Nova Scotia (186 MW). The Canadian industry expects to see another record year in 2016.

Mexico installed an impressive 713.6 MW of new capacity to reach a total of 3,073 MW by the end of 2015. Mexico's Energy Reform legislation was enacted in December 2013.

Mexico has set an ambitious annual target of 2,000 MW per year until 2023. The country is facing one of its biggest energy challenges in 20 years, with the current energy reform opening up the electricity market like never before. The market reforms for the electricity sector are expected to have a significant impact on the future of wind power in the country. 2016 will be another strong year for the Mexican wind power market.

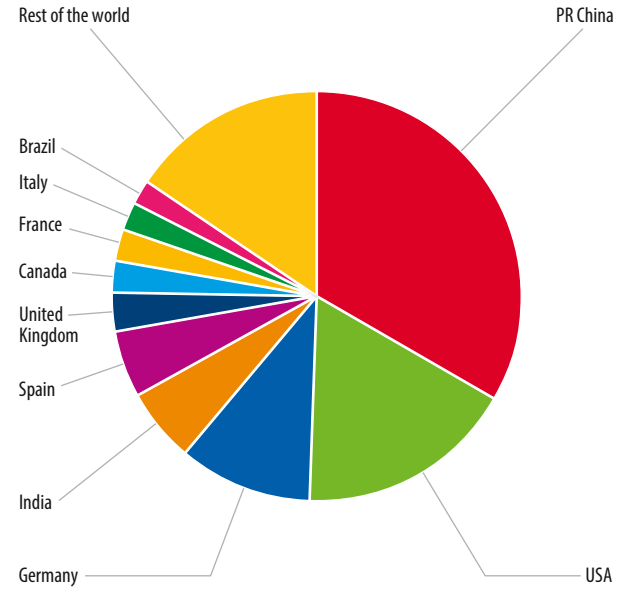
TOP 10 NEW INSTALLED CAPACITY JAN-DEC 2015



Country	MW	% Share
PR China	30,753	48.5
USA	8,598	13.5
Germany	6,013	9.5
Brazil	2,754	4.3
India	2,623	4.1
Canada	1,506	2.4
Poland	1,266	2.0
France	1,073	1.7
United Kingdom	975	1.5
Turkey	956	1.5
Rest of the world	6,950	11.0
Total TOP 10	**56,517**	**89**
World Total	**63,467**	**100**

Source: GWEC

TOP 10 CUMULATIVE CAPACITY DEC 2015



Country	MW	% Share
PR China	145,362	33.6
USA	74,471	17.2
Germany	44,947	10.4
India	25,088	5.8
Spain	23,025	5.3
United Kingdom	13,603	3.1
Canada	11,205	2.6
France	10,358	2.4
Italy	8,958	2.1
Brazil	8,715	2.0
Rest of the world	67,151	15.5
Total TOP 10	**365,731**	**84.5**
World Total	**432,883**	**100**

Source: GWEC

EUROPE: UNPARALLELED YEAR FOR GERMANY

Across Europe 13,805 MW of wind power was installed in 2015. The European Union member states (EU) accounted for 12,800 MW of the total.

There are now 141.6 GW installed in the EU with a total cumulative capacity of 147.8 GW for all of Europe. Wind power installed more than any other form of power generation in 2015, accounting for 44.2% of all power capacity installations. Wind energy overtook hydropower as the third largest source of power generation in the EU with a 15.6% share of total power capacity by the end of 2015.

Renewables accounted for 77% of new power plant installations in 2015 (22.3 GW of a total of 29 GW) of which wind accounted for 44%.

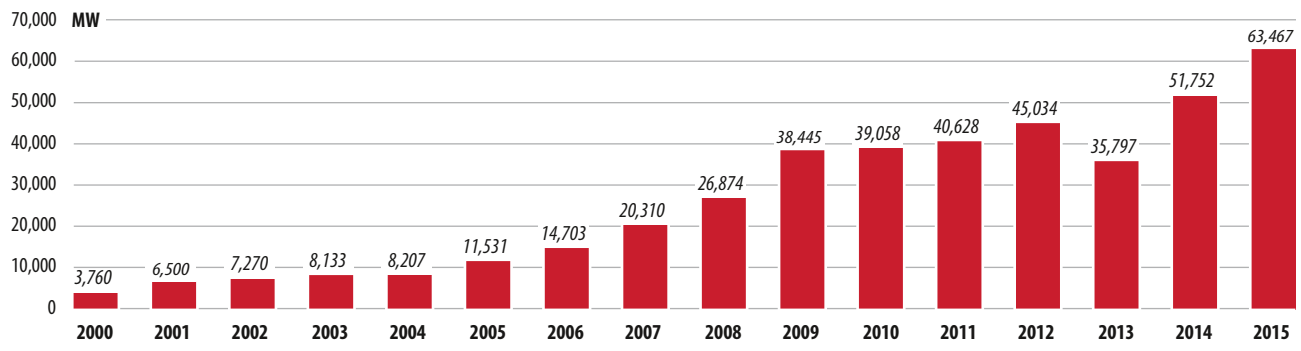
Overall EU installation levels once again mask significant volatility across Europe. Germany alone accounted for almost 50% of total EU wind energy installations with 6,013 MW. Poland at 1,266 MW and France at 1,073 MW were the only two other markets to install over 1 GW during the year. Together these 3 countries account for over two thirds of all installations. In a number of previously healthy markets such as Sweden and the UK, installations slowed down significantly.

At the end of 2015, the EU had 142 GW of installed wind power capacity of which 131 GW was onshore and 11 GW offshore. However, 47% of all new EU installations in 2015 took place in Germany and 73% occurred in the top four markets, a similar trend to the one seen in 2014. This is unlike previous years when installations were less concentrated and spread across many more healthy European markets.

EUR 26.4 billion was invested in wind energy in Europe in 2015, 40% higher than the total investment in 2014. While wind power led 2015 installations, solar PV accounted for 29%; coal 16% and gas 6.4%.

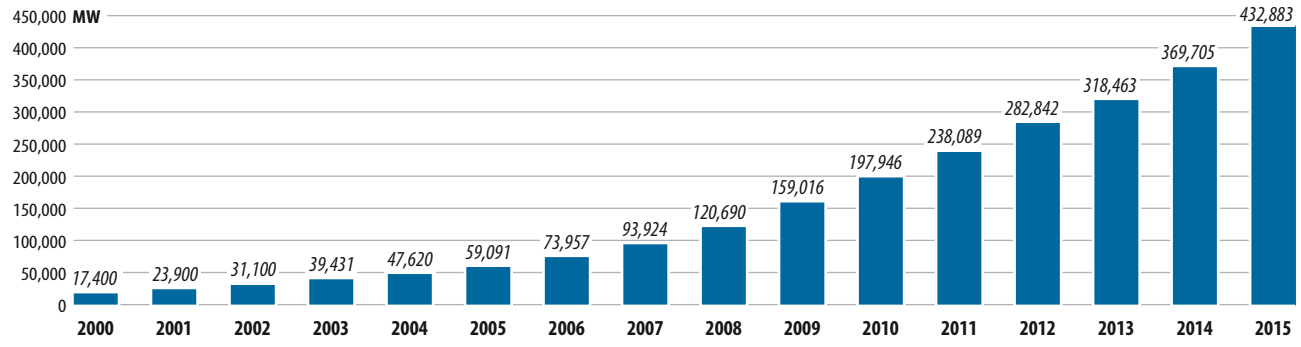
Germany remains the EU country with the largest installed capacity (44.9 GW), followed by Spain (23 GW), the UK (13.6 GW), France (10 GW) and Italy (9 GW). Sweden, Denmark, Poland and Portugal each have more than 5 GW installed.

GLOBAL ANNUAL INSTALLED WIND CAPACITY 2000-2015



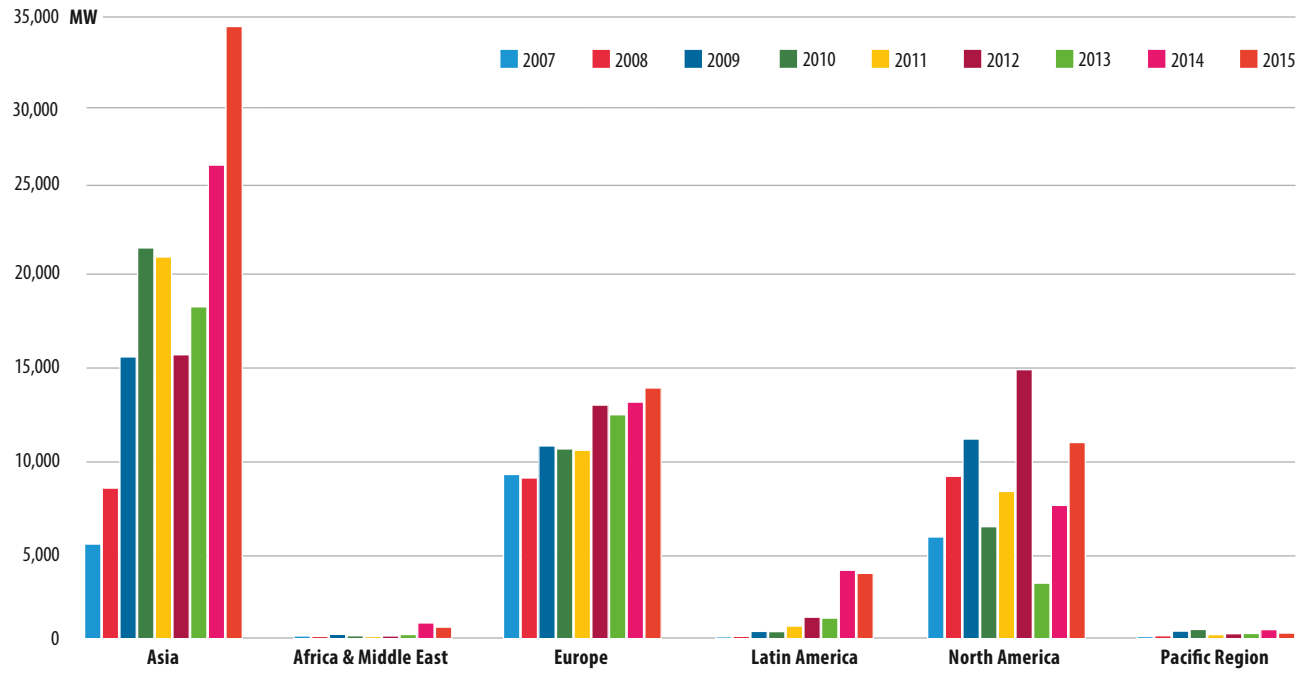
Source: GWEC

GLOBAL CUMULATIVE INSTALLED WIND CAPACITY 2000-2015



Source: GWEC

ANNUAL INSTALLED CAPACITY BY REGION 2007-2015



Source: GWEC

© Areva / Jan Oelker

Annual installations of wind power in the EU have increased over the last 14 years from 3.2 GW in 2000 to 12.8 GW in 2015 at a compound annual growth rate (CAGR) of 9%. Wind power accounts for one third of all new power installations since 2000 in the EU.

In 2015, the annual onshore market in the EU decreased by 7.8%, but offshore installations more than doubled compared to 2014. Overall, EU wind energy annual installations increased by 6.3% compared to 2014.

Offshore wind accounted for almost a quarter of total EU wind power installations in 2015, and investment in offshore wind in Europe doubled to EUR 13.3 billion. It was a record year for financing and grid connected installations. Germany (2,282 MW), the United Kingdom (572 MW) and the Netherlands (180 MW) were the three countries to grid-connect new offshore wind turbines in 2015, with 14 projects reaching completion.

The UK still has the largest offshore wind capacity in Europe at 5,067 MW, accounting for 46% of total European installations. Germany had a stellar year and rose to the second spot in 2015. Germany saw total installation rise to 3,295 MW (29.9%). With 1,271 MW (11.5%), Denmark is third, followed by Belgium at 712 MW (6.5%), the Netherlands at 427 MW (3.9%), and Sweden with 202 MW (1.8%). Other small markets include Finland with 26 MW, Ireland with 25 MW, Spain with 5 MW; Norway with 2 MW and Portugal with 2 MW.

Weakened legislative frameworks, on-going economic crises and austerity measures implemented across Europe continue to hinder growth of the wind power industry. The year ahead is likely to be difficult but the broader investment shift away from fossil fuels could boost the European renewables sector.

Beyond the EU, **Turkey** is the largest European market, with annual installations of 956 MW in 2015. The Turkish market reached a cumulative installed capacity of 4,694 MW last year. Looking ahead, the future of Turkey's wind sector looks promising.

LATIN AMERICA AND THE CARIBBEAN: BRAZIL CONTINUES TO LEAD

Latin America and the Caribbean had a good year. The region saw 3,652 MW of new capacity come online, bringing total installed capacity to 12.2 GW. Latin America has begun developing a substantial wind power industry to complement its rich hydro and biomass (and potentially solar) resources.

Post the Paris Agreement at COP21[8], the demand for clean energy, bolstered by concerns for energy security and diversity of supply, will promote the growth of wind power in Latin America and the Caribbean.

For the fourth year in a row the Latin American market installed over 1 GW of new capacity. In 2012, six markets in the region installed 1,225 MW of new wind capacity for a total installed capacity of just over 3.5 GW. In 2013, just five markets including Argentina, Brazil, Chile, Dominican Republic and Uruguay accounted for 1,219 MW of new wind power capacity for a total installed capacity of 4.7 GW. In 2014, ten markets added new capacity. These included Argentina, Brazil, Chile, Costa Rica, Ecuador, Peru, Honduras, Nicaragua, Venezuela and Uruguay. In 2015, eight markets added new capacity. These included Argentina, Brazil, Chile, Costa Rica, Guatemala, Honduras, Panama and Uruguay.

Brazil led Latin America with installations of 2,754 MW; although the projects were fully commissioned not all of them could be given a grid connection before the end of the year. Brazil continues to be the most promising onshore market for wind energy in the region out to 2020.

Uruguay has a goal to generate as much as 38% of its power from wind by the end of 2017 and added almost 316 MW, bringing its total installed capacity to over 845 MW. With its neighbours Argentina and Brazil, Uruguay has traded electricity for years. In 2013, for the first time in more than a decade, Uruguay didn't import electricity from its neighbors, selling USD 21 million worth of electricity to Argentina. The National Utility - UTE and Brazil's Eletrobras are testing a 500 MW transmission line, which could enable Uruguay to add more wind power[9].

Chile added 169 MW of new capacity to reach a total installed capacity of almost 1 GW. **Panama** added record capacity of 235 MW to reach 270 MW, and **Costa Rica** added 70 MW of new capacity to reach a total of 268 MW. **Honduras** saw its total installed capacity reach 176 MW, when it added 50 MW of new capacity in 2015. **Guatemala** for the first time added wind power to its energy mix in 2015, with a 50 MW project.

Argentina added 8 MW of new capacity to bring its total installed capacity up to 279 MW last year. The Caribbean reached a total installed capacity of 250 MW across various island states by the end of 2015.

PACIFIC

The region saw its total installed capacity rise to just over 4.8 GW last year. **Australia** added 380 MW in 2015, bringing its total installed capacity up to 4,187 MW.

The previous Australian Prime Minister did not support renewables and was causing significant difficulties for the renewable energy industry in Australia. In a strange move, in the run up to COP21 last year, the Australian parliament approved legislation cutting the Renewable Energy Target from 41 TWh to 33 TWh[10]. However, the target is at least now fixed, and the new Prime Minister is more forward looking. In a positive development, the province of South Australia committed to a new target of zero net emissions by 2050 last year.

Samoa added 550 kW of new wind power capacity in 2015. This was the first wind project in the Pacific Island nation.

© Creative Commons

The project site is located on the island of Upolu; Samoa's second largest island. United Arab Emirates-based energy firm Masdar developed the project with funds from the UAE's Pacific Partnership Fund.

New Zealand and the rest of the Pacific did not add any new wind power capacity in 2014, just like 2013.

AFRICA AND THE MIDDLE EAST

The Africa and Middle East region saw 953 MW of new capacity additions last year, bringing cumulative capacity for the region up to 3,489 MW. Africa's wind resource is best around the coasts and in the eastern highlands, but until 2014 it was in North and East Africa that wind power has been developed at scale.

South Africa installed 483 MW of new capacity, for a cumulative capacity of 1,053 MW. This is just the beginning of a promising wind market in the region, which has surpassed 1 GW in just two years.

Egypt saw a new wind farm come online in 2015. It is one of the largest wind farms in Africa, with 100 turbines with a total capacity of 200 MW. It was inaugurated in Egypt's Gulf of El-Zayt. This brought Egypt's total installed capacity up to 810 MW. Egypt wants to source 20% of its energy from renewable sources by 2030.

Ethiopia had a good year as well, as 153 MW of new capacity came on line last year. This brought total installed capacity in Ethiopia to over 324 MW.

Last year **Jordan** added its first large wind farm (117 MW) to its generation mix for a total of 119 MW. The Tafila

8 http://unfccc.int/files/meetings/parisnov2015/application/pdf/parisagreementenglish.pdf
9 http://www.bloomberg.com/news/articles/2015-06-17/uruguay-spends-2-6-billion-to-become-south-america-wind-leader
10 http://www.windpowermonthly.com/article/1352943/australia-approves-ret-cut-33twh

GWEC team in Mongolia June 2015 © Sebastian Meyer

wind farm is the first utility scale wind power project in the Middle East. The wind farm accounts for almost 6.5% of Jordan's 1.8 GW renewable energy target for 2020[11].

At the end of 2015, over 99% of the region's total wind installations were spread across ten countries – South Africa (1,053 MW), Morocco (787 MW), Egypt (810 MW), Tunisia (245 MW), Ethiopia (324 MW), Jordan (119 MW), Iran (91 MW), Cape Verde (24 MW), Kenya (19 MW), Israel (6.25 MW) and Algeria (10 MW). New projects are expected to come online in Egypt, Ethiopia, Kenya, Morocco, Tanzania and South Africa in 2016.

2015: EXTRAORDINARY YEAR FUELED BY CHINA'S FIT REDUCTION PLAN

After a slowdown in 2013, the wind industry set a new record for annual installations in 2014 by installing 51.7 GW of new wind power. In 2015, however, the global wind industry smashed all previous records by installing over 63 GW of new capacity.

The record-setting figure represents a 22% increase in the annual market. Total cumulative installations stood at 433 GW at the end of 2015, representing cumulative growth of 17%. This record was led by China's annual capacity addition, which alone accounted for 48% of total global installations.

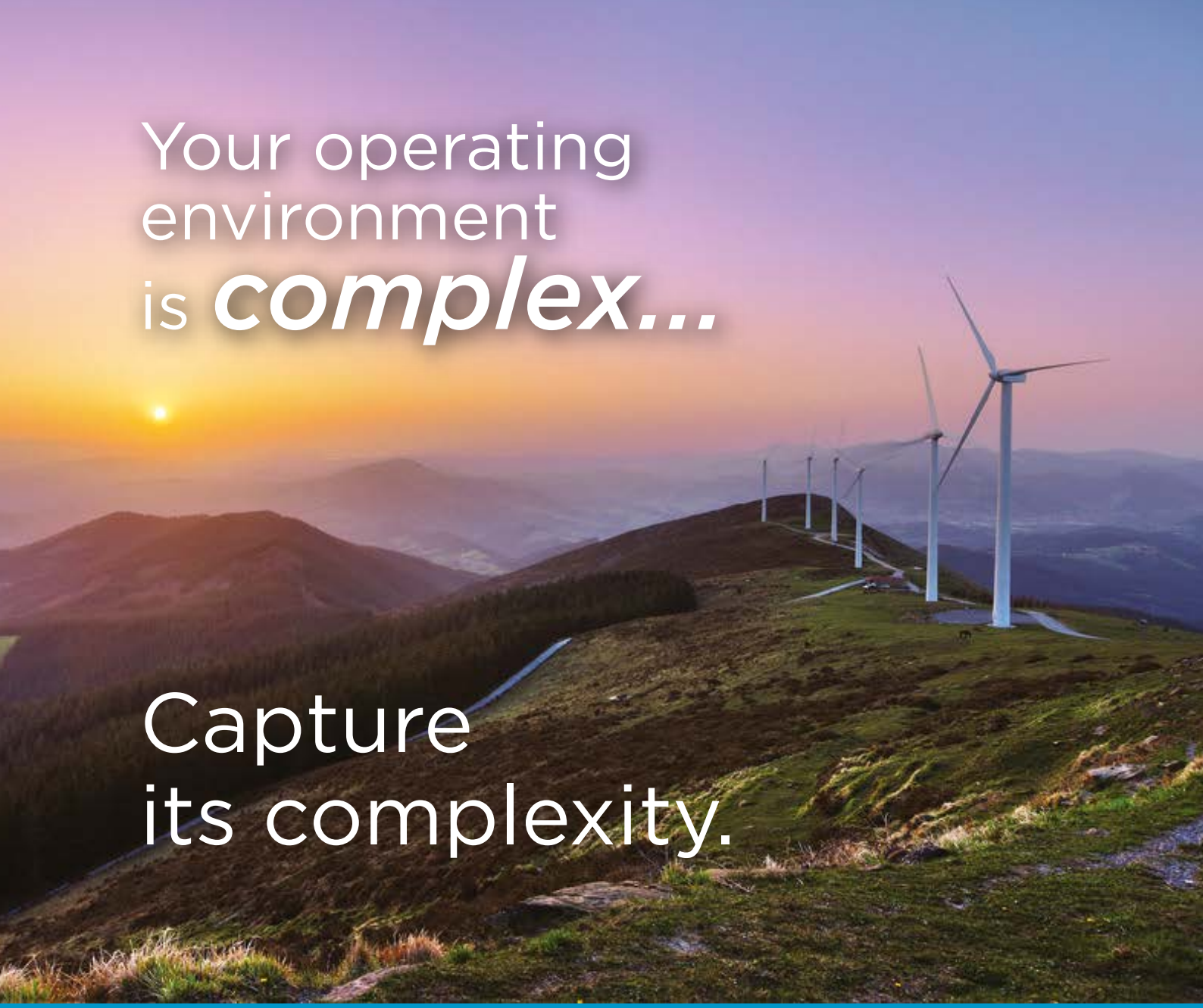
Wind power is a mature technology, with proven reliability and cost competitiveness across an ever-increasing number of markets today. The cost-stability of wind power makes it a very attractive option for utilities, independent power producers and companies who are looking for a hedge against the wildly fluctuating prices of fossil fuels while at the same time reducing their carbon footprint.

Wind power remains the most competitive way of adding new power generation capacity to the grid in a large number of markets around the world, even when competing against heavily subsidized conventional generation technologies.

2015 was a big year for the big markets – China, the US, Germany and Brazil, all of which set new records. But there is a lot of activity in new markets around the world and in 2016 the installations are likely to see a broader distribution.

There is still an acute need around the world for new power generation, which is clean, affordable, indigenous, reliable and quick to install. Wind power is leading the charge in the transition away from fossil fuels; and is blowing away the competition on price, performance and reliability.

11 http://www.masdar.ae/assets/downloads/content/4282/2016_jordan.pdf



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MARKET FORECAST 2016-2020

After setting new records in 2014, the wind power industry surprised many observers with another record breaking year in 2015, chalking up 22% annual market growth and passing the 60 GW mark for the first time in a single year; and this after having broken the 50 GW mark for the first time in 2014. Once again, the big story was China, installing an astonishing 30.8 GW against the backdrop of a slowing economy and nearly flat demand. Europe and the United States had surprisingly strong years; and Canada, Brazil, Mexico and other 'new' markets continued to develop.

Three big trends will continue to drive growth in the medium term:

Climate: the positive outcome of the climate negotiations at the UNFCCC's COP 21 in December was an unexpected pleasant surprise. The long term targets adopted by 186 countries gathered in Paris is a *de facto* call for a 100% emissions free power sector by 2050 at the latest; and given the lack of any serious competition from any other emissions free power sources, this means a power sector supplied largely or completely by renewable energy, with wind and solar leading the pack.

The real test of the Paris Agreement, of course, will be in the implementation, and much could go wrong. However, we were heartened by the discourse at the dozen or so business conferences held in the margins of the Paris talks, where the message was clear: "the future is renewables, and that's the direction we're headed." It will take some time before that translates into concrete developments across a range of markets, but it may have already played a role in the very aggressive RE growth targets contained in the recently released 13th Five-Year Plan in China.

Cratering prices: while we have seen very low wind prices in the US market for some time, and the Brazilian and South African tendering systems have also generated low prices for the last several years, we have recently seen a spate of tender results in Egypt, Morocco, Peru and elsewhere with what up until now were unheard of prices outside the US plains states – in the vicinity of €40/MWh or below, and in the case of Morocco, below €30/MWh. The latest surprise was Mexico's first tender, with low prices for both wind and solar.

Is this the new normal? Time will tell, but it is clear that the costs of both wind and solar technology have fallen dramatically in recent years, and new and complex financing structures are creating the conditions for renewables to be competitive in an increasing number of markets. Of course, some of this is explained by the excellent wind resources in some of these locations, but the downward pressure on prices will continue, and not just in new markets. China is lowering its FIT for wind this year, and will do so again in 2018.

US Market Stability: The United States, as a pioneer in the global wind industry as well as having some of the best wind resources in the world, has had much lower prices than most of its OECD competitors for some time. The difficulty was always the on-again, off-again nature of the US market, as it was subjected to short term policy frameworks which left policy gaps every few years and hampered the growth of the industry.

So it was very welcome news, and a big surprise to all except for those directly involved, when the US Congress passed and the President signed into law a long term extension and phase out of the Production Tax Credit (PTC), which has been the main federal policy support for wind energy in the US. The US wind industry now embarks on its longest-ever period of policy stability, and the potential implications of this go far beyond the US market: in terms of company strategies; manufacturing location choices; and development of the supply chain. Five years from now the US wind industry will be a very different and much stronger animal, we believe.

In addition to climate and competitiveness, energy security ranks high up on the list of drivers for the global market, as does the need to clean the air of the choking smog that is making more and more of the developing world's major cities unhealthy places to live. The demand for clean, sustainable and indigenous power sources to fuel economic growth will continue to grow, especially in emerging economies across Africa, Asia and Latin America.

So what about the short term? While it's very hard to turn the trends listed above into market forecasts for the next several years, we anticipate a period of sustained growth, although we do not expect the kind of spectacular growth we have seen in the last two years. After 'catching up' with the *Global Wind Energy Outlook*[1] Advanced Scenario in 2014, we've moved well ahead of it in 2015; and we now seem to have a much better chance of keeping on that track through 2020 than we thought 12 months ago.

Last year at this time we projected a 2015 market of about 53 GW, and while it's nice to be prudent, that's quite a large variance. What were the main differences? China, for one: just as nobody predicted that China would install 23 GW in 2014, *nobody* predicted 30 GW in 2015…we were looking at a flat market in China for 2015. Likewise for the US, while we expected an increase in the US, we didn't expect that the market would essentially double from 2014 to 2015. For the rest of the world, we were reasonably close.

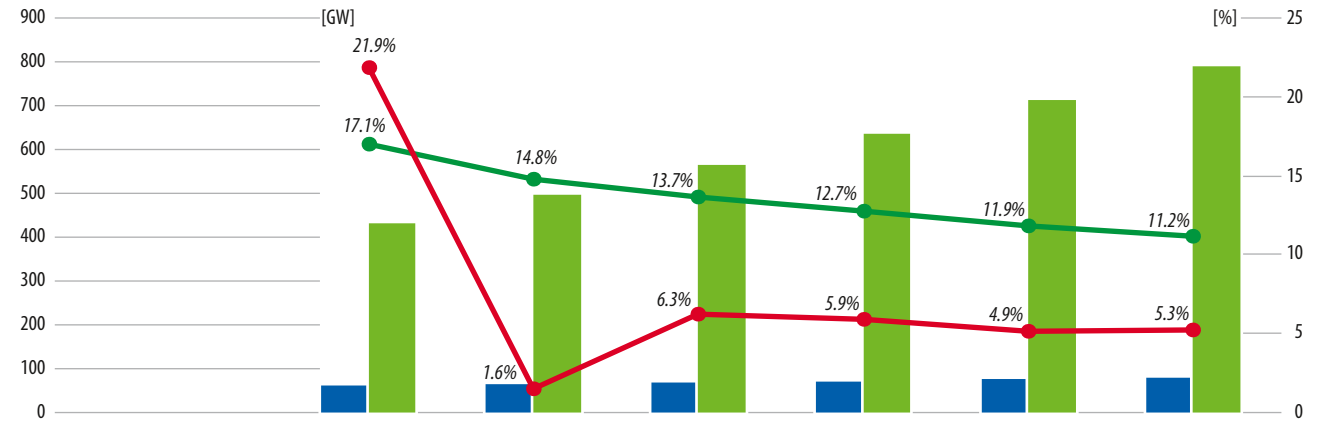
REGIONAL MARKET DEVELOPMENT

Asia will continue to dominate the period from 2016-2020, capturing at least 50% of the global market, although its dominance may be tempered slightly towards the end of the decade. Europe will continue its steady pace towards its 2020 targets, although increasing policy uncertainty might mean some bumps in the road. With Mexico, Canada and the US all on a strong policy footing, North America should continue its strong growth for the rest of the decade.

Latin America will continue to be driven largely by Brazil, although there will be increasing contributions from

1 http://www.gwec.net/wp-content/uploads/2014/10/GWEO2014_WEB.pdf

MARKET FORECAST FOR 2016-2020



	2015	2016	2017	2018	2019	2020
Cumulative [GW]	432.9	496.9	564.9	636.9	712.4	792.1
Cumulative capacity growth rate [%]	17.1%	14.8%	13.7%	12.7%	11.9%	11.2%
Annual installed capacity [GW]	63	64	68	72	75.5	79.5
Annual installed capacity growth rate [%]	21.9%	1.6%	6.3%	5.9%	4.9%	5.3%

Source: GWEC

a variety of markets, including a large new potential market in Argentina. Africa and the Middle East continue to diversify, although in the short term it will be dominated by South Africa, Egypt and Morocco, with Kenya and Ethiopia coming on strong. The Pacific region will return to substantial growth with a period of policy stability in Australia.

Asia

China surpassed the EU in cumulative installations in 2015, and will continue to drive Asian growth. Despite FIT cuts for wind as of this year and again in 2018, the new Five-Year Plan has upped the target for China's wind sector for 2020 once again, this time to 250 GW, which we would expect that the market will in fact exceed. Cutting the choking smog in major cities, reducing GHG emissions and enhancing energy security will be the main drivers. Also, we believe that we are now seeing the beginnings of the 'take-off' of the Chinese offshore sector, with about 1 GW of projects in the construction phase, adding a new dimension to the world's largest market.

Despite the Indian government's very public commitment to renewables' development, the wind industry only experienced modest growth in 2015, and it's not yet clear how fast the industry can grow given infrastructure limitations and the overall parlous state of the electricity industry's finances. The government is working hard to overcome these, however, and we expect modest growth in India throughout the period. Elsewhere in Asia, while we don't expect too much from South Korea and Japan in the short term, we do see new markets emerging every year, and the signing of the first PPAs in Indonesia are hopefully the beginnings of a large new potential market. Pakistan, the Philippines and Mongolia continue to grow, and we're hopeful that Viet Nam can begin to exploit its excellent wind resources before the end of the decade. Overall, we expect the Asian market to roughly double between now and 2020, adding 177 GW over the period.

Europe

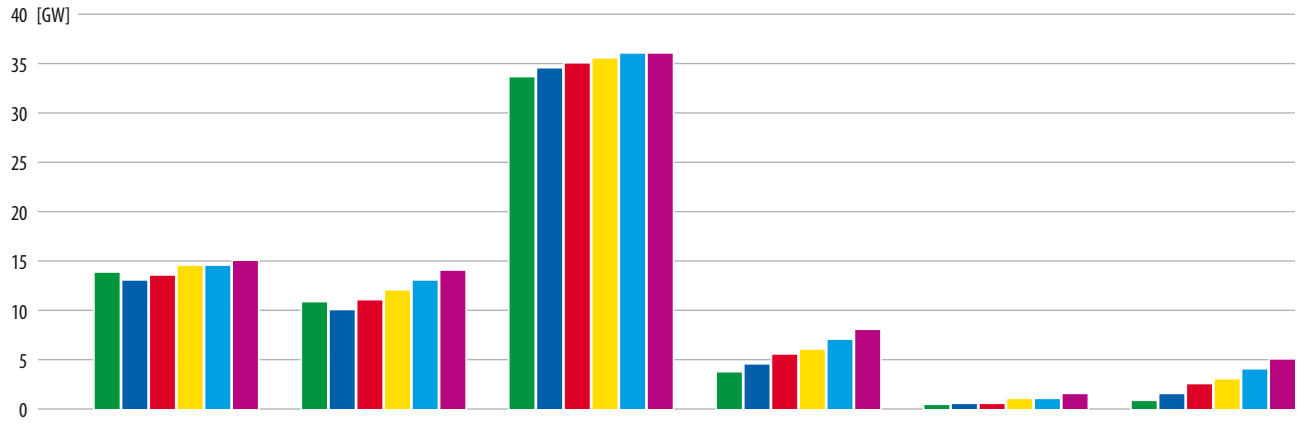
Germany posted extraordinary numbers in 2015, bolstered by more than 2 GW of offshore installations, which is not likely to be repeated in the near future. Poland was Europe's number two market last year, at least partly due to a rush to install prior to the change in the support scheme, and the UK is facing a period of policy instability which may, ironically, lead to stronger installations in the short term but does not bode well for the medium term. Turkey's market remains strong and is expected to grow significantly in 2016, and some southern European markets are recovering from the aftereffects of the financial crisis. However, it seems likely that there will be a small downturn in 2016, with later recovery at least in part dependent upon the outcome of EU-wide deliberations on post-2020 targets and support schemes.

The offshore sector, while unlikely to repeat 2015's 3 GW performance, which was about 24% of the overall EU market, seems on quite solid footing at the moment. The new generation of >5GW turbines is now starting to get rolled out in Europe and progress has been made on cost reduction targets, although there is still some way to go. Overall, we expect Europe to continue more or less in line with its 2020 targets, and add about 70 GW of new capacity between now and 2020.

North America

The US has always been very difficult to call because of the precarious, short term nature of the federal support scheme for wind power. Now that this is no longer the case, at least for the next five years, it becomes difficult to call for another reason, i.e., it could grow spectacularly, far above current predictions, depending on a number of

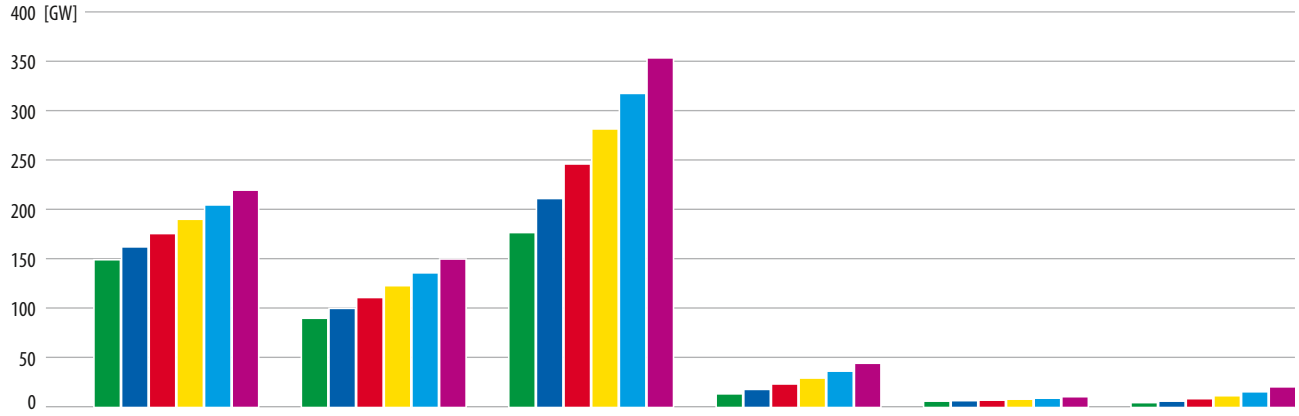
ANNUAL MARKET FORECAST BY REGION 2016-2020



	Europe	North America	Asia	Latin America	Pacific	Middle East & Africa
2015	13.8	10.8	33.9	3.7	0.4	1.0
2016	13.0	10.0	34.5	4.5	0.5	1.5
2017	13.5	11.0	35.0	5.5	0.5	2.5
2018	14.5	12.0	35.5	6.0	1.0	3.0
2019	14.5	13.0	36.0	7.0	1.0	4.0
2020	15.0	14.0	36.0	8.0	1.50	5.0

Source: GWEC

CUMULATIVE MARKET FORECAST BY REGION 2016-2020



	Europe	North America	Asia	Latin America	Pacific	Middle East & Africa
2015	147.8	88.8	175.8	12.2	4.8	3.5
2016	160.8	98.8	210.3	16.7	5.3	5.0
2017	174.3	109.8	245.3	22.2	5.8	7.5
2018	188.8	121.8	280.8	28.2	6.8	10.5
2019	203.3	134.8	316.8	35.2	7.8	14.5
2020	218.3	148.8	352.8	43.2	9.3	19.5

Source: GWEC

political and economic factors which are impossible to determine at this stage. Regardless, we expect a strong and increasingly stable market in the US over the next five years.

The big picture view of the Canadian market has also improved of late, with the recent election of a Liberal government in Ottawa led by Justin Trudeau, which is determined to resume Canada's leadership role in the international climate debate. Coupled with a very progressive provincial government in Alberta and increasing market diversity across the country, the world's 7th largest market (6th in terms of annual market in 2015) looks set for a period of solid growth. Mexico's newly reformed market is just getting underway, so it's too early to say whether it will reach its target of 2 GW/year any time soon. Overall, we would expect the North American market to add about 60 GW over the next five years.

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Latin America, Central America and the Caribbean

Despite Brazil's political and economic woes, the wind sector continues to power ahead, although with some headwinds. With another 10 GW already contracted by 2019, and two auctions scheduled for 2016, we remain cautiously optimistic. Elsewhere in the region Chile and Uruguay will add capacity in 2016, although Uruguay is likely to pause there for a while. Peru's recent successful and very low priced tender results could mean that market is going to move in earnest, and there are some stirrings in Colombia.

But the big new story in Latin America is Argentina, with the advent of a new government and a new commitment to utilizing the country's vast renewable energy sources, sorting out the electricity sector's finances and re-establishing itself as a leader in the international climate debate. We could have a sizeable new South American market relatively soon. Much could go wrong, of course, but the current government is working hard to put things in place as soon as possible. We expect to see 30 GW of new wind power across the region by 2020.

Africa and the Middle East

Jordan inaugurated its first wind farm in 2015, underlining the diversification of the uptake of wind power across the region, although most of them are small markets, at least for now. South Africa, despite Eskom's financial woes which prevented the round four projects from reaching financial close in 2015, will continue to be the largest market in the region. Morocco will see a number of projects come on line over the next five years, mostly from the famous tender won by the consortium of EGP, Nareva and Siemens early this year. Egypt is still a sleeping giant, waiting for the pieces to fall into place with their new support systems, but they still maintain very aggressive targets for 2022.

Ethiopia is rapidly taking steps to allow IPPs to take advantage of their tremendous wind resources, which augurs well for that market, and Kenya's Lake Turkana project finally started construction during 2015. Elsewhere in the region a number of smaller projects are at various stages of development, and we are very optimistic about the spread of wind power across Africa to meet the development needs of its growing economies, which will result in about 16 GW of new installations out to 2020.

Pacific

After a relatively quiet year in the main market in the Pacific, Australia seems poised for another round of growth based on the clarification of the Renewable Energy Target, bringing some visibility to the market out to the end of the decade. Australia's new Prime Minister has shown a more positive attitude towards renewables than his predecessor, and the market for wind in Australia is expected to nearly double over the next 5 years. This, combined with some activity in the Islands and New Zealand, leads us to anticipate that about 4.5 GW will be added in the region in the period from 2016-2020

So, this is what we expect to see over the next five years, from the vantage point of the end of March 2016. While we can expect that there will be both positive and negative surprises in various markets, the larger factors driving the industry are robust and likely to remain so for the period. We'll revisit this in 12 months' time to see how accurate we were and to adjust the projections once again.


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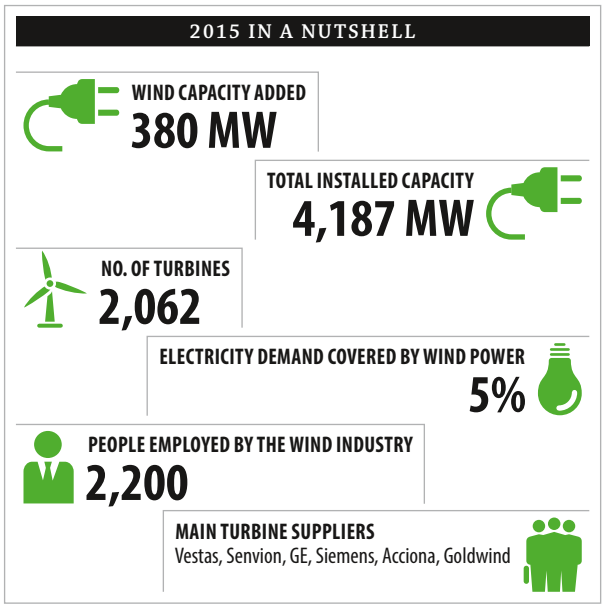
The Australian wind industry had a quiet year in 2015. The most significant development was that the large-scale component of the national Renewable Energy Target (RET) was revised downwards and legislated to remain in place without further changes to 2020. While the downwards revision of the target was disappointing, the certainty provided by the revised legislation should allow the industry to get back on track after a two-year hiatus during the review of the policy.

While confidence slowly returns to the sector, the activity levels behind-the-scenes are encouraging. Wind farm developers are working hard to ensure that their sites are ready to go, with many development permits being revised to allow for larger, more modern turbines.



AUSTRALIA

MAIN MARKET DEVELOPMENTS IN 2015

Australia added 380 MW in 2015 bringing total installed capacity to 4,187 MW, which was made up of 2,062 turbines across 76 wind farms. Wind power accounts for about 5% of national electricity consumption. Main market players in Australia are Vestas, Senvion, GE, Siemens, Acciona and Goldwind.

Australia's wind farms are primarily located in the south of the country, with the strongest wind resource along its southern coastline and to the west. Most states have multiple wind farms, with the exception of Queensland, which has only one small wind farm. All Australian wind farms are land-based and no proposals currently exist to develop an offshore industry.

Installed wind capacity by state

State	Installed Capacity (MW)
South Australia	1,475
Victoria	1,230.1
New South Wales	668
Western Australia	491
Tasmania	310
Queensland	12.5
Total	4,187

State-based renewable energy schemes were a lifeline for the industry during 2015. The Australian Capital Territory's first reverse auction scheme for 200 MW of wind capacity awarded contracts to three wind farms. The low prices awarded for these contracts (the lowest was AUD 81.50/MWh (EUR 53.1/USD 58.1) for the 20 MW Coonooer Bridge wind farm) surprised everyone and demonstrated how much progress the wind industry has made in bringing costs down. All three of these projects are currently under construction, creating jobs in rural Australian communities.

Other states have announced renewable energy procurement programmes to complement the national RET, and 2016 will see contracts awarded for these.

Most states in Australia take part in the National Electricity Market (NEM), which is one of the largest interconnected power systems in the world. The market is regulated by the Australian Energy Market Regulator and operated by the Australian Energy Market Operator. The states participating in the NEM include the entire eastern side of the country and South Australia, with an undersea cable connecting the island state of Tasmania. The southern part of Western Australia has a separate grid called the South West Interconnected System, and small power grids exist in more sparsely populated areas of the country.

LATEST POLICY DEVELOPMENTS

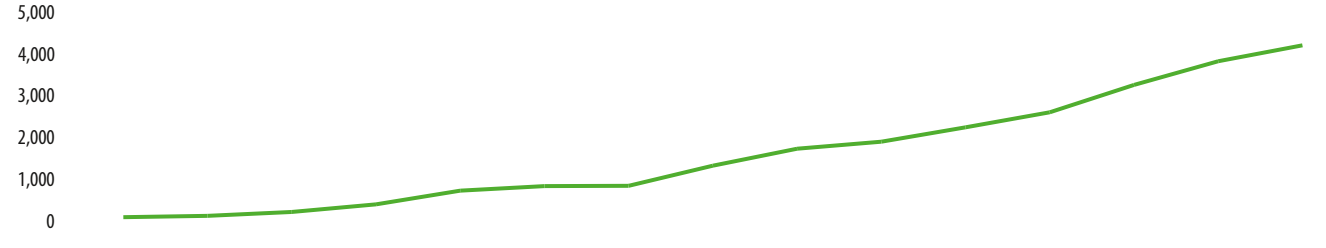
In 2015 the Renewable Energy Target was revised downwards from 41,000 GWh to 33,000 GWh per year. The new target has been legislated to remain in place until 2020 without review, which will serve to promote investor confidence in the scheme.

The RET scheme encourages the cheapest available renewable energy to be built, which is currently wind power. However, the price of solar projects continues to decrease and additional government support mechanisms for the technology help it to become more competitive with wind projects. The final target is likely to be fulfilled by a mix of the two technologies.

While 2016 is expected to be a big year for the Australian wind industry, the second half of 2015 remained quiet while waiting for the market to fully recover. A leadership change in September also helped to boost confidence as the new Prime Minister has shown a more forward looking attitude to technology and innovation.

There has been an increase in activity with companies seeking funds and existing approvals being amended to allow for newer, larger turbines. Progressive state governments have also been driving growth. Of particular note is the Australian Capital Territory (ACT)'s reverse auction scheme, which has so far funded four wind farms with a

TOTAL INSTALLED CAPACITY



year	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
MW	73	105	198	380	708	817	824	1,306	1,712	1,890	2,226	2,584	3,239	3,807	4,187

Source: GWEC

Portland wind farm © Pacific Hydro

total capacity of 300 MW. Victoria and New South Wales are also progressing purchasing schemes, with NSW announcing a tender for 137 GWh in order to offset the electricity used by a regional train system. Furthermore, South Australia committed to zero net emissions by 2050, on top of its ambitious renewable energy target of 50% by 2025.

A report by the Senate Select Committee on Wind Farms in August led to the announcement of a new National Wind Farm Commissioner and an Independent Scientific Panel investigating wind farm noise and health. The Commissioner and the Panel both report to the Minister for the Environment. The Commissioner will act to monitor and progress public complaints and the Panel will seek to increase public understanding of the issues.

KEY BARRIERS TO WIND ENERGY DEVELOPMENT

With the revised Renewable Energy Target legislation passed with bipartisan support, the industry expects that the next four years will be an exciting period of rapid construction. With that will come challenges for the construction industry which will need to increase capacity, as well as challenges for public acceptance as some members of rural communities come to terms with the changing landscape.

High levels of renewable energy penetration in South Australia, which has limited capacity in its connection to the east coast is presenting some technical challenges. As fossil fuel generators close down there may be some issues in that part of the network.

OUTLOOK FOR 2016 AND BEYOND

The Clean Energy Council is expecting a big 2016 for the wind industry, with new projects signing deals and construction getting into full swing. Wind energy enjoys broad support across Australia, including in the regions in which wind farms are situated; and the newly-revised Renewable Energy Target will mean almost doubling the installed wind capacity in the next four years.

By getting on with building wind energy projects and improving both community engagement and benefit sharing practices, the industry will be able to retain its support from the Australian community.

With input from the Clean Energy Council (CEC)

2015 was another strong year for wind power development in Brazil, with new records set for both installations and wind power generation. At the end of the year Brazil's cumulative wind power capacity totalled 8.72 GW, a 46% increase, accounting for 6.2% of national generation capacity. Wind power is the fastest growing energy source in the country, representing 39.3% of new power installations, followed by hydropower (35.1%) and thermal energy (25.6%).

BRAZIL

Brazil has some of the best wind resources in the world, exceeding the country's current electricity needs three times over. This year Brazil's wind generation record was broken by producing 10% of the national electricity demand on 2 November, showing the excellent operational performance of wind power in Brazil.

Solid growth of the Brazilian wind industry is expected to continue: the Brazilian government together with the wind industry has set a target to reach 24 GW of wind power by 2024, covering 11% of Brazil's generation capacity. Wind power already contracted for 2019 would bring total installed capacity to 18.67 GW.

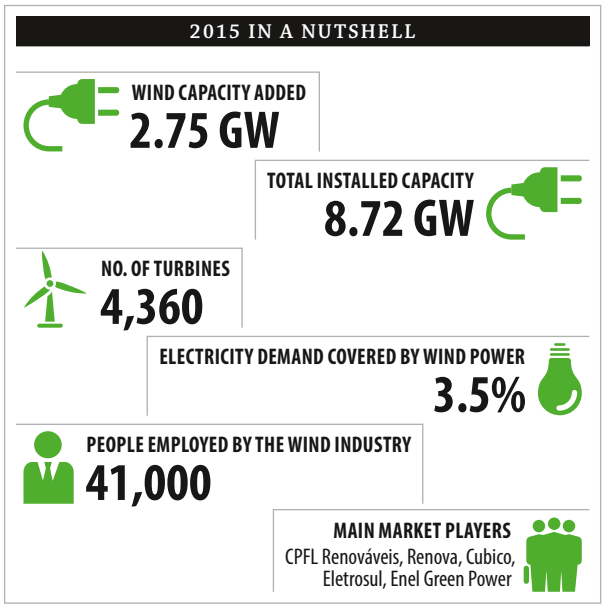
MAIN MARKET DEVELOPMENTS IN 2015

In 2015, Brazil added a record of 2.75 GW of new wind power capacity over 1,373 wind turbines across 111 wind farms, which will supply enough power for over 5 million homes. This represents an investment of BRL 17.8 billion[1] (EUR 4.52 bn), 66% of the total investment in renewables in 2015.

In cumulative terms, Brazil's wind capacity stood at 8.72 GW spread over 349 wind farms, representing a total investment of BRL 50 billion (EUR 11.47/USD 12.5 bn[2]). The sector employs over 41,000 people, supplies electricity to about 15 million homes, and has reduced CO_2 emissions by about 16 million tons, demonstrating the important economic, social and environmental benefits the Brazilian wind industry brings to the country.

The major new wind farms that came online in 2015 were:

- **Ventos de Santa Joana complex:** located in the state of Piaui, with a capacity of 439 MW distributed over 15 wind farms (investors: CHESF, Contour Global and Cubico)
- **St. Bridget complex:** located in the state of Pernambuco, with a capacity of 182 MW distributed over 7 wind farms (investor Cubico)
- **Campo Neutral complex:** located in the state of Rio Grande do Sul and consisting of the 7 Chui wind farms with a capacity of 162 MW; and 11 wind farms at the Verace complex with a capacity of 163 MW (investor: Eletrosul).



Installed capacity by state at the end of 2015 (MW)

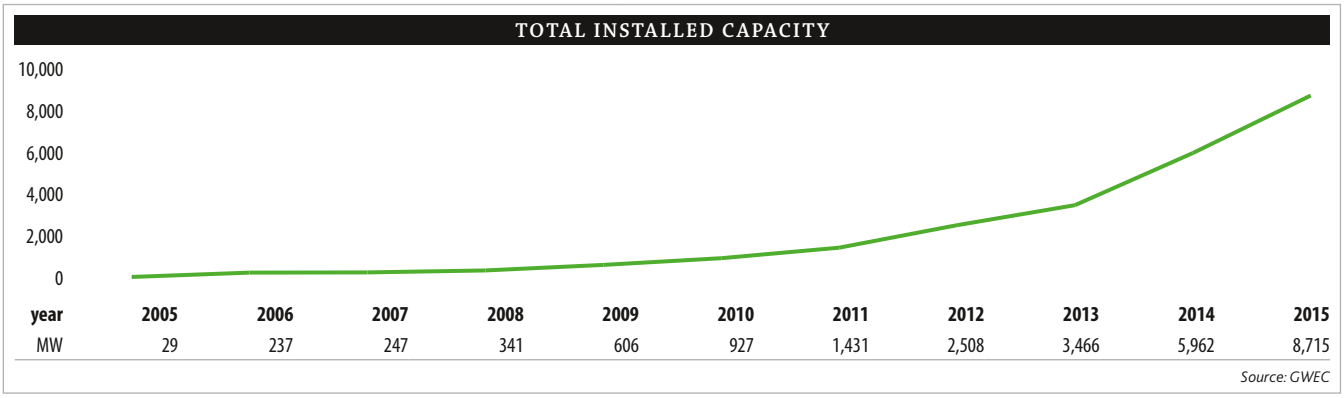
State	Installed capacity	Number of wind farms
Bahia	1,618.9	62
Ceará	1,304.3	47
Paraíba	69.0	13
Pernambuco	377.3	19
Piauí	705.1	25
Paraná	2.5	1
Rio de Janeiro	28.1	1
Rio Grande do Norte	2,779.6	100
Rio Grande do Sul	1,557.7	66
Santa Catarina	2,38.5	14
Sergipe	34.5	1
Total	**8,715.4**	**349**

The leading market players in the Brazilian wind market were CPFL Renováveis, Renova, Cubico, Eletrosul and Enel Green Power.

The set of financing rules which were set to gradually increase the level of local content during 2013-2015, published by the National Development Bank (BNDES), consisting of criteria for financing of wind projects through FINAME (Financing of Machinery and Equipment) were completed in 2015. These rules came into force in January 2013, and ended in 2015, with a compliance deadline of 1 January 2016.

New factories covering the entire supply chain of the wind industry were opened during 2015: SKF entered the market with a factory in Cajamar, in the state of São Paulo, producing bearings, seals and lubrication systems; Gamesa opened its first nacelle factory in Camaçari, in Bahia; Acciona expanded its production line in Simões Filho, also in Bahia; and TEN-Wind Towers Northeast now has a production capacity of 200 steel towers annually.

Three energy auctions were held in 2015. 1,177 MW of power was sold at an average price of BRL 191/MWh (EUR 43.8/USD 47.8 MWh), demonstrating the competitiveness and maturity of Brazil's wind sector.



Energy auctions in 2015

Auction	Date	Contracted capacity (MW)	Average market price (BRL)
LF A 2015	27 April	90	177.47
A-3 2015	21 August	538.8	181.14
2nd LER 2015	13 November	548.2	203.46
			Weighted average price BRL (MWh)
			191.25

LATEST POLICY DEVELOPMENTS

A *Parliamentary Front in Defence of Renewables* was established with the objective of pushing the government to adopt a more aggressive R&D program; to exempt the supply chain from taxes; to improve the transmission system and to scale energy auctions in order to stabilise the market; and a number of other measures to support a sustained development of renewables.

This Parliamentary Front will have a decisive role in preparing proposals promoting the wind sector in the Congress, with participation of 220 deputies and 13 senators, and with the support of eight associations in the energy sector, including the Brazilian Wind Energy Association (ABEEólica).

Furthermore, a *Program for Federal Government Power Expansion (PIEE)* was launched. The purpose of the PIEE is to give a signal to investors on the investments planned for the coming years. For power generation, the PIEE indicates an additional BRL 116 billion (EUR 26.6/USD 29 bn) investment adding between 25-32 GW of power capacity to the system. Out of this, 10 to 14 GW will come from solar, wind and biomass; for the wind sector this means an estimated an additional investment of 4-6 GW during 2015-2018 via auctions. The aim of the PIEE is to guarantee that new renewable energy capacity will be added in the system.

Considering Brazil's current economic crisis, it is worth paying attention to the government's financial situation. Brazil is undergoing aggressive public sector belt-tightening, and it is unclear whether and to what extent BNDES will continue to finance wind projects. However, due to a number of actions by the industry and ABEEólica at the end of 2015, there were signs that the government would maintain investments in the sector.

Several new regulations came into force in 2015 regarding tax exemptions for the sector, air safety regulations, cargo logistics, power plant construction close to archaeological sites and new rules to improve grid procedures.

Wind power is widely supported by the public due to the increased income and economic boost that it has provided to the regions where wind installations are located.

KEY BARRIERS TO WIND ENERGY DEVELOPMENT

One of the key barriers to wind development is the lack of sufficient transmission lines in the areas with most wind power potential. New auctions to provide additional transmission lines are needed to strengthen the system. It is expected that the Brazilian government will hold a large auction for transmission lines in 2016.

OUTLOOK FOR 2016 AND BEYOND

For 2016, the forecast is to install over 3 GW of wind power of which at least 2 GW will be in the regulated sector, and the rest in the free market, representing an investment of BRL 18 billion (EUR 4.13/USD 4.51 bn). Further focus is also expected on Research and Development and on Operations and Maintenance. The Brazilian wind industry has as its key objective to continue developing the sector in order to keep Brazil among the top ten leading wind power markets globally.

There are currently no plans to start offshore wind development in Brazil, as the rich onshore resources and higher prices for offshore mean that it is not competitive. Of the estimate of 400 GW or more of total onshore wind power potential, only 8.7 GW have been utilised so far.

With input from the Brazilian Wind Energy Association (ABEEólica)

1 Bloomberg New Energy Finance
2 All exchange rates from 1 March 2016

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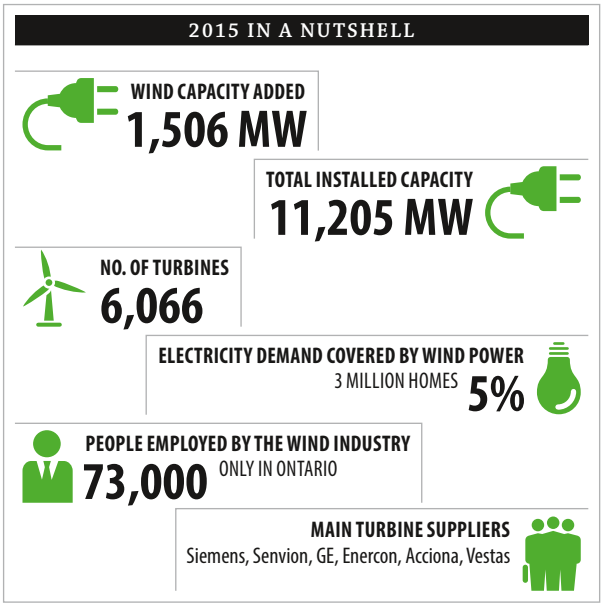
CANADA



The Canadian wind energy industry added 1,506 MW of new wind energy capacity in five provinces in 2015, its third biggest year ever. Ontario led the way with ten projects totalling 871 MW, followed by Quebec with six projects totalling 397 MW. Nova Scotia added 18 new wind generating facilities with a combined capacity of 185.5 MW. Alberta added one 29.2 MW project and Saskatchewan saw one 23 MW project come on line.

Canada ended the year with 11,205 MW of installed wind energy capacity, supplying approximately 5% of the country's electricity demand and powering approximately three million Canadian homes.

Canada's wind fleet has grown by an average of 23% per year over the past five years, and has been the largest source of new electricity generation over that period.

Ontario became the first Canadian province to surpass 4 GW of installed wind energy capacity, ending 2015 with 4,361 MW. Quebec and Alberta are the next largest markets for wind in Canada, with 3,262 MW and 1,500 MW respectively. Atlantic Canada also reached a milestone in 2015, surpassing 1,000 MW of operating wind energy, with a little over half of that located in Nova Scotia.

Six wind turbine manufacturers (OEMs) supplied turbines to Canadian wind energy projects in 2015, led by Siemens Canada Limited with 47% of the total market. Senvion Canada Inc., GE Renewable Energy, ENERCON, Acciona Wind Energy Canada and Vestas Canada also contributed.

The new wind energy projects commissioned in Canada in 2015 represent more than CAD 3 billion (EUR 2.03/ USD 2.22 bn) in investment. Of the 36 new wind energy projects installed, 23 had some level of Aboriginal Peoples, municipal or local ownership.

LATEST POLICY DEVELOPMENTS

While federal government incentives played an important role in the early stages of wind energy deployment in Canada, the federal government has limited responsibility for electricity generation, and provincial governments are now responsible for the policy frameworks that are driving wind energy growth in Canada. The federal government may, however, play a more active role with October's election of a new Liberal government, led by Prime Minister Justin Trudeau. The Liberal Party of Canada came to power promising stronger action on climate and more support for clean energy and clean technology development.

While the details of the new government's plans remain unclear, it is working to bring the provinces together to develop a pan-Canadian climate strategy. They have also committed to creating a CAD 2 billion (EUR 1.4/USD 1.5 bn) Low Carbon Economy Trust to fund projects that reduce greenhouse gas emissions.

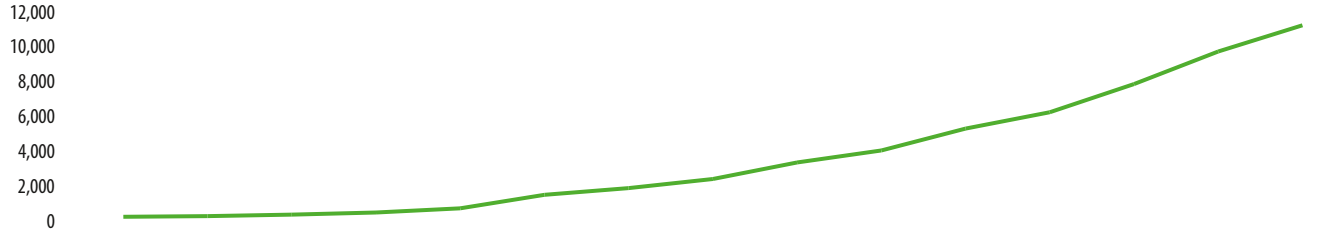
The new government has also expressed interest in working with the provinces on the development of a Canadian Energy Strategy that will bring more renewable energy onto the electricity grid; supporting provinces in their plans to boost clean electricity exports to the United States; leveraging the federal government's creditworthiness to issue green bonds to support both large- and community-scale renewable energy projects; shifting subsidies from fossil fuels to new and clean technologies; and helping provinces and territories invest in modern grid, power storage, and transmission that ensure a bigger role for clean energy.

MAIN MARKET DEVELOPMENTS IN 2015

Wind energy procurement in Ontario and Quebec has driven much of Canada's wind energy deployment in recent years. New announcements made late in 2015, however, have made it clear that significant new wind energy opportunities are emerging in Canada's prairie provinces.

Alberta's NDP government unveiled a new climate strategy in November that pledges to phase out the

TOTAL INSTALLED CAPACITY



year	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
MW	198	236	322	444	684	1,460	1,846	2,369	3,319	4,008	5,265	6,214	7,827	9,699	11,205

Source: GWEC

province's 6,289 MW coal fleet by 2030, replacing it with renewable energy and gas generation. The percentage of electricity demand met by renewable sources will triple from 9% today to as much as 30% within 15 years, with wind energy playing a leading role. Although the implementation details are still being worked out, the new policy is expected to drive thousands of megawatts of new wind installations.

Also in November, neighbouring Saskatchewan, which currently has 221 MW of installed wind energy capacity, announced its intention to grow that capacity to over 2,000 MW by 2030. The expansion is part of a broader strategy that will double the percentage of renewable electricity generating capacity in the province within 15 years, cutting electricity sector greenhouse gas emissions 40% below 2005 levels. Both Alberta and Saskatchewan are expected to issue requests for proposals (RFPs) for new wind energy in 2016.

Ontario went to the market to buy 300 MW of new wind energy in 2015 for the first time since cancelling its fixed-price feed-in tariff (FIT) program in 2013. Results of this highly competitive RFP are expected in March. The province will follow up with a second RFP later in 2016.

Quebec unveiled a new 200 MW project at the end of 2015 that, when commissioned, will complete its goal of adding 4,000 MW of wind energy to its grid. A new energy policy, to be released early in 2016, will signal the next steps in the development of Quebec's wind energy sector. There are compelling reasons for the province to target additional wind energy development, including preserving manufacturing jobs, meeting Quebec's aggressive climate and electrification targets, and pursuing new clean energy exports to neighbouring jurisdictions looking to reduce emissions.

KEY BARRIERS TO WIND ENERGY DEVELOPMENT

Slow electricity demand growth in most provinces means there is limited need for new generation of any kind for traditional purposes. Also, plans for new large conventional generation, like major hydroelectric projects in British Columbia and Newfoundland and nuclear refurbishment in Ontario, have the potential to impact the opportunities for governments to take advantage of the cost and environmental benefits of adding new wind energy to the current mix.

Source: CanWEA

At the same time, however, provincial governments across the country, and the federal government as well, have made aggressive long-term greenhouse gas emissions reduction commitments that can only be met through increased electrification of transportation, heating and cooling and industrial processes. This will increase the demand for zero-carbon electricity generation. Policymakers and utilities are increasingly recognizing that wind energy is a cost-competitive and scalable way to ensure the electricity powering the broader, low-carbon economy is clean.

OUTLOOK FOR 2016 AND BEYOND

The Canadian wind energy industry is looking forward to another strong year in 2016, with at least 1,000 MW of new capacity expected to come online.

There are still close to 1,500 MW of contracted projects in Ontario's construction pipeline and the province has firm plans to purchase at least 600 MW more in the near term, while Quebec still has another 700 MW under contract to come online in the next two years. Combined with new procurement plans in Alberta and Saskatchewan, it is clear there remain significant development opportunities in Canada's wind market. As the economy picks up and climate action plans begin to take shape, wind energy is poised to continue to be a rapidly growing part of Canada's electricity supply mix.

With input from the Canadian Wind Energy Association (CanWea)

2015 marked another record year for China's wind industry. With installations of 30.75 GW, representing 32.6% annual market growth, China consolidated its leading role in the global wind market. This brings cumulative installations to 145.4 GW, up 26.8% from 2014. China accounted for 48.6% of global installations in 2015, and has 33.6% of cumulative installations globally.

PR CHINA

MAIN MARKET DEVELOPMENTS IN 2015

2015 was the second consecutive year where wind power installations increased rapidly due to an anticipated reduction in the feed-in tariff (FIT). Towards the end of the year, the announcement of an additional FIT reduction gave the industry further cause for concern. The FIT for onshore wind is to be lowered again at the beginning of 2018. This latest announcement will be the driving force for maintaining installation rates at record levels over the next two years.

Wind tariff adjustments in 2016 and 2018

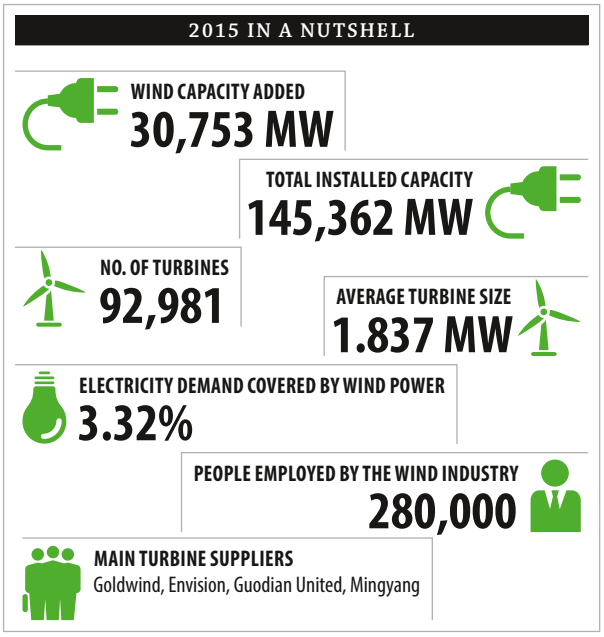
	2016 (RMB/kWh)	2018 (RMB/kWh)	Geographical Coverage
Category I	0.47	0.44	Inner Mongolia except ChiFeng, Tongliao, Xing'an, Hulunbeier; Urumqi, Yili, Karamay, Shihezi of Xin Jiang
Category II	0.50	0.47	Zhang Jiakou, Chengde in Hebei Province; Chifeng, Tongliao, Xing'an, Hunlunbeier in Inner Mongolia; Jiayuguan, Jiuquan in Gansu Province
Category III	0.54	0.51	Baicheng and Songyuan of Jilin Province; Jixi, Shuangyashan, Qitaihe, Suihua, Yichun, Daxinganling of Hei Longjiang province; Xinjiang except that covered in Category II; Ninxia autonomous region
Category IV	0.60	0.58	Areas not covered in Category I, II and III

KEY MARKET PLAYERS

Goldwind continued to dominate the Chinese market with more than 25% of the total annual market. The top five manufacturers accounted for 58% of the total market, installing over 2 GW each.

Key players in the Chinese wind market in 2015

	Manufacturer	MW	Market share
1	Goldwind	7,748.9	25.2%
2	Guodian United	3,064.5	10.0%
3	Envision	2,510	8.2%
4	Mingyang	2,510	8.2%
5	CSIC	2,092	6.8%
6	Shanghai Electric	1,926.5	6.3%
7	XEMC	1,510	4.9%
8	DongFang Electric	1,388	4.5%
9	Windey	1,260	4.1%
10	Sany	951	3.1%
	Others	5,792.1	19%
	Total	**30,753**	**100%**



The top leading foreign manufacturers were Gamesa with 434 MW (1.4%), followed by Vestas with 283.75 MW (0.9%) and GE with 113.65 MW (0.4%).

In 2015, China exported 274.5 MW of wind power to five countries: the US, Pakistan, France, Sweden and Belarus. By the end of the year, cumulative exports reached 2,035.75 MW.

China's wind power exports 2008 – 2015

	2008	2009	2010	2011	2012	2013	2014	2015
Annual (MW)	14.5	28.75	11.05	213.06	430.45	692.35	368.75	274.5
Cumulative (MW)	16.84	45.59	56.64	269.7	700.15	1,392.5	1,761.25	2,035.75

OFFSHORE WIND DEVELOPMENT

New offshore wind installations accounted for 360.5 MW in 2015 (100 turbines), up 57.2% from 2014. More than 50% were inter-tidal projects (181.5 MW), and the rest of the new installations were near shore projects (179MW).

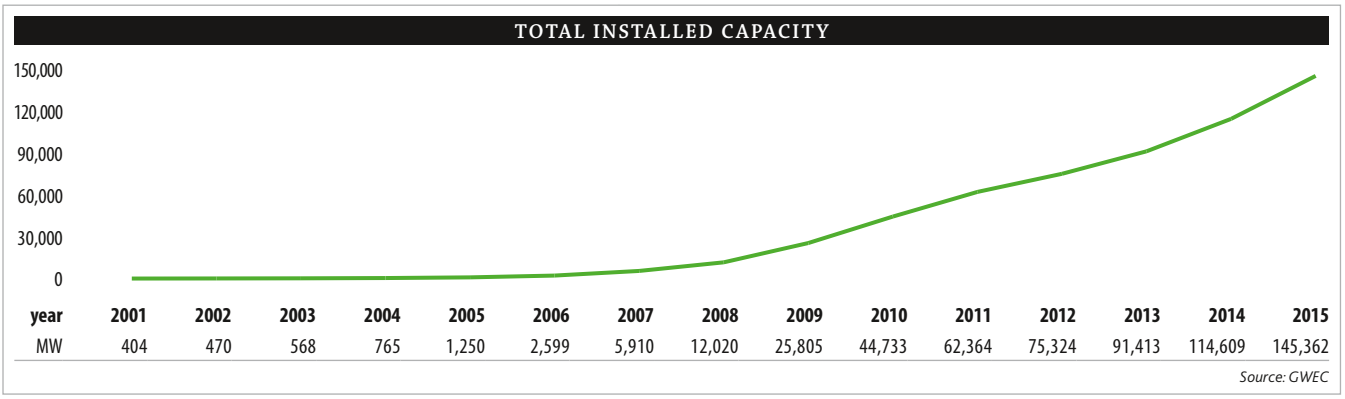
Chinese offshore wind installations 2007-2015

	2007	2009	2010	2011	2012	2013	2014	2015
Annual (MW)	1.5	14	135.5	109.58	127	39	227.6	360.5
Cumulative (MW)		15.5	151	260.58	387.58	426.58	654.18	1,014.68

Ten turbine manufactures were active in the Chinese offshore wind market, and four installed over 100 MW each. Shanghai Electric led the market with 459.18 MW (45.3%), followed by Sinovel (170 MW, 16.8%); Envision (131 MW, 12.9%); Goldwind (118.5 MW, 11.7%), XEMC (57.5 MW, 5.7%); Guodian United (39 MW, 3.8%); CSIC (14 MW, 1.4%); Mingyang (12 MW, 1.2%); DEC (9.5 MW, 0.9%) and Sany (4 MW, 0.4%).

WIND DEVELOPMENT AT REGIONAL LEVEL

In 2015, the top five provinces were Xinjiang, Inner Mongolia, Yunnan, Ningxia and Gansu, all but Yunnan



year	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
MW	404	470	568	765	1,250	2,599	5,910	12,020	25,805	44,733	62,364	75,324	91,413	114,609	145,362

Source: GWEC

© Crossgates Wind Turbine Training Facility

located in the North West region, accounting for 53.3% of the country's overall installations. The top five provinces in terms of cumulative installations were Inner Mongolia, Xinjiang, Gansu, Hebei and Shandong, accounting for 52% of the total.

Top ten provinces - new installed capacity 2015 (MW)

	Province	2015 New
1	Xin Jiang	6,582.7
2	Inner Mongolia	3,355.2
3	Yunnan	2,324.75
4	Ningxia	2,230.4
5	Gansu	1,902.9
6	Shanxi	1,704.5
7	Guizhou	1,308.2
8	Shandong	1,296.6
9	Jiangsu	1,212
10	Hebei	1,157.9
	Others	7,677.85
	Total	**30,753**

	Province	2015 Cumulative
1	Inner Mongolia	25,667.51
2	Xin Jiang	16,250.76
3	Gansu	12,628.85
4	Hebei	11,030.30
5	Shandong	9,559.90
6	Ninxia	8,374.50
7	Shanxi	7,549.75
8	Yunnan	6,014.75
9	Jiangsu	4,888.15
10	Guizhou	3,259.90
	Others	65,805.03
	Total	**145,361.89**

LATEST POLICY DEVELOPMENTS

China's economy has been slowing down over the past two years. GDP growth was 6.9% in 2015 compared to 7.3% in 2014, which has had a direct impact on the country's overall electricity demand. According to the China Electricity Council, electricity demand grew by just 0.5% in 2015, the lowest growth rate since 1974.

New power generation installations in 2015 were 151 GW, a 10.5% increase from 2014; while total electricity production stood at 5,600 TWh, up 0.6% from 2014. This economic slowdown has led to lower capacity utilization across most power generation technologies. The average full load hours (for all technologies) in 2015 was 3,969 hours, representing an average annual decline of 349 hours.

Average full load hours for coal-based generation in 2015 was 4,329, the lowest since 1969, 410 hours lower than last year. This is also the basis for Chinese government

officials and national energy experts halting any new permits for fossil fuel-fired facilities for the next three years.

Due to the slow growth in demand, wind and solar PV experienced serious grid curtailment in 2015. According to NEA[1], the average operating capacity for wind farms was 1,728 hours, a year-on-year decrease of 172 hours. The province with the highest full load hours was Fujian with 2,658 hours and the lowest was Gansu with only 1,184 hours.

In 2015, 33.9 TWh of wind electricity was curtailed. The average curtailment rate was 15%. Some provinces are experiencing extreme curtailment: Inner Mongolia 18%, Gansu 39%, Xinjiang 32% and Jilin 32%.

Gansu and Yunnan provinces reported cases where their provincial governments made wind farms compensate for the reduced capacity hours of coal based power plants due to priority access rights for renewables. These orders were in direct violation of China's Renewable Energy Law, as renewables should enjoy priority access to the grid for the full amount of electricity produced.

At the end of 2015, a positive development was the release of a new draft regulation on *Rules on Full Amount Purchase of Renewable Energy* which was circulated to stakeholders for comments. This draft regulation divides renewables based electricity into *mandatorily purchased electricity* and *market based electricity*. Both categories would have priority access to the grid. The *mandatorily purchased electricity* will be calculated according to average full load hours for the region, and the off-taker would pay for it. The *market based electricity* part is to be sold at the price negotiated as part of an offtake contract; this practice is seen as a placeholder for a future wholesale market.

The draft regulation also obliges the grid operator to guarantee priority access to *mandatorily purchased electricity*. In case wind based electricity is curtailed, it is the 'beneficiary' of the curtailment, usually a coal fired power plant, which will have to compensate the affected wind farm operator. Under these draft rules, it is also envisaged that the grid operator will only deal with the transmission system; this development would be in line with the expected broader electricity market reform.

ENERGY TRANSITION: AN OPPORTUNITY FOR CHINA'S WIND INDUSTRY

Although several challenges persisted, 2015 was also an important year of political and regulatory transformation, which created opportunities for wind and the broader renewables industry. China's government had been talking about the concept of *energy transition* or *energy revolution* since 2013; and finally during 2015, the support for these ideas reached an historical high in the political system.

1 http://www.nea.gov.cn/2016-02/04/c_135073627.htm

During 2015 the 13th Five-Year Plan (FYP) was drafted, covering the period from 2016 to 2020. Throughout the year, the concept of *energy transition*, including higher penetration of renewables, was often cited by energy experts and government officials. Many of the advocates of the energy transition were stalwarts from the fossil fuel industry and not known to be supporters of the renewables industry. This signals a shift in attitudes among high-level government officials who now seem to want to promote a cleaner energy future for China.

Many high-level government officials are concerned about the extreme air pollution in major cities, and express the desire to reduce air pollution and curb climate impacts. They are also keen to boost the economy by shifting focus from the traditional fossil fuel industry to the promising renewables industry.

The choking smog in Beijing and across China is becoming a major public health concern. Even people who were previously insensitive to the rising pollution levels are now actively raising their voices about the unbearable and painful breathing conditions. This is now a critical social issue, and there is significant pressure on the government to take action.

Similarly, in the run up to the COP21 climate summit, the demand for mitigating climate change impacts for China, as the world's biggest GHG emitter, played a key role in the framing of the energy sector related proposals under

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the 13th Five-Year Plan. The government set itself a target of peaking GHG emissions by 2030. It is now actively designing and implementing a national carbon market. All of these actions set the stage for the renewables industry to become mainstream in China.

The government is also looking for ways to revitalize the economy and have re-initiated electricity market reform, which has been stalled for more than a decade. The objective is to find ways to lower the cost of electricity generation and to further boost the competitiveness of the manufacturing industry.

Additionally, China is assessing new growth areas in the field of technology and innovation. Currently the renewables industry is seen as a promising high-technology industry and hence a strategic part of the future energy mix.

The 13th Five-Year Plan includes an objective for non-fossil renewable energy consumption to reach 15% by 2020 and 20% by 2030. For wind power, the target is to reach cumulative installed capacity of 250 GW by 2020.

KEY BARRIERS TO WIND ENERGY DEVELOPMENT

Grid curtailment remains the most critical challenge facing the wind industry in China. The economic slowdown and decreasing electricity demand mean that curtailment is not only happening to wind and other renewables but also to other power technologies.

Other challenges are linked to the financing of the FIT, which is becoming an increasing burden on the government. The government raised the renewable energy surcharge, which is added to each kWh of electricity produced, to RMB 0.019/kWh (EUR 0.0026, USD 0.0029) from RMB 0.015/kWh (EUR 0.0021, USD 0.0023) in the beginning of 2016. The surge of solar PV and the rapid pace of wind power development both add pressure to find enough funding to finance the FIT, and also results in pressure on the renewable industry to lower costs.

OUTLOOK FOR 2016 AND BEYOND

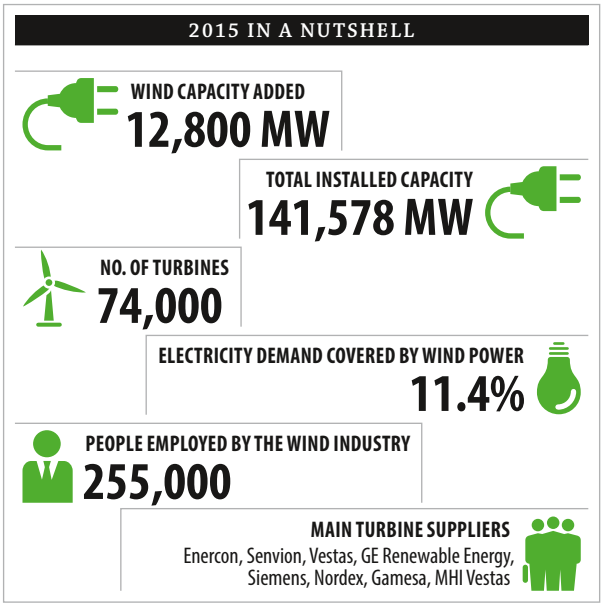
China's 13th Five-Year Plan sets a goal of 250 GW of wind power by 2020. This would mean adding more than 100 GW in the next five years, which translates into at least a 20 GW annual market. While the decrease in the tariff in 2018 doesn't make the industry happy, the 13th FYP still gives some assurance to the industry for the next five years.

With input from the Chinese Wind Energy Association (CWEA) and Chinese Renewable Energy Industry Association (CREIA)

MAIN MARKET DEVELOPMENTS IN 2015

During 2015, 12,800 MW of wind power capacity was installed and grid-connected in the EU, an increase of 6.3% on 2014 installations. Of the 12,800 MW installed in 2015, 9,766 MW was onshore and 3,034 MW offshore. Wind power led new power capacity additions in Europe in 2015, accounting for 44.2% of new capacity installations.

The EU ended the year with a total of 142 GW of wind power, of which 131 GW were onshore and 11 GW offshore. Wind energy has overtaken hydro as the third largest power source in the EU with a 15.6% share of total cumulative capacity. The wind power capacity currently installed in the EU would in an average wind year produce 315 TWh of electricity, enough to cover 11.4% of the EU's total electricity consumption in 2015.



THE EUROPEAN UNION

Germany was the largest market in 2015 in terms of annual installations, with 6,013 MW of new capacity, 38% of which was offshore (2,282 MW). Poland came in second with a record 1,266 MW, more than double 2014 installations, followed by France with 1,073 MW and the UK with 975 MW, including 572 MW (59%) offshore.

Almost half of all new installations in the EU in 2015 were in Germany, reflecting the traditional size and strength of its wind energy market and the stability of the regulatory framework. However, the connection of large amounts of offshore capacity installed but not grid-connected in 2014, and a desire by the industry to complete installations before Germany moves to market-based arrangements in 2017 also helps explain the high level of installations in 2015.

In cumulative terms, Germany remains the EU country with the largest installed capacity (45 GW), followed by Spain (23 GW), the UK (14 GW) and France (10 GW). There are now 16 EU countries with more than 1 GW installed and nine countries with more than 5 GW.

Market leaders in the EU as regards assets owned are ENEL, Iberdrola Renewables, DONG Energy, E.ON, EDF, ENGIE, EDP Renewables, RES, Vattenfall, Acciona Energía, ERG Renewables, Allianz Capital Partners, and SSE. Wind turbines OEM market leaders in the EU wind market are ENERCON, Senvion, Vestas, GE Renewable Energy, Siemens, Nordex, Gamesa, and MHI Vestas.

LATEST POLICY DEVELOPMENTS

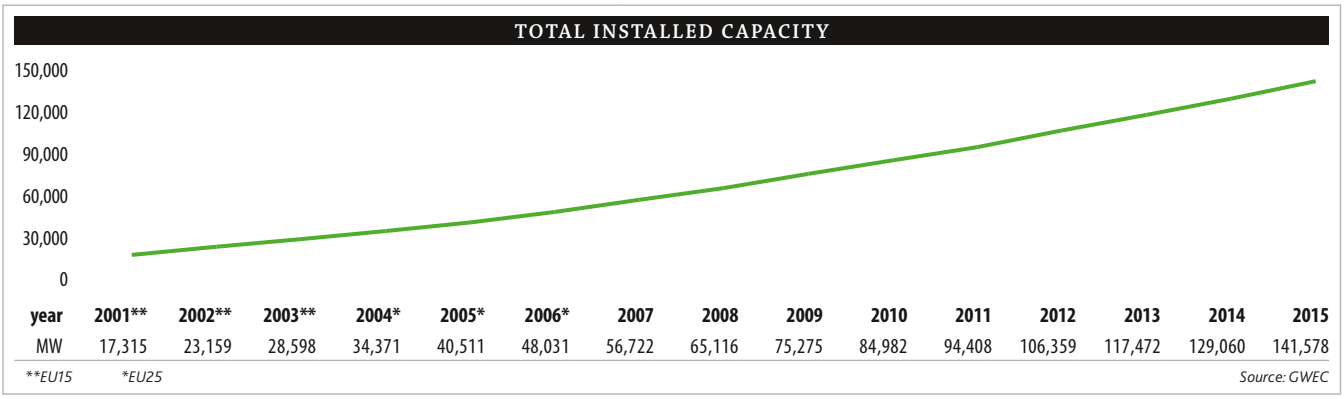
In 2015 the European Commission (EC) launched its vision for a unified energy strategy for the European Union: the Energy Union[1]. This umbrella framework strategy aims at coordinating the energy policy of the 28 Member States focused on five pillars: security of supply, integrated internal energy market, energy efficiency, emission reductions, and research and innovation.

Under the Energy Union, the EC is currently working on several dossiers. One of them, the European Emission Trading Scheme[2], is being revised to make it more effective in incentivizing emission reductions from industrial activities and transport. Furthermore, a number of structural changes are affecting the EU's energy market design[3], such as the increasing penetration of renewable energy and the spread of distributed generation. The EC launched a public consultation in the summer of 2015 on energy market design, to ensure the inclusion of all electricity players in a fully interconnected market, at minimum cost.

The EC also launched a consultation in November 2015 for a revised Renewable Energy Directive[4] for the period 2020-2030, to succeed the 2009 Directive which set renewable energy targets for 2020[5]. The EC will unveil its legislative proposals during the first half of 2016. The outcome of these policy debates will shape renewable energy development in the EU out to 2020 and 2030 and will have an important impact on the future wind energy development in the Union.

OFFSHORE WIND POWER

Offshore wind had a record year with over 3 GW of installations in European waters. Offshore wind energy accounted for 24% of total EU wind power installations in 2015, double the share of annual additions in 2014. The European offshore wind energy industry committed to a cost reduction path in its joint declaration in 2013[6]



year	2001**	2002**	2003**	2004*	2005*	2006*	2007	2008	2009	2010	2011	2012	2013	2014	2015
MW	17,315	23,159	28,598	34,371	40,511	48,031	56,722	65,116	75,275	84,982	94,408	106,359	117,472	129,060	141,578

***EU15* **EU25* *Source: GWEC*

and it is already delivering thanks also to larger turbines with higher yields[7].

SUPPORT FRAMEWORK FOR WIND ENERGY

Due to the implementation of the European Commission's State Aid Guidelines for energy and environmental protection[8], support mechanisms for wind energy in the European Union are shifting towards market-based schemes, such as Feed-in Premium tariffs. Competitive auctions are also being rolled out in several EU Member States, in particular in Germany and Poland, while many other EU Member States have been using auctions already for some years including Denmark, Italy, the Netherlands, Latvia, Lithuania, Portugal, and the United Kingdom.

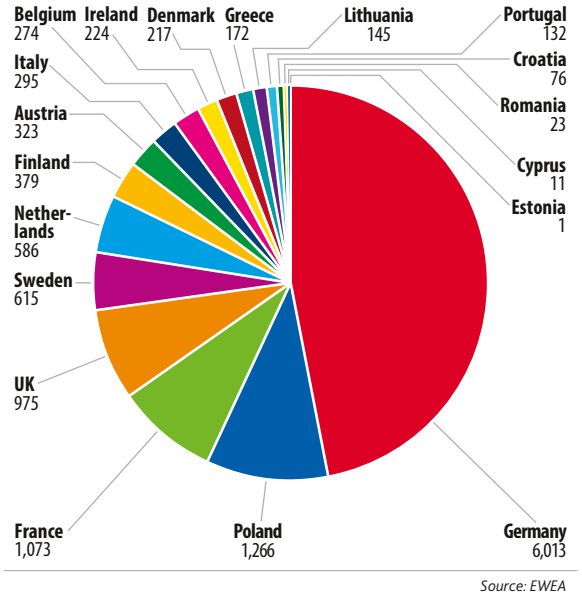
Onshore wind is already the most cost-competitive renewable energy source in the European Union thanks to the cost-reduction path the industry has taken. However, the industry has suffered from sudden and sometimes retroactive legislative changes in several countries (i.e., Romania and Spain). Moreover, the lack of political visibility led to fewer installations in 2015 in some countries.

KEY BARRIERS TO WIND ENERGY DEVELOPMENT

Sudden changes in legislation in a number of EU Member States make it hard for investors and developers to plan investments in new wind energy assets as well as in repowering and retrofitting existing assets. Clear and stable regulatory frameworks are necessary for wind energy to effectively develop in the EU.

The EU power sector suffers from overcapacity caused by uneconomical and inefficient fossil fuel power plants being artificially kept online by public subsidies[9]. That in turn causes electricity prices to drop, undermining the business case for investing in new power capacity. Finally, aviation rules, environmental constraints and poor guidance at national level negatively impact wind energy development onshore as well as offshore.

Member State share of new installations in 2015 (MW)



Source: EWEA

OUTLOOK FOR 2016 AND BEYOND

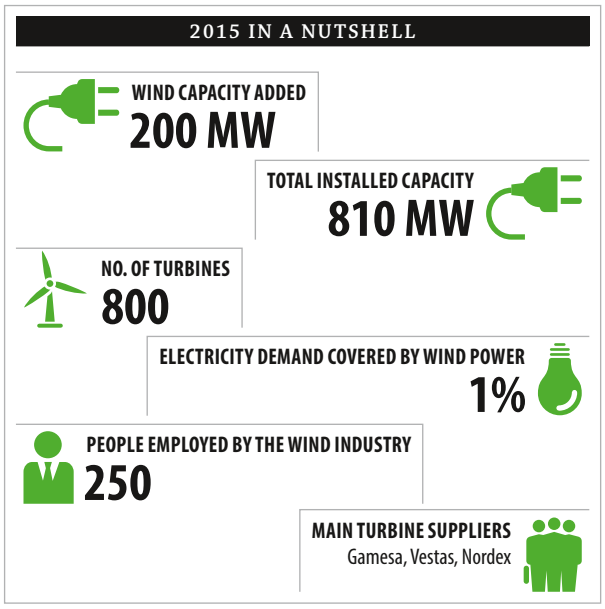
2015 marked a record year for wind energy installations in the European Union. To beat this record in the years to come will be a challenge for the industry but the outlook to 2020 is encouraging. In fact, in 2015 EUR 26.4 billion were invested in the European wind energy sector, 40% more than in 2014.

With input from the European Wind Energy Association (EWEA)

1 For more information: https://ec.europa.eu/priorities/energy-union-and-climate_en
2 For more information: http://ec.europa.eu/clima/policies/ets/reform/index_en.htm
3 For more information: https://ec.europa.eu/energy/sites/ener/files/documents/1_EN_ACT_part1_v11.pdf
4 For more information: https://ec.europa.eu/energy/sites/ener/files/documents/RED%20II%20Public%20Consultation_0.pdf
5 For more information: http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=-CELEX:32009L0028&from=EN
6 For more information: http://www.ewea.org/offshore2015/united-industry/
7 In 2015 the average capacity of grid-connected turbines was 4.2 MW, 13% more than 2014. For more information please consult EWEA offshore wind energy statistics at http://www.ewea.org/fileadmin/files/library/publications/statistics/EWEA-European-Offshore-Statistics-2015.pdf
8 European Commission, Guidelines on State aid for environmental protection and energy 2014-2020, 28.6.2014, available at http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52014XC0628(01)&from=EN
9 For more information please consult EWEA position on Market Design, available at http://www.ewea.org/news/detail/2015/07/09/keeping-conventional-power-plants-on-life-support-not-the-answer-to-europes-overcapacity-puzzle/

Once an exporter of oil and gas, Egypt is today struggling to meet its own energy needs. Indeed, rapidly growing power demand, severe power shortages with frequent black-outs, and the need to reduce domestic fossil fuel consumption are the key drivers pushing forward renewable energy development in the country.

Egypt has some of the richest wind resources in the Middle East and North Africa region. However, today wind power supplies only 1% of the country's electricity generation. Over the past year, the government has made a number of policy changes to support renewable energy and it has an ambitious target to reach 20% renewable electricity by 2022, including 7,200 MW (12%) of wind energy. With successful implementation Egypt could well become one of the leading renewable energy markets in the region in the near term.



EGYPT

MAIN MARKET DEVELOPMENTS IN 2015

Egypt's best wind resources are located in the Suez Gulf area with average wind speeds of 10.5 m/s at 50 meters height as well as in the large regions of the Nile banks in the Eastern and Western Deserts with average wind speeds of 7.5 m/s at 80 meters height.

In 2015, Egypt added 200 MW of new wind power, bringing the country's total wind capacity to 810 MW. Egypt's wind farms are located in three regions along the Red Sea coast: the biggest one is the 545 megawatt Zaafarana wind farm consisting of 700 turbines; the 200 MW Gabal El Zayet wind farm was inaugurated in November 2015, and consists of 134 turbines; and the 5 MW Hurghada wind farm.

Egypt's wind farms at the end of 2015

Wind Farm	Capacity (MW)	Year of operation
Hurghada	5	1993
Zaafarana 1	30	2001
Zaafarana 2	33	2001
Zaafarana 3	30	2003
Zaafarana 4	47	2004
Zaafarana 5	85	2005
Zaafarana 6	80	2007
Zaafarana 7	120	2009
Zaafarana 8	120	2010
Gabal El Zayet 1	200	2015

All the existing wind energy projects in Egypt are owned by the New and Renewable Energy Authority (NREA). However, the private sector is encouraged to participate by using the FIT system or by participating in tenders. At the moment, results are about to be announced for the winning consortium of the first competitive bidding under the framework of the "Build-Own-Operate (BOO) scheme for 250 MW of wind power.

To date, financing for renewable energy projects in Egypt has come from international soft finance. Wind farms have been developed largely through resources from the German, Spanish, Japanese and Danish governments, as well as the European Investment Bank and the World Bank.

There is no wind industry yet in Egypt but the government wants to encourage the transfer of know-how by creating a strong wind power market, giving priority to local manufacturing in future tenders for wind projects

LATEST POLICY DEVELOPMENTS

Having taken effect in 2015, Egypt's new Renewable Energy Law encourages the generation of electricity from RE sources via four development schemes:

1. **Governmental Projects:** Via EPC contracts (Engineer, Procure and Construct. It is a form of procurement frequently used for large international infrastructure or power projects).

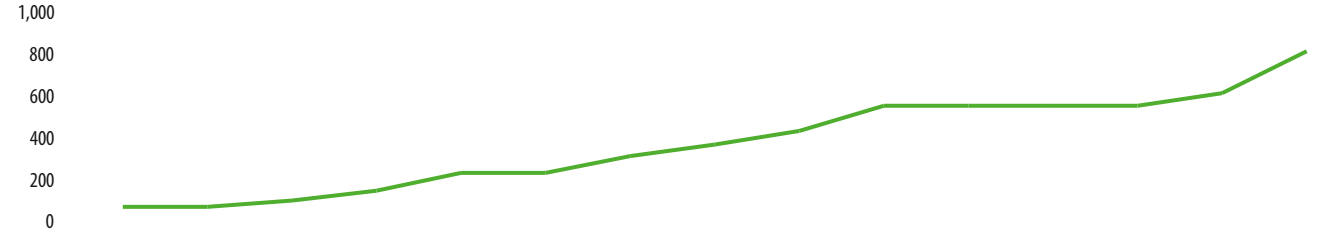
2. **Competitive bids:** The Egyptian Electricity Transmission Company (EETC) issues tenders to private sector companies internationally under the framework of the "Build, Own and Operate" (the BOO scheme).

3. **Third Party Access IPP scheme:** This mechanism allows investors to sell electricity generated from projects directly to consumers using the national grid for distribution subject to a wheeling charge.

4. **The Feed-in Tariff scheme:** The government has announced an interim target for the first regulatory period (2015-2017) to contract 4,300 MW of solar and wind energy, of which 2,000 MW will be wind projects.

The FIT level is set at USD 4 cent/kWh (EUR 3.64 cent/kWh) for the NREA projects and the price resulting from the first BOO tender is expected to be below that.

TOTAL INSTALLED CAPACITY



year	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
MW	68	68	98	145	230	230	310	365	430	550	550	550	550	610	810

Source: GWEC

© Gamesa

KEY BARRIERS TO WIND ENERGY DEVELOPMENT

Fossil fuel subsidies and dependence are major obstacles to Egypt's realising its renewable energy goals. Low energy prices have dampened energy production, increased demand growth and led to a spreading energy deficit. In 2014 a five-year tariff reform program was adopted. Consequently, the price of the electricity generated from renewable energy will be increased annually at the same rate as wholesale electricity through 2019.

OUTLOOK FOR 2016 AND BEYOND

Egypt has several wind projects in the pipeline:

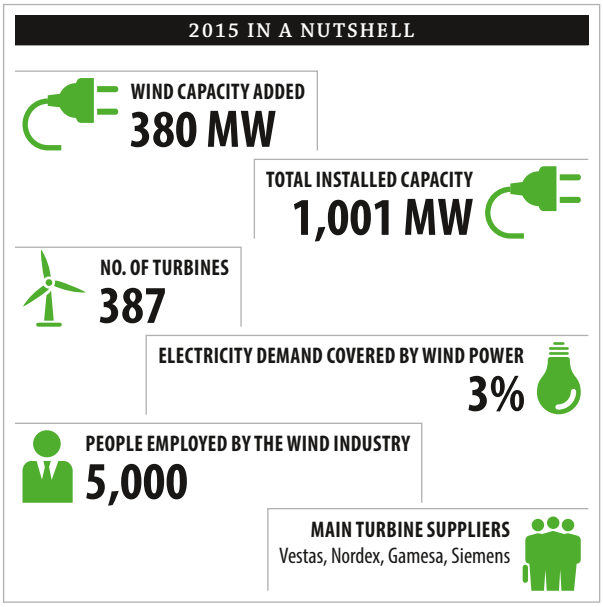
- Three NREA projects with a capacity of 520 MW;
- Two projects via competitive bidding with a capacity of 400 MW (200 MW each);
- One project with a capacity 250 MW under the BOO framework. Additionally, a short list will be selected for a project with a capacity of 250 MW in the West Nile area;
- 14 projects with a capacity of 700 MW via the Feed-in Tariff system (construction is expected to start by the end of 2016);
- Two further projects (250 MW and 320 MW) are planned under the BOO framework with same price and conditions with the first BOO tender. The results will be announced in March 2016.

Egypt enjoys wide public acceptance for wind power due to the critical need to increase renewable energy to contribute to the country's energy mix in order to reduce blackouts and to enhance energy security. Furthermore, most of the wind projects are located in desert areas, helping to create new communities in these remote areas. The Egyptian Environmental Law also requires a public consultation to be held in the project area, assuring acceptance from the local population.

With input from the New and Renewable Energy Authority (NREA)

Finland is a sparsely populated northern country with a long coastline and good wind resources. Roughly the size of Germany, Finland has only 5.2 million inhabitants. Despite favorable conditions, wind power development in Finland has started later than in many other European countries.

The introduction of a comprehensive feed-in premium in 2011 made it possible to establish a wind industry in Finland. Wind power capacity remained at modest levels for some time, but recent years have seen impressive growth.



FINLAND

MAIN MARKET DEVELOPMENTS IN 2015

In 2015, Finland added 380 MW of wind capacity bringing the total to 1,001 MW. This is enough to supply 3% of Finland's electricity needs with annual production of 2.3 TWh, 110% more than in 2014. Finland has a target of increasing production from wind power to 6 TWh by 2020.

In forested areas, high towers of 140 meters or more are required, especially in areas away from the coast. Most wind projects, however, are located along the long coastline, in the northern parts in particular; but projects are also being developed in other parts of the vast country. While the Finnish grid is stable and in good condition, further reinforcement is needed to be able to accommodate wind power in some areas.

By the end of April 2014, over 11,000 MW[1] of wind power projects had been announced in Finland. Planned offshore projects total 2,200 MW.

The Finnish support scheme has attracted both national and international investors. While Vestas, Nordex, Gamesa, and Siemens dominate the Finnish wind market, a number of other manufacturers also have smaller shares.

Finland has a sliding feed-in premium set at EUR 83.50/MWh (USD 91.7/MWh) for 12 years for new wind power projects. Originally the system was open for 2,500 MW of wind power, but after national elections in 2015 the new government set a November 2017 deadline for granting support to wind power projects. A working group has been formed to draft a new, market-based and technology neutral support scheme for renewables in Finland. The government's goal is to increase the share of emission-free renewable energy to more than 50% in the 2020s. The new scheme, in accordance with EU guidelines, is based on technology neutrality and the order of economic feasibility.

In 2015, the Finnish wind industry employed 2,200 people in project development, installations and O&M; and 2,000-3,000[2] in component manufacturing.

LATEST POLICY DEVELOPMENTS

A new support scheme for renewable energy including wind power is being prepared as a part of the revision of the *Strategy for Energy and Climate*. The work is planned to be finished by the end of 2016.

At government level, there is also a working group studying the simplification of environmental permitting, which will hopefully clarify and simplify the permitting of wind power projects.

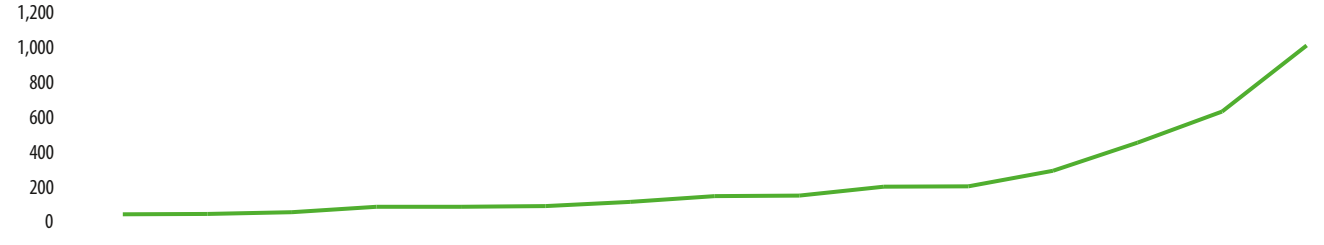
According to surveys conducted by Finnish Energy, 74% of Finns want more electricity to be produced by wind power. The share has declined in recent years (from 81% in 2014), but wind power still remains the next most popular option after solar. Wind power gets a lot of media attention despite its modest share in the energy mix. Wind power is still a new phenomenon in Finland, and small but vocal opponent groups play a role.

KEY BARRIERS TO WIND ENERGY DEVELOPMENT

The 2015 elections brought uncertainty to the Finnish wind market. At present, the key priority for the industry is the future support scheme. The new scheme will take effect in 2018 at the earliest.

It has been clear that in order to keep Finnish wind power sector growing, a new, more market-based support mechanism is needed for when the current FIT quota is filled. With a changed environment after freshly made plans to cut the quota, the need for a new mechanism is even more urgent. Finland has enjoyed a reputation as a

TOTAL INSTALLED CAPACITY



year	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
MW	39	41	51	82	82	86	110	143	146	197	199	288	449	627	1,001

Source: GWEC

© Vastavalo, Raimo Rosholm

stable investment environment but that good reputation will be jeopardized if politicians are unable to create better conditions for investing in Finland.

OUTLOOK FOR 2016 AND BEYOND

Finland has the potential to increase wind power capacity considerably. The Finnish wind industry expects to install 400-500 MW of wind power in the course of 2016, and a further 400-700 MW in 2017.

The lion's share of Finland's wind power potential is onshore. However, Finland has excellent offshore wind conditions and an investment decision was recently announced by Suomen Hyötytuuli Oy (SHO) that it would proceed with its 40 MW Tahkoluoto offshore wind project. The project is located in the Gulf of Bothnia, in the north of the Baltic Sea west of Finland, and will benefit from a feed-in premium. The project has also received 20 million euro (USD 22 mn) grant as a demonstration subsidy from the government to support research on offshore arctic conditions which will be conducted in course of the project. The research will contribute to a growing pool of cold-climate wind-power technology research conducted by leading Finnish institutes.

Much of this research, including advanced testing of wind drag, as well as materials and techniques to circumvent potential dangers relating to cold climate operation, has been carried out by the Lappeenranta University of Technology and the VTT Technical Research Centre of Finland. The Tahkoluoto project will comprise ten 4 MW Siemens SWT-4.0-130 turbines. The project is scheduled for commissioning in the third quarter of 2017.

With input from the Finnish Wind Power Association

1 *http://www.tuulivoimayhdistys.fi/en/wind-power-in-finland/industrial-wind-power-in-finland/industrial-wind-power-in-finland*
2 In 2014

France continued with solid wind development in 2015, adding 1,073 MW of new capacity, bringing the country's total to 10,358 MW. Overall, wind power supplied 4% of national electricity consumption. While annual capacity additions have been stable for several years, an increase is expected in the short term due to simplification of regulatory procedures adopted during the past two years.

FRANCE

MAIN MARKET DEVELOPMENTS IN 2015

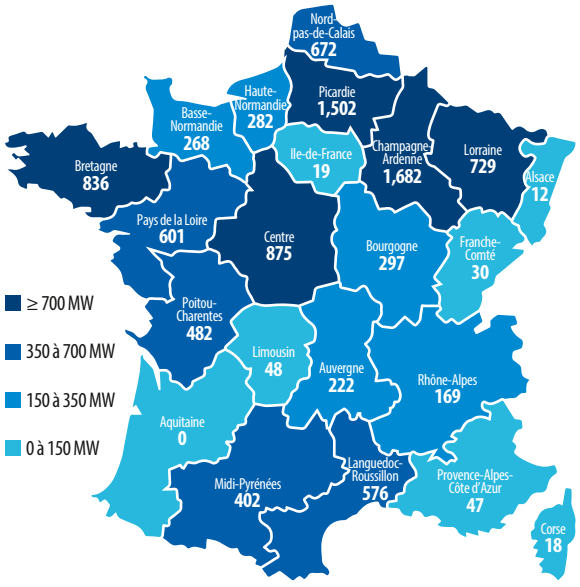
In 2015, the key manufacturers in the French wind energy market were Vestas with 30% of the market, followed by Enercon (22%), Nordex (19%), Senvion (15%) and GE Wind (7%). The top five developers/operators were Engie Group (12%), EDF EN (10%), Boralex (5%), RES (4.6%) and Wind Prospect (4.5%).

While there were no new market entrants in 2015, POMA, an onshore wind turbine manufacturer, announced an investment of EUR 15 million in a factory in France, which is expected to begin production in 2017.

The regions with the most wind development in France in 2015 were Champagne-Ardenne with an installed capacity of 1,682 MW, Picardie with 1,502 MW and Centre with 872 MW. France has a centralised electricity system: 95% of connections to wind farms are covered by ERDF (Distribution System Operator), and the remaining 5% by RTE (Transmission System Operator).

At the end of 2014, the wind industry in France employed 12,520[1] people.

Installed capacity by region in 2015 (MW)



Source: Panorama de l'électricité renouvelables au 30 juin 2015, RTE

2015 IN A NUTSHELL

WIND CAPACITY ADDED
1,073 MW

TOTAL INSTALLED CAPACITY
10,358 MW

NO. OF TURBINES
5,696

ELECTRICITY DEMAND COVERED BY WIND POWER
4%

PEOPLE EMPLOYED BY THE WIND INDUSTRY
12,520 (END 2014)

MAIN TURBINE SUPPLIERS
Vestas, Enercon, Nordex, Senvion, GE Wind

LATEST POLICY DEVELOPMENTS

In August 2015, France adopted the new Energy Transition Law, which lays out a roadmap for transforming France's energy model and defines new objectives for the nation's energy policy. The new law includes a target to reduce greenhouse gas emissions by 40% by 2030 and to get 40% of the country's electricity from renewable energy sources by 2030. This means doubling the share of renewables in the French energy system over the next fifteen years. A new energy plan, the Programmation Pluriannuelle de l'énergie (PPE), which includes targets per sector for the period of 2016-2023, is currently under preparation by the government and expected to be published in May 2016. The plan sets technology specific objectives, which for wind power are likely to be, by 2023:

- Onshore wind power: between 21.8-27 GW
- Offshore wind (bottom-fixed): two new auctions of 0.5-3 GW
- Floating offshore wind/other marine renewables: one new auction of 1 GW

Support framework for wind energy

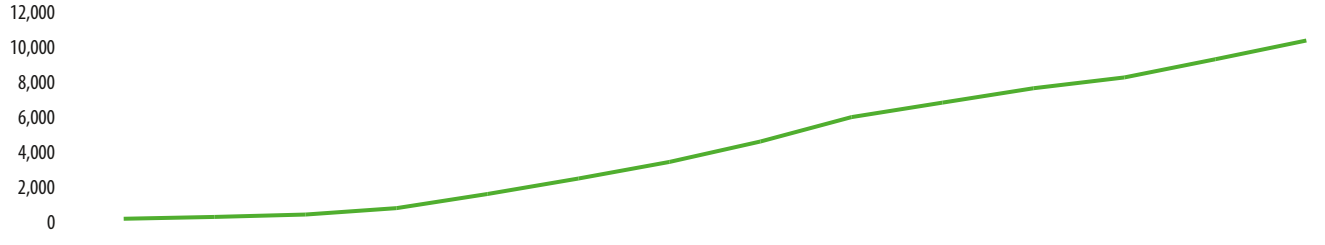
The level of feed-in tariff in France is EUR 8.2 cent/kWh (USD 9.1 cent/kWh) for onshore installations and for offshore installations the level of the tariff is defined by the winning bids of the tender.

OFFSHORE WIND POWER

Six offshore wind farms totalling 3 GW are currently under construction: *from round 1:* Courseulles (500 MW), Fécamp (500 MW), Saint-Nazaire (500 MW) and Saint-Brieuc (500 MW); *from round 2:* Dieppe-Le Tréport (500 MW) and Iles d'Yeu et de Noirmoutier (500 MW). A third tender for offshore wind power is expected to be launched by the end of 2016.

The most important challenges faced by the sector are the need for cost reductions; defining areas for offshore wind

TOTAL INSTALLED CAPACITY



year	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
MW	148	253	390	757	1,711	2,495	3,577	4,713	5,977	6,809	7,613	8,558	9,285	10,358

Source: GWEC

© Enercon Joe Melleran

development due to conflicting interests over maritime areas; and increased competition in the market. A public debate focusing on offshore wind power development in France is likely to be held during the summer of 2016.

The French wind industry has set ambitious goals to reach 12 GW of bottom-fixed and 6 GW of floating offshore wind capacity by 2030.

KEY BARRIERS TO WIND ENERGY DEVELOPMENT

The main obstacles to wind development in France include:

- Delays and increased costs for grid connection
- Constraints linked to radar and aviation; and for installations close to military facilities
- Litigation, with long waiting times for results

OUTLOOK FOR 2016 AND BEYOND

The French industry expects solid growth to continue in 2016 and is looking to install more than 1,000 MW of onshore wind power. Additionally, France has six offshore wind projects under construction, the first of which is expected to come online in 2018. A third tender for offshore wind power is also likely to be published in the course of 2016. Moreover, the results of the tender for floating offshore wind pilot farms is expected to be announced in the course of 2016.

With input from the French Wind Energy Association (FEE)

1 Source: "Observatoire de l'éolien 2015" (Survey conducted by BearingPoint France / FEE)

The German wind market set a new record in 2015, adding 6,013 MW of new wind power to the grid, including more than 2.2 GW of offshore installations. In cumulative terms, Germany ended the year with 44,947 MW, making it the third biggest wind power market globally. This would in a good wind year produce 78 TWh of electricity, enough to cover 12% of Germany's total electricity consumption and to power 20 million households.

GERMANY

MAIN MARKET DEVELOPMENTS IN 2015

Onshore wind power

Although the rate of onshore installations decreased by 19%, Germany had a strong year adding 3,731 MW of onshore capacity in 2015. The number of turbines dismantled accounted for a combined capacity of 195 MW, down 46% from 2014. Meanwhile, repowering accounted for 484 MW in 2015.

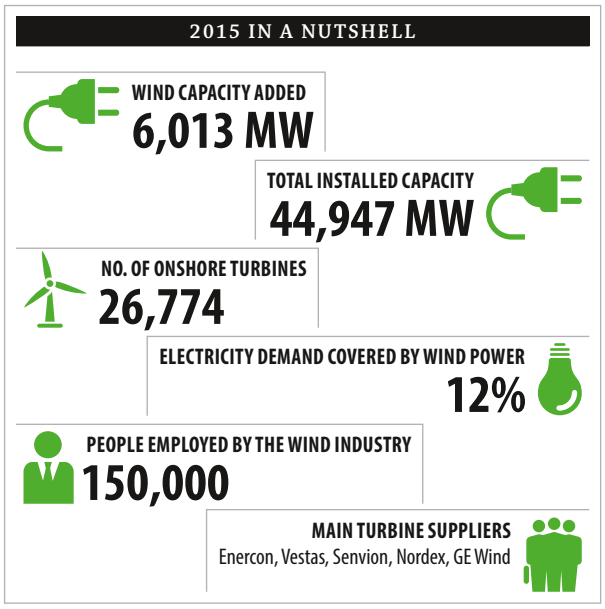
At present, the average cost of electricity from wind power in Germany is 12% cheaper than four years ago. This is mainly due to the progress made with cost-effective and optimized turbine technology as well as current low financing costs. However, both the risk of an interest rate hike, as well as a new rule in the Renewable Energy Act 2014 (EEG, cp. § 24) which suspends remuneration for negative electricity prices, pose potential future risks.

Ranking no. 3 in the global wind markets, German manufacturers remain in an excellent position. Around two-thirds of their 2015 production was destined for export. In 2014, the German onshore wind industry directly and indirectly employed about 130,500[1] people, generated a turnover of 11.8 billion euros (USD 13.1 bn), and contributed to the growth of the domestic industrial base. This position is due to technological leadership and to the strong German domestic market. The main market players in the German onshore wind market in 2015 were Enercon, Vestas, Senvion, Nordex and GE Wind.

Offshore wind power

The German offshore wind industry added a spectacular 2,282 MW of new installations in 2015, demonstrating the capability of the German offshore wind industry and meeting the expectations set at the beginning of the year. However, this was an exceptional result due to problems and delays with the completion of offshore grid connections since 2013 which could only be resolved in 2015.

Germany ended the year with a total of 3,295 MW of offshore wind power. Additionally, installations for a further 41 wind turbines accounting for 246 MW were completed, but not yet grid-connected and another 122 foundations were laid for turbines to be installed in 2016. The industry expects to install about 700 MW in 2016.

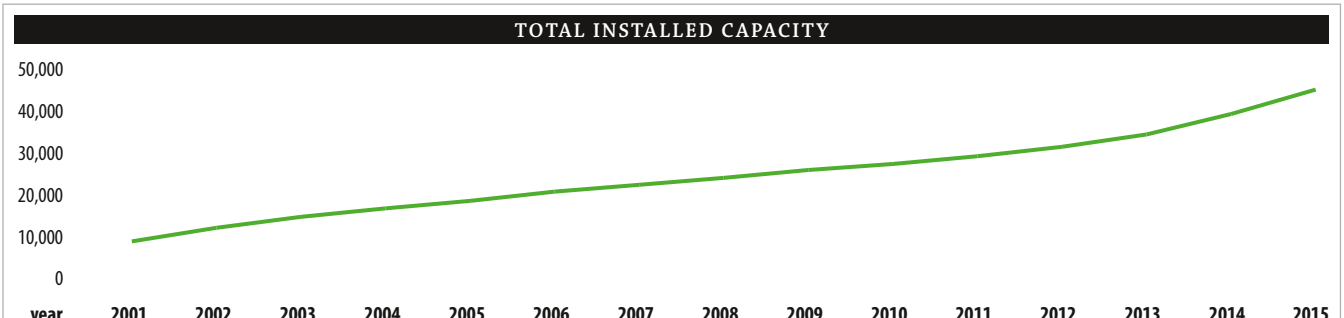


Installed capacity by State in 2015

Rank	State	Gross capacity additions [MW]	Gross additions number WTG	Share of added capacity of gross addition
1	Schleswig-Holstein	888.35	307	23.8%
2	North Rhine-Westphalia	421.65	167	11.3%
3	Lower Saxony	413.30	152	11.1%
4	Brandenburg	398.05	148	10.7%
5	Bavaria	372.40	143	10.0%
6	Saxony-Anhalt	264.45	97	7.1%
7	Hesse	207.70	75	5.6%
8	Rhineland-Palatinate	201.20	72	5.4%
9	Mecklenburg-Western Pomerania	193.05	68	5.2%
10	Baden-Württemberg	144.05	52	3.9%
11	Thuringia	76.55	26	2.1%
12	Saxony	69.05	30	1.9%
13	Saarland	63.85	23	1.7%
14	Hamburg	8.00	4	0.2%
15	Berlin	4.70	2	0.1%
16	Bremen	4.60	2	0.1%
Total		**3,730.95**	**1,368**	**100%**

The new Renewable Energy Sources Act (EEG) 2016 provides the basis for a sustainable domestic offshore wind market. The German Ministry of Economics and Technology (BMWi) have set an intermediate target of 11,000 MW of offshore wind by 2025. This would mean an annual rate of 700 MW, but a continuous annual volume of at least 900 MW from 2021 onwards would be necessary in order to create a basis for further cost reduction; for securing value creation and industrial production in Germany; for enhancing security of supply; and for making a long term, effective contribution to climate protection.

For the industry a reliable and regular installation rate is more important in the long run than one-off records. To achieve such a continuity it is necessary that the Renewable Energy Sources Act (EEG) 2016 and the Offshore Grid Development Plan (O-NEP) 2025 are properly coordinated.



year	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
MW	8,754	11,994	14,609	16,629	18,415	20,579	22,194	23,826	25,673	27,087	29,011	31,210	34,250	39,128	44,947

Source: GWEC

LATEST POLICY DEVELOPMENTS

Support framework for wind energy

The Renewable Energy Sources Act (EEG), which came into force in 2000 and was amended in 2012 and again in 2014, continues to provide stable support for wind energy in Germany. The revision of the Renewable Energy Sources Act in July 2014 focused on three main objectives: to lower costs, to attract a diversity of market players and to meet renewable energy targets. The revised EEG sets new targets for electricity produced by renewable sources with a goal to achieve a 40 to 45% share of renewables by 2025, 55 to 60% by 2035 and a minimum of 80% by 2050.

The revised EEG also included game-changing amendments, adding technology specific targets. The new target for onshore wind is 2,500 MW per year through 2020 and a cumulative target for offshore wind was set at 6,500 MW by 2020. Furthermore, the incentive scheme for wind power was revised in the 2014 amendment of the EEG. Onshore wind power now receives an initial tariff of EUR 8.79 cent/kWh (USD 9.9 cent/kWh) paid for at least five years, followed by a basic tariff of EUR 4.89 cent/kWh (USD 5.5 cent/kWh).

A new revision of the EEG is currently under preparation at the German Ministry for Economic Affairs and Energy, and is expected to take effect on 1 January 2017. The biggest change is the government's plan to introduce auctions for renewables. The wind industry is concerned about growing uncertainty generated by the planned EEG amendment. For manufacturers, quantity control by means of tendering is in principle suitable for organising further competitive expansion. However, while the draft version of the EEG 2016 includes good suggestions for securing leadership in innovation, successful exports and industrial production in Germany, it introduces a cap for annual volumes of renewable energy growth by controlling the tendering volumes for onshore wind energy and by setting an inflexible 45% renewables target for the electricity sector.

According to the draft EEG2016, onshore wind development would be managed by means of set annual volumes. This forces the industry into a low growth path which would threaten Germany's position as a hub for the technology. The industry calls for a stabilised growth path for a period of ten years. It expects the government to orient itself on the expansion path contained in the EEG 2014. It also makes sense to adjust the objectives of the EEG 2016 with the Climate Protection Plan 2050, so that both plans would contribute to achieving both the goals of the energy sector and climate protection.

KEY BARRIERS TO WIND ENERGY DEVELOPMENT

One of the key challenges for expanding the wind energy development in Germany is system optimisation and grid expansion, in particular regarding offshore wind. Over the past years, however, administrative barriers and regulatory uncertainty have also become issues. Technical and environmental issues, such as radar, rare species, height restrictions, and turbine distance from housing have delayed or brought projects to a standstill. Moreover, long planning procedures (3 to 5 years) along with the unclear situation regarding the design of the future support mechanism cause uncertainty and unpredictability in the market. Additionally, transport and logistics are becoming a more serious barrier for onshore wind development due to lack of sufficient infrastructure investment and staff.

OUTLOOK FOR 2016 AND BEYOND

The domestic onshore wind market has been very stable in the past few years and that is expected to continue. In 2016, the German wind industry expects a decline in installations to a level of about 3,000-3,300 MW. For the offshore wind industry, about 700 MW is expected to be connected to the grid in 2016. The outlook for 2017 will much depend on the timing and design of the new tendering system.

With input from the German Wind Energy Association (BWE) and VDMA Power Systems

1 Source: The German Federal Ministry for Economic Affairs and Energy 2014

OFFSHORE WIND

2015 was a huge year for offshore wind installations. New capacity additions totalled nearly 3.4 GW across five markets globally. This brought total offshore wind installed capacity to over 12 GW.

At the end of 2015, more than 91% (11,034 MW) of all offshore wind installations were located in waters off the coast of eleven European countries. The remaining 9% of the installed capacity is located largely in China, followed by Japan and South Korea.

Globally the UK is the largest offshore wind market today and accounts for over 40% of installed capacity, followed by Germany in the second spot with 27%. Denmark accounts for 10.5%, Belgium for almost 6%, Netherlands 3.5% and Sweden 1.6%. Other European markets including Finland, Ireland, Norway, Spain and Portugal make up about 0.5% of the market. The largest market outside of European waters is China, which accounts for approximately 8.4% of the global market in the sector.

However, governments outside of Europe are setting ambitious targets for offshore wind, and development is starting to take off in some of these markets. Japan and South Korea have put actual turbines in the water. The US saw the first commercial project start construction in 2015. The GWEC-led FOWIND consortium is developing an offshore wind roadmap for India.

Relatively higher costs and installation complexity compared to onshore wind are a big challenge for offshore wind development. However, according to a study[1] commissioned by E&Y in 2015, offshore wind costs could be reduced to EUR 90 per MWh (USD 94) by 2030. The report says that the sector will have nearly reduced the LCOE to EUR 100 per MWh by 2020, by which time cumulative installed capacity in European waters is expected to have reached 23.5 GW.

Key cost reduction steps include: deploying larger turbines to increase energy capture (a 9% saving); encouraging greater competition (7%); keeping the volumes up (7%) and tackling supply-chain challenges (3%). The offshore industry is on its way to meeting the goal of getting the LCOE down to EUR 100 per MWh. At present, the average offshore wind turbine size is 4.2 MW in European waters, average water depth 27.1 meters and average distance from shore 43.3 km.

EUROPE CROSSES 11 GW MARK

In 2015, an astounding 3,035 MW of new offshore wind capacity came online in Europe, a 108% increase over the 2014 market. Offshore wind accounted for 24% of total EU wind power installations in 2015, up from 13% share of annual additions in 2014.

Three underlying factors enabled this growth: effective policy, the grid connectivity of large amounts of offshore capacity installed but not grid-connected in 2014, and the industry's rush to complete installations before the German market switches to market-based arrangements in 2017.

Overall 419 new turbines were erected in 2015. Also, for the first time, offshore turbines were decommissioned. A total of 7 turbines in the UK and Sweden were decommissioned, resulting in a net addition of 412 turbines. A total of 14 projects were completed in 2015.

Over 75% of all net capacity brought online was in Germany (2,282.4 MW), a four-fold increase in its grid-connected capacity compared to 2014. This was in large part due to the delay in grid connections finally coming online in 2015.

The remaining installations in the EU took place in just two markets. The second largest market was the UK with 572 MW, and an 18.7% share of total installations. The Netherlands followed with 180 MW, a 5.9% share of the market.

Overall, 3,230 turbines are now installed and grid-connected, bringing the cumulative total to just above 11 GW in Europe, capable of producing 40.6 TWh in a normal wind year.

The UK has the largest amount of installed offshore wind capacity in Europe at over 5 GW, representing almost 46% of all European installations. Germany follows with 3.2 GW with almost 30% of all installations. Denmark stands third with 1.2 GW installed capacity accounting for 11.5% of total European installations. By the end of 2015 Belgium had 712.2 MW with 6.5% market share, the Netherlands had 426.8 MW with 3.9% market share, Sweden had 201.7 MW with 1.8% market share. Finland had 26 MW installed and Ireland had installed 25.2 MW. Spain, Norway and Portugal each have one wind turbine operating offshore.

Siemens is the lead offshore wind turbine supplier in Europe with 63.5% of total installed capacity. MHI Vestas (18.5%) is the second biggest turbine supplier, followed by Senvion (7.4%), Adwen (5.7%), and BARD (3.6%).

In terms of the total number of wind turbines connected to the grid at the end of 2015, Siemens remains the top supplier with 2,059 turbines, accounting for 63.6% of the market.

MHI Vestas has 750 grid-connected turbines representing 23.2% of the total, followed by Senvion (140 turbines, 4.3%), Adwen (127 turbines, 3.9%), BARD (80 turbines, 2.5%), WinWind (18 turbines, 0.6%), and GE Renewable Energy with 15 turbines (0.5%).

Number of wind farms, turbines and MW fully connected to the grid in Europe (2015)

Country	Belgium	Germany	Denmark	Spain	Finland	Ireland	Netherlands	Norway	Portugal	Sweden	UK	Total
No. of farms	5	18	12	1	2	1	6	1	1	5	27	**80**
No. of turbines	182	792	513	1	9	7	184	1	1	86	1,454	**3,230**
Capacity installed (MW)	712.2	3294.6	1,271.3	5	26.3	25.2	426.8	2.3	2	201.7	5,066.5	**11,034**

Source: EWEA, 2016; Rounding and decommissioning of 16 MW affect the sums

1 Offshore Wind in Europe: Walking the Tightrope to Success, Ernst & Young, 2015.

Stiftung OFFSHORE-WINDENERGIE © Jan Oelker

2015 also marked a significant year for offshore wind financing. Ten projects worth EUR 13.3 billion (USD 15 bn) in total reached final investment decision in 2015, compared to EUR 6.5 bn (USD 7.3 bn) in 2014. In total, 3 GW of new capacity were financed across four countries, 66% of which was in the UK.

Total investments in offshore wind in 2015 were more than EUR 18 bn (USD 20.3 bn); this includes investments in construction of offshore wind projects, transmission assets and refinancing. This makes 2015 a record year in terms of total committed funds.

An estimated financing of EUR 11 billion (USD 12.4 bn) will be needed for just over 3 GW of new capacity in 2016. Several transactions are already under appraisal or expected to go through final investment decision in 2016.

Projects under appraisal include the Otary Rentel (294 MW) wind farm, Hornsea Phase 1 (1,200 MW), Hohe See (492 MW), Dudgeon (402 MW), Beatrice (664 MW), and the refinancing of Luchterduinen (129 MW).

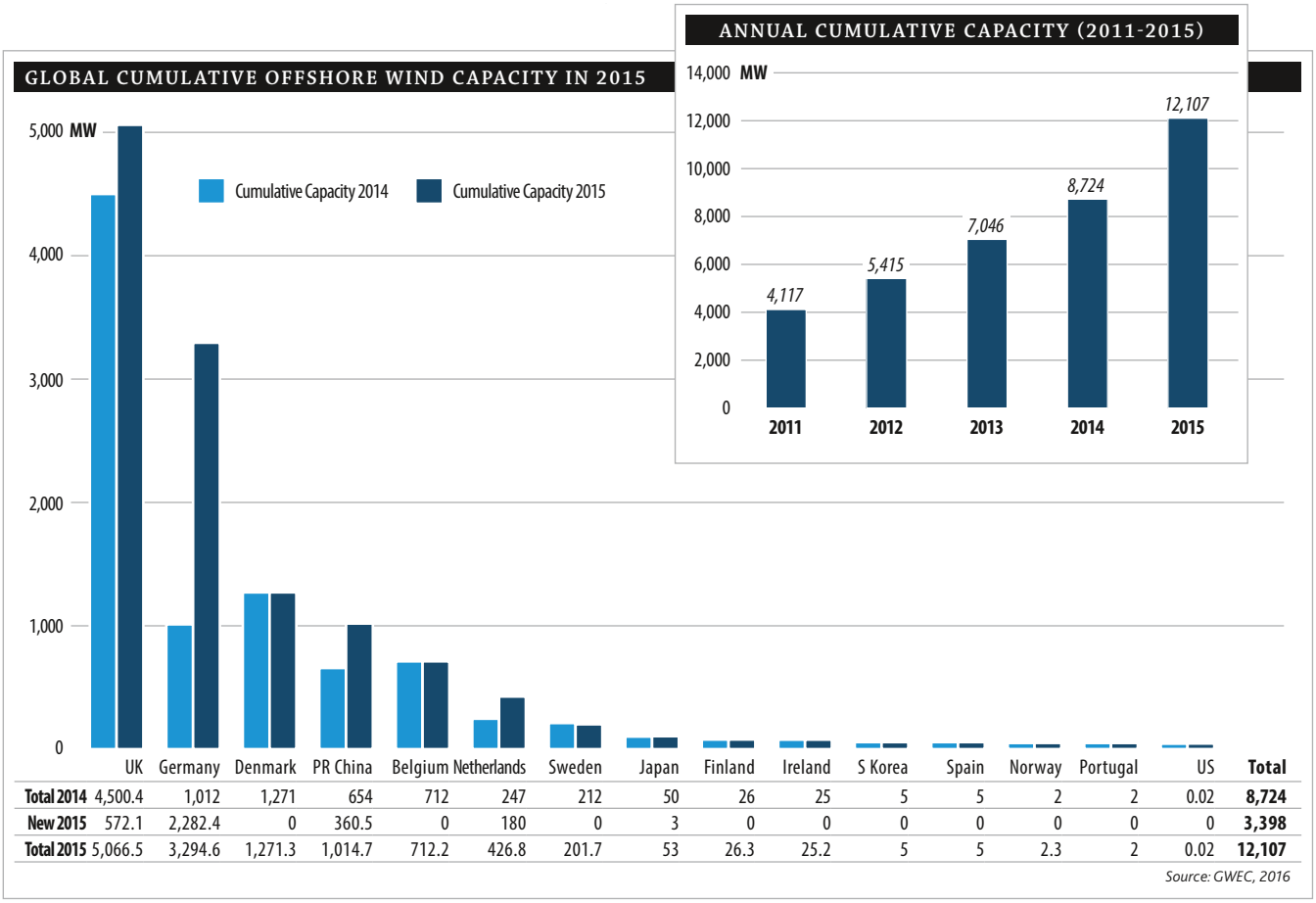
Additionally, reduced risk perception for offshore wind projects has led to the emergence of project bonds as a means of financing. For the first time in 2015, EUR 1.5 bn (USD 1.7 bn) was raised through project bonds for the construction and refinancing of offshore wind farms.

UK remains largest global market

The UK has the highest share of consented offshore wind capacity today. It continued to lead the world's offshore industry in terms of cumulative installations in 2015.

Out of the 22 offshore wind farms where work was carried out in Europe last year, five were in the UK. At four offshore wind sites – Gwynt y Môr, Westernmost Rough, Humber Gateway and Kentish Flats 2 Extension –153 turbines were connected in 2015, for a total annual market of 572 MW. At one offshore wind farm – Robin Rigg – two turbines of 3 MW each were decommissioned.

At the time of writing over 4 GW of projects are fully contracted and will be delivered over the next four years, with a further 1 GW anticipated to reach financial close within weeks.



	UK	Germany	Denmark	PR China	Belgium	Netherlands	Sweden	Japan	Finland	Ireland	S Korea	Spain	Norway	Portugal	US	Total
Total 2014	4,500.4	1,012	1,271	654	712	247	212	50	26	25	5	5	2	2	0.02	**8,724**
New 2015	572.1	2,282.4	0	360.5	0	180	0	3	0	0	0	0	0	0	0	**3,398**
Total 2015	5,066.5	3,294.6	1,271.3	1,014.7	712.2	426.8	201.7	53	26.3	25.2	5	5	2.3	2	0.02	**12,107**

Source: GWEC, 2016

In November 2015, Amber Rudd, UK's Minister for Climate and Energy stated that based on current plans the country expects to see 10 GW of offshore wind installed by 2020. However, this is linked to the industry meeting its obligation of bringing offshore costs to under GBP 100 (EUR 125) per MWh by 2020. The UK industry is well on its way to meeting this condition. The Minister further said that the government will make funding available for three auctions and intends to hold the first of these auctions by the end of 2016[2].

Germany had an exceptional year

The offshore wind industry in Germany had a record year. A total of 546 offshore wind turbines came online bringing offshore capacity in Germany up to 2,282 MW. Over 75% of all net capacity brought online in Europe was in Germany, a four-fold increase in its grid-connected capacity compared to 2014. Cumulatively, Germany accounts for about 30% of the offshore capacity installed in Europe.

The German offshore wind market had surpassed the one-gigawatt mark in 2014, more than doubling both 2013's annual market and the country's cumulative offshore capacity. At the end of 2015, Germany accounted for almost 26% of all consented projects in Europe. Sites in Germany are an average of 52.6 km from shore. 792 offshore turbines were connected to the grid by 31 December 2015, with a combined capacity of 3,295 MW.

In 2015 Germany saw 41 wind turbines with a total capacity of 246 MW fully erected, but not yet connected to the grid. 122 foundations were constructed offshore in 2015 for wind turbines to be installed in 2016.

According to the working group AG Energiebilanzen, offshore wind power produced over 8 TWh of electricity in 2015. This was enough to cover the power consumption of over 2 million households or around 1.4% of the gross electricity generation in Germany that year[3].

In 2016, the German government is expected to adopt a revision to the Renewable Energy Sources Act (EEG), which will lay the foundations for a stable domestic market. The German offshore sector under the EEG 2016 will see an intermediate expansion target of 11 GW by 2025. This will limit the annual market to approximately 700 MW over the next 10 years.

The industry considers reliable, continuous expansion more important in the long term than any one-off records. To achieve such continuity it is necessary that the Renewable Energy Sources Act (EEG) 2016 and the Offshore Grid Development Plan (O-NEP) 2025 are properly coordinated. The industry has asked for the annual market to be at least 900 MW so as to be able to achieve economies-of-scale and long-term certainty

2 https://www.gov.uk/government/speeches/amber-rudds-speech-on-a-new-direction-for-uk-energy-policy
3 https://www.wind-energie.de/en/press/press-releases/2016/offshore-wind-energy-germany-figures-2015-record-achieved-due-catch

for investing in further cost-reductions. It is expected that Germany will add approximately 700 MW of new offshore capacity in 2016.

Netherlands: Fourth largest market in 2015

In 2015, Netherlands added 180 MW of offshore capacity, installing 60 turbines, which make it the world's sixth largest offshore market. Netherland's total installed capacity reached 427 MW by the end of last year.

The Netherlands has a 15% renewable energy goal out to 2020. It has a plan to expand the country's offshore wind power capacity by 3.5 GW by 2023.

In March 2016, the Dutch Senate approved a law that will allow the government to move ahead with an offshore wind tender. This amendment to the Dutch Electricity Act allows transmission operator TenneT to start construction of grid infrastructure required for the new wind farms off the country's coast and at Borssele (Zeeland). This amendment also clarifies for wind farm developers the damage liability from delays and disruption to the grid.

A key challenge for the sector is to ensure a smooth running of the planned tenders for offshore wind energy. The first tender is expected to be held during spring 2016, a second one before the end of the year, and a further 1,400 MW are planned to be auctioned in the Borssele area.

The industry has also a goal to reduce costs by 40% over the next five years. Over the longer term, the Dutch North Sea has huge potential to further develop large scale wind after the 2023 targets have been achieved; to start with the already designated area of *IJmuiden Ver* could accommodate 6,000 MW of offshore wind power.

France gearing up to deliver

Six offshore wind farms totalling 3 GW are currently under construction in France. *From Round 1* projects: Courseulles (500 MW), Fécamp (500 MW), Saint-Nazaire (500 MW), Saint-Brieuc (500 MW); and from *Round 2 projects:* Dieppe-Le Tréport (500 MW) and Iles d'Yeu et de Noirmoutier (500 MW). The industry expects the third tender for offshore wind power to be launched by the end of 2016.

The key challenges faced by the sector are the need for cost reductions, defining areas for offshore wind development due to conflicting interests over maritime areas and increased competition in the market. A public debate focusing on offshore wind power development in France is likely to be held during the summer of 2016. The French wind industry has set ambitious goals to reach 12 GW of bottom-fixed and 6 GW of floating offshore wind capacity by 2030.

CHINA CROSSES THE 1 GW MARK

By the end of 2015, China added 360.5 MW of new offshore capacity. This was a 57% increase over last year. At the end of 2015 cumulative installed capacity reached 1,014.68 MW, making China the 4th largest market globally.

China's Offshore Installations 2007-2015

Year	New Installed Capacity (MW)	Cumulative Installed Capacity (MW)
2007	1.5	
2009	14.0	15.5
2010	135.5	151
2011	109.58	260.58
2012	127.0	387.58
2013	39.0	426.58
2014	227.6	654.18
2015	360.5	1,014.68

The new offshore projects are spread across sites along the coasts of Guangdong, Fujian and Jiangsu provinces. The majority of Chinese offshore projects are installed in the shallow waters close to shore, called *inter-tidal* projects, where the sites dry out (or nearly so) at low tide. Most of the projects in deeper waters, such as those granted under the first round of tenders, are either still in development or have just started construction. See details of the newly added offshore projects in the table below. Most of these projects are inter-tidal.

In China, offshore development is accelerating slowly and is expected to pick up steam this year. An ever increasing number of developers are 'testing the waters' with inter-tidal offshore projects.

However, the major bottleneck for large-scale offshore development is the low FIT. This is currently set as RMB 0.85/kWh (EUR 0.12/USD 0.13) for 'near-shore' offshore projects and RMB 0.75/kWh (EUR 0.10/USD 0.12) for inter-tidal projects.

Offshore wind projects in China at the end of 2015

Province	Project Name	Developer	Manufacturer	Installation (MW)
Fujian	Long Yuan Nanri Island 4.0	Long Yuan	Shanghai Electric	12
	Ping Haiwan Wind Farm	Zhong Min	XEMC	50
Guang Dong	Huaneng Zhejiang Haimen	Huaneng	Dongfang	1.5
Jiang Su	Jiangsu Dafeng	Tianrun Goldwind	Goldwind	3
	Jiangsu Dafeng	Tianrun (Goldwind)	Goldwind	6
	Longyuan Rudong 4.0	Longyuan	Shanghai Electric	100
	Three Gorges 4.0	Three Gorges	Shanghai Electric	32
	CPIBinhai	China Energy Investment	Shanghai Electric	20
	CGN Rudong 4.0	China Guangdong Nuclear	Shanghai Electric	56
	Sinohydro Rudong 2.5	Sinohydro	Shanghai Electric	80
Total (MW)				**360.5**

Choshi © NEDO / Tepco / MHI

For projects to get this tariff there is a cut-off date of 2017. This is complicating matters and also making it difficult for some developers to make a decision given the uncertain course of the FIT.

Another bottleneck is the difficulty in getting all the necessary licenses, as the offshore projects are controlled by multiple government agencies. In some cases, the EIA has been particularly difficult to conduct and finish.

China's offshore wind progress will continue but at a much slower pace than the onshore growth. Local developers are seeking to gain experience and expertise in this sector. Major changes to this market are expected after 2017, when the existing tariff is set to expire and a new FIT for offshore will kick in.

DOMESTIC INDUSTRY MOVES JAPAN FORWARD

By the end of 2015 Japan had 53 MW of offshore wind power, including two 2 MW floating wind turbines. A Siemens semi-offshore 3MW wind turbine was installed at the Eurus Akita port in 2015. The Japanese government fixed the FIT at JPY 36/kWh (EUR 28/USD 33) for offshore wind power in March 2014. The offshore FIT is 1.6 times higher than the onshore tariff (JPY 22/kWh), which improves investment confidence in the sector.

12 MW of floating offshore turbines will start to operate in 2016. Several projects are expected to start construction within a couple of years; Kashima Port Project1-Phase1 will be the first. Overall there are 1,407 MW of offshore wind power projects currently under planning.

Offshore wind power in Japan at the end of 2015

Type	Location		Distance (km)	Depth (m)	Rated (MW)	No. of WTG	Total (MW)	Start operation
Fixed	Hokkaido	Setana Port	0.7	13	0.6	2	1.2	Dec.2003
	Akita	Akita Port	0.1	-	3.0	1	3.0	Feb.2015
	Yamagata	Sakata port	0.05	4	2.0	5	10.0	Jan.2004
	Ibaragi	Kamisu	0.04	4	2.0	7	14.0	Feb.2010
			~0.05	4	2.0	8	16.0	Feb.2013
	Chiba	Choshi*	3.1	12	2.4	1	2.4	Mar.2013
	Fukuoka	KitaKyusyu*	1.4	14	2.0	1	2.0	Jun.2013
Floating	Nagasaki	Kabashima*	1.0	100	2.0	1	2.0	Oct.2013
	Fukushima	Iwaki city	20	120	2.0	1	2.0	Dec.2013
		Naraha*			7.0	(1)	(+12.0)	2016
					5.0	(1)		2016
*National projects: Under commissioning/construction			**Total**			**27**	**52.6**	

Offshore wind projects in the pipeline in Japan

Type	Location		Area	WTG size	No.of WTGs	Total (MW)	Start Operation
Fixed	Hokkaido	Wakkanai port	Port			10	
		Ishikari new port	Port	2.5MW	40	100	2020
	Aomori	Mutsuogawara port	Port	2.0MW	40	80	
	Akita	Noshiro port	Port	5.0MW	16	80	2021
		Akita port	Port	5.0MW	13	65	~2022
	Yamagata	Sakata port	Port			15	
	Ibaragi	Kashima port1, 1st	Port	5.0MW	20	100	
		Kashima port1, 2nd	Port	5.0MW	5	25	~2017
		Kashima port2	Port	5.0MW	25	125	
	Fukuoka	Kitakyusyu port	Port			200**	
		Kitakyusyu	Gen.			300**	
	Niigata	Iwafune, Murakami	Gen.	5.0MW	44	220	2025
	Yamaguchi	Yasuoka, Shimonoseki	Gen.	4.0MW	15	60	
Floating	Fukushima	Iwaki city	Gen.	7.0MW	1	7	2016
		Naraha*		5.0MW	1	5	~2016
	Fukuoka	Kitakyushyu*	Gen.		2	7.5	2017~
		No data*	Gen.		2	7.5	
Test Field	Niigata	Awashima	Gen.				
	Nagasaki	Kabashima	Gen.				
		Total				**1,407**	

** National projects* *** Estimated by JWPA* **** 3GW is offered at Akita Farm offshore by NGO, in addition to the details listed here*

Currently there is no law or regulation for offshore wind power development in Japan for undesignated areas. A marine area in Japan is categorized into two kinds, either as a *Port associated area* or as a *General common sea area*. The former is controlled by port authorities, therefore the entity from whom official permissions are needed is clear. Unfortunately, there is no law or regulation for the latter area. Hence, there is a significant business risk for projects planned under the *General common sea area* at present.

All of the four projects installed up until 2013 were government-led investments and were mainly developed for testing different technologies. 2014 saw commercial development begin and bring a positive change echoing the introduction of the offshore FIT.

Ten commercial projects with a total capacity of 800 MW are being considered for the *Port associated area* and three projects with 580 MW are being considered for the *General common sea area*.

As for national projects, the Japanese Ministry of Environment (MOE) is conducting a *Floating Offshore Wind Turbine Demonstration Project* (GOTO FOWT) at Kabashima in the Goto islands in the Nagasaki prefecture. A Hitachi 2 MW downwind rotor wind turbine on the spar type floater has been in operation since October 2013. The electricity produced by this wind turbine was used for producing hydrogen in 2015. This turbine will soon be moved from Kabashima to Fukue Island, which has a bigger population and electricity demand.

As for METI's FukushimaFORWARD project, the second floating offshore turbine (7 MW) was anchored in August 2015 and is expected to be commissioned soon. The third floating offshore turbine (5 MW) is being manufactured at Hitachi's factory. This will be installed on the Japan Marine United Corporation's (JMU) advanced spar type floater and will start operation in 2016. A total of 3 floating turbines with 12 MW capacity will start operation in 2016.

Japan's New Energy and Industrial Technology Development Organization (NEDO) started a feasibility study for a new advanced floating offshore wind power demonstration project in 2015. Two groups are nominated as potential candidates. Each group will try to develop 2 floating offshore wind turbines within the rated capacity of 7.5 MW in total with the intention to achieve cost reduction compared to the former projects. The long coast line and high cost for onshore development, makes offshore wind an attractive option for the Japanese wind industry.

UPCOMING MARKETS

US set to deliver the first commercial project

No offshore wind capacity is installed in the United States, with the exception of the University of Maine's 0.02 MW VolturnUS floating turbine project. The first wind farm will be commissioned 3 miles off the coast of Block Island, Rhode Island.

Construction began on the 30 MW, USD 290 million (EUR 255 mn) project in early 2015 and Deepwater Wind, the developer responsible for building the farm, says it's on track to be generating power by the fourth quarter of 2016. A construction milestone was celebrated in July 2015 when five steel foundation jackets and deck platforms were placed in the water.

According to the company's website, the five-turbine farm will connect Block Island to the mainland for the first time with an underground cable and is expected to supply power to 17,200 Rhode Island homes by generating approximately 125,000 MWh per year[4]. Block Island will receive about 90% of its energy needs from this project. Whenever the wind farm is under maintenance or not producing enough power, the mainland grid will

4 http://dwwind.com/project/block-island-wind-farm/

serve the island. Diesel power is the current source of the island's energy.

The National Renewable Energy Laboratory (NREL) estimates that the US has 4,200 GW of developable offshore wind potential, compared to its estimate of 11,000 GW of onshore wind potential. Wind resources are classified on a scale of zero to seven based on their power density, and more than 66% of offshore wind in the United States is in wind power class six or seven.

Developers have proposed building nearly 4.9 GW of offshore wind capacity off the coasts of nine different states mostly along the northeast coast. But some challenges remain even for projects that have progressed through key regulatory and market milestones.

Demonstration projects supported by the US Department of Energy – the Virginia Offshore Wind Technology Advancement (VOWTAP[5]) Project, Fisherman's Energy Wind[6] of New Jersey and WindFloat of Oregon – face development hurdles despite making significant progress in project development.

Each of these projects received USD 4 million (EUR 3.5 mn) in design and planning support. Eventually these three projects were to get as much as USD 47 million (EUR 41 mn) each to help fund construction. The goal was to have the projects up and running in 2017, but both Fishermen's Energy and WindFloat (semi-submersible) – are facing serious challenges[7].

Fishermen's Energy's proposal has a two-phase approach, the first phase a 25 MW project in New Jersey State Waters followed by a 330 MW utility scale project in Federal Waters, for the second phase.

In March 2016, the New Jersey legislature passed a second bill[8] that requires the Board of Utilities to re-open an application window for a 20-25 MW offshore wind project in state waters, a move aimed at providing Fishermen's Energy a final chance to win regulatory approval. The NJ Board of Utilities (BU) has twice rejected Fishermen's fully permitted 24 MW, USD 220 million (EUR 194 mn) project on grounds that it fails to provide the state with sufficient economic and environmental benefits to qualify for Offshore Renewable Energy Certificates[9] (ORECs).

Further the BU disagreed with the developer's proposed OREC price of USD 199.17 per MWh, as this was contingent on Fishermen's Energy receiving about USD 100 million in federal subsidies that it did not have fully in hand last year[10]. In a renewed effort to address these concerns, the project developer switched from XEMC to Siemens turbines, while pledging to utilize traditional project financing along with proven technology[11].

On the other end the US Department of Interior's Bureau of Ocean Energy Management (BOEM) is in charge of the permitting process for offshore projects including planning, leasing, site assessment, construction and operations. It has executed individual lease sales in a number of states including Rhode Island and Massachusetts (2013), Virginia (2013), Maryland (2014), Massachusetts-2 (2015) and New Jersey (2016)[12].

The US will see its first commercial offshore project come online in 2016. The path forward will be challenging, and will be linked to the outcome of the upcoming Presidential election results as well. The level of federal support for offshore wind could come under scrutiny under a new Administration.

India sets the ball rolling

The Indian Ministry of New and Renewable Energy (MNRE) has initiated discussions on promoting a demonstration project in India. In October 2015, it announced *India's Offshore Wind Policy*. The National Institute for Wind Energy (NIWE) is the nodal agency for implementing the policy and creating the necessary ecosystem for the sector.

Facilitating Offshore Wind in India[13] (FOWIND) is a European Union supported four-year project. A GWEC led consortium is implementing this project in Gujarat and Tamil Nadu. NIWE is the knowledge partner for the project in India. FOWIND will undertake the first offshore wind resource measurement in the Gulf of Khambat, off the coast of Gujarat in 2016. FOWIND works in close consultation with the MNRE and state government agencies to establish a roadmap for offshore wind power development in India.

The Offshore Wind Policy outlines an international competitive bidding mechanism for the sector. The first tender is likely to be announced in late 2018.

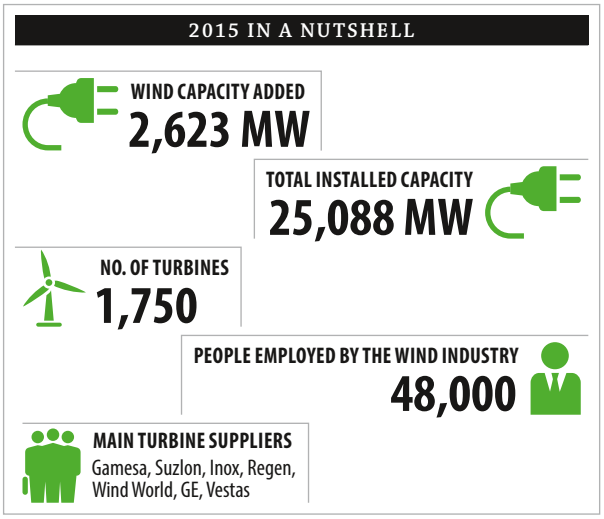
5 Dominion Power's VOWTAP project include the National Renewable Energy Laboratory; General Electric, which will supply the Alstom-designed turbines; KBR, a global engineering, construction and services firm; Keystone Engineering, the substructure designer; Newport News Shipbuilding, and the Virginia Tech Advanced Research Institute.
6 http://www.fishermensenergy.com/offshore-new-jersey.php
7 http://breakingenergy.com/2015/06/25/oregon-offshore-wind-projects-troubles-leave-the-doe-0-for-3-so-far/
8 The General Assembly voted 53-21 in favour of S988, which the state Senate passed last month. S988 calls for the new application window to be opened within 60 days following enactment of the bill into law. The bill will move to Governor Chris Christie, who allowed the first similar legislation to die earlier this year by declining to sign it. At the time of writing it remains to be seen if he will sign or veto S988. http://www.fishermensenergy.com/pdf/2016/03/letter-to-gov-christie.pdf
9 Electric utilities would be required to purchase ORECs - a revenue guarantee mechanism that would allow developers to finance offshore wind projects. Their developers would obtain one OREC per MWh at a price set by the BU.
10 http://www.rechargenews.com/wind/1427269/nj-legislature-passes-new-bill-to-help-fishermens-wind-pilot
11 http://www.njspotlight.com/stories/15/10/14/its-day-in-court-over-fishermen-s-energy-revamps-offshore-wind-proposal/
12 http://www.boem.gov/Lease-and-Grant-Information/
13 http://www.fowind.in

India continued to be the fifth largest annual market globally, adding 2,623 MW of new wind power to reach a total of 25,088 MW, garnering a 5.8% share of the global market in 2015, and passed Spain to move into fourth place in the cumulative global rankings.

Wind power accounted for over 8.7% of the total installed capacity in the country[1], and almost two-thirds of the renewables installed capacity.

In February 2015, India committed to installing 60 GW of wind and 100 GW of solar by 2022. Further, India made a commitment at COP21 to raise the share of non-fossil-fuel power capacity in the country's power mix to 40% by 2030.

India was also among the top ten countries in terms of renewable energy investment, which rose to USD 10.2 billion (EUR 8.9 bn[2])[3].



INDIA

MAIN MARKET DEVELOPMENTS IN 2015

In 2015, the majority of wind farms were built in the States of Rajasthan, Madhya Pradesh, Maharashtra and Andhra Pradesh. These projects were built by large IPPs such as Renew Power, Hero Future, Continuum, Orange, Mytrah, Oriental Green Power and others.

During 2015 wind power grew at a moderate pace. Wind power producers opted for the tax-based AD incentive (80% depreciation in the first year of installation) or the GBI of INR 0.5/kWh for at least four years and up to ten years.

To address grid integration challenges, the government initiated the Green Corridor programme. The objective is to improve linkage between India's regional (southern) grids with its national grid. This will facilitate interstate transmission.

The main turbine suppliers in India last year were Gamesa, Suzlon, Inox, Regen and Wind World. LM Wind set up its second blade factory in Vadodra, Gujarat. Senvion, an established European player, started up its operations in India last year.

Support framework for wind energy

28 states and union territories have defined a Renewable Purchase Obligation (RPO) for renewables. However, the renewable energy certificate (REC) framework linked to the RPO, which was introduced for inter-state purchase and sale of renewables-based power, has not been a success. This is largely due to non-compliance and weak enforcement of the RPO by the states and market regulators.

Wind power producers can either opt for preferential tariffs decided by the state regulator ranging from INR 3.50-5.91/kWh (EUR 0.05-0.08) or get tradable RECs [minimum price: INR 1,500/MWh, EUR 19.8/MWh; maximum price: INR 3,300/MWh, EUR 43.7/MWh] along with wind power bought at the Average Power Purchase Cost (APPC) by the Utility at approximately INR 3.4/ kWh[4] (EUR 0.05) for the FY 2015-16.

LATEST POLICY DEVELOPMENTS

- A National Wind Mission (NWM) comprising targeted developments in onshore and offshore wind power was circulated in draft for stakeholder consultation.
- The Offshore Wind Policy was published.
- The tax on coal for the National Clean Energy Fund (NCEF) doubled to INR 400 (EUR 5.3) per tonne in the budget for FY 2015-16. The NCEF is used for supporting research and clean energy technology solutions.

The State Electricity Regulatory Commissions determine the tariff for wind projects. However, the Central Electricity Regulatory Commission publishes each year a tariff guideline for the entire country based on wind power density in five zones. The tariff applicable for FY 2015-16 is listed in the table below.

Levelised Tariff for FY 2015-2016

	Levelised Total Tariff (FY 2015-16) (INR / kWh)	**Benefit of AD (If availed)** (INR / kWh)	**Net Levelised Tariff (adjusted for AD benefit, if availed)** (INR / kWh)
Wind Energy			
Wind Zone-1 (CUF 20%)	6.58	0.71	5.87
Wind Zone-2 (CUF 22%)	5.98	0.64	5.34
Wind Zone-3 (CUF 25%)	5.27	0.57	4.70
Wind Zone-4 (CUF 30%)	4.39	0.47	3.92
Wind Zone-5 (CUF 32%)	4.11	0.44	3.67

CUF: Capacity Utilization Factor

TOTAL INSTALLED CAPACITY

year	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
MW	1,456	1,702	2,125	3,000	4,430	6,270	7,845	9,655	10,926	13,065	16,084	18,421	20,150	22,465	25,088

Source: GWEC

KEY BARRIERS TO WIND ENERGY DEVELOPMENT

The high cost of finance remains a challenge. High interest rates (11 to 13%) and limited availability of debt financing are challenges for developers as well as OEMs in the country. Despite the high cost of funds, last year India saw over USD 10 bn [EUR 9.9 bn] worth of investments in the renewables sector.

Most of the state level power sector utilities in India also suffer from poor financial health and are unable to comply with RPOs and so are unwilling to purchase wind power.

The State of Maharashtra has refused to sign any more wind PPAs. Maharashtra passed a new renewable energy policy in July 2015. The policy states that a total of 5 GW of wind energy projects shall be commissioned. Out of that, 1.5 GW will be used to fulfill RPOs of power distribution companies, and the remaining, 3.5 GW capacity of wind projects, can be utilized as open access /captive consumption/REC (renewable energy certificates), etc.

The State Utility (MSEDCL), however, retroactively announced that it would consider capacity additions from 2011 onwards. Between 2011 and July 2015, MSEDCL had signed PPAs for around 1 GW of wind power, which meant it could now accept only 500 MW more.

In practice that has not happened and fully constructed projects of almost 550 MW are still awaiting PPAs. Wind projects with a total capacity of 364 MW were ready in 2014-15 and another 192 MW were completed in 2015-16. Projects of Continuum Wind Energy, Green Infra Wind Energy, Hero Future Energies, ITC, Maharashtra Seamless and Tata Power are at risk[5].

OUTLOOK FOR 2016 AND BEYOND

The government in its latest budget announcement for FY 2016-17 reduced the AD from 80% to 40%. Further, the Generation Based Incentive will come to an end in 2017. These two factors will likely contribute to a rush for installations of wind farms that could result in installations during the Indian fiscal year 2016-2017 of 4,000 MW. The current manufacturing capacity in the country is around 9,500 MW.

With input from Indian Wind Turbine Manufacturers Association (IWTMA)

1 http://www.cea.nic.in/reports/monthly/installedcapacity/2016/installedcapacity-01.pdf
2 Exchange rate used for conversion : 1 USD = 0.88 EUR
3 http://fs-unep-centre.org/sites/default/files/publications/globaltrendsinrenewableenergyinvestment2016lowres0.pdf
4 http://www.cercind.gov.in/2015/orders/SO15.pdf Exchange rate used EUR 1= INR 75.46
5 http://www.ibtimes.co.in/550-mw-wind-power-projects-could-soon-become-non-performing-assets-672366

© FukushimaFORWARD MHI 7MW

JAPAN

MAIN MARKET DEVELOPMENTS IN 2015

Wind power grew at a moderate pace in Japan in 2015, installing 245 MW in 2015 compared to 140 MW in 2014. Cumulative installations crossed the 3 GW mark at the end of 2015.

Offshore wind power capacity reached 52.6 MW with a total of 27 turbines in Japanese waters. In 2015, one Siemens 3MW turbine was installed about 100m off-shore from the Akita port. Japanese wind farms produced 5.268 TWh of electricity last year, which is about 0.5% of electricity supply in 2015.

LATEST POLICY DEVELOPMENTS

Feed-in tariff

The FIT for onshore wind remained steady at JPY 22/kWh (EUR 0.17/USD 0.19) and JPY 36/kWh (EUR 0.28/USD 0.32) for offshore wind projects (excluding semi-offshore), because of limited new installations. Projects can only qualify for the FIT after nearly finishing a very costly and lengthy EIA process.

Very few developers with strong balance sheets can afford to invest with such uncertainty. Consequently, the Japan Wind Power Association (JWPA) has requested the government to move the FIT qualification timelines a little earlier so as to make wind power development bankable. The government has indicated its intention to give longer visibility on the FIT and could also reduce the FIT approval timing to the middle of the EIA process.

2015 IN A NUTSHELL

WIND CAPACITY ADDED
245 MW

TOTAL INSTALLED CAPACITY
3,038 MW

NO. OF TURBINES
2,077

ELECTRICITY DEMAND COVERED BY WIND POWER
0.5%

PEOPLE EMPLOYED BY THE WIND INDUSTRY
5,000

MAIN TURBINE SUPPLIERS
Alstom, Enercon, Siemens, Hitachi

2030 Energy Mix Plan

The Japanese Ministry of Economy, Trade and Industry (METI) announced the latest *2030 Energy Mix Plan* on 16 July 2015 prior to COP21[1].

Electricity Supply Share in 2030

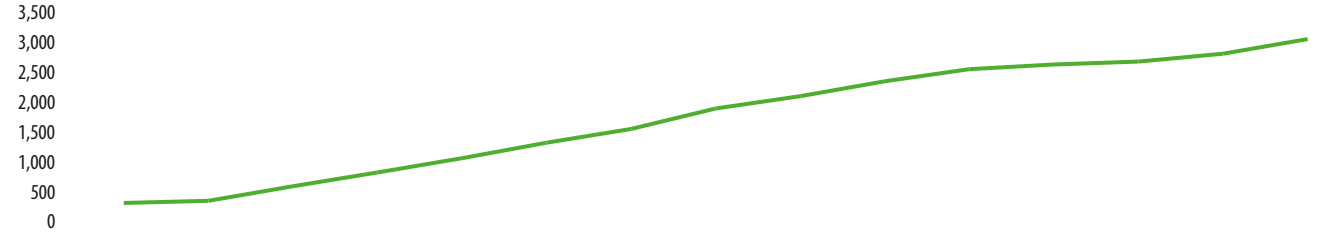
Source	Electricity share	Capacity
Renewables	22-24%	
Large hydro	8.8%	
Photovoltaic	7.0%	65 GW (Solar PV)
Biomass	3.7-4.6%	
Wind	1.7%	10 GW (Wind)
Geothermal	1.0-1.1%	
Nuclear	20-22%	(20 plants)
Natural gas	27%	
Coal	26%	
Oil	3%	

Unfortunately, wind power was allocated just a 1.7% share of the electricity supply in 2030. This would translate to 10 GW of total capacity including 0.82 GW of offshore wind. This means only 7GW of new installations over the coming 15 years.

METI has applied an upper limit to the FIT burden at 3.7-4.0 trillion JPY by 2030. Stable renewables (Geothermal, Hydro and Biomass) got 1.0-1.3 trillion JPY. 65GW of planned solar power capacity accounts for 2.2 trillion JPY share. The remaining share for wind power was 0.5 trillion JPY. This is 10 GW at a FIT price of 22JPY/kWh. The government set higher priority for stable renewables, and as wind power was not included in that category, it is further disadvantaged.

The JWPA believes wind power has a much higher potential in Japan. The 10 GW of wind power in the 2030 Energy Mix Plan is equivalent to merely 5% of the potential in Japan. JWPA published an *Emergency Proposal for Wind Power Mass Introduction* on 17 April 2015[2]. JWPA believes that wind power is the only technology at the moment that can be deployed at scale in the near future at the price being offered.

TOTAL INSTALLED CAPACITY



year	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
MW	303	339	582	812	1,050	1,312	1,563	1,830	2,084	2,334	2,556	2,614	2,663	2,794	3,038

Source: GWEC

New wind turbines developed by Japanese manufacturers

Company	WTG	Rated output	Start operation	Type
MHI	MWT167/7.0	7.0MW	Under commissioning	Hydraulic drive
Hitachi	HTW5.0-126	5,0MW	September 2015	Downwind
	HTW2.0-86	2.0MW	March 2014	Downwind
JSW	J100-3.0	3.0MW	September 2013 (2.7MW)	Gearless PMSG
Toshiba	U88	2.0MW	March 2015	Plasma control

KEY BARRIERS TO WIND ENERGY DEVELOPMENT

JWPA has developed a pathway called *WindVision 2030*[3] to reduce the FIT burden for the government. This report proposes practical steps to achieve higher wind power deployment. The 10 GW cap for wind power in the "2030 Plan" shall be met in the early 2020s. JWPA has proposed a pathway to install 36.2 GW of wind power capacity out to 2030[4].

Key elements for promoting wind power

- To reduce LCOE
- To improve grid infrastructure
- To promote repowering
- To promote offshore wind power
- To establish domestic supply chain

Source: WindVision Report (2016) (see note 3)

Grid restrictions

Local Grid Extension Projects

Hokkaido	Status
Northern Hokkaido Souden Company (Eurus Energy, Eco power, etc.)	On-going
Nippon Souden Company (Softbank • SB Energy, Mitsui Trading Co., Marubeni, etc.)	Suspended
Tohoku	
- Akita Souden Company (Marubeni, local banks)	On-going
- Kamikita Souden Company (JWD, etc.)	On-going

Currently METI is offering wind developers a 50% subsidy for local grids' extension. Besides the METI, the Fukushima prefecture local government intends to support local grid line extensions.

In December 2015 the Hokkaido and Tohoku Electric Power Companies asked wind power developers to accept unlimited (formerly maximum 30 days) & unpaid curtailment. Talks are ongoing with the Electric Power Companies to resolve this problem.

The critical inter-regional grid extension still depends on the progress of Japan's Electric Power System Reform, which is progressing gradually. From April 2016 Tokyo Electric Power Co (TEPCO) will start unbundling its power generation, transmission and distribution businesses. This change will be nationally applied by 2020.

Manufacturing

- Mitsubishi Heavy Industries, Ltd. (MHI) built the second 7MW turbine for the Fukushima floating offshore wind power project (FukushimaFORWARD). It finished installation on the semi-sub type floater and was commissioned 20km offshore in September.
- Hitachi's HTW5.0-126 5MW prototype started operations at Kamisu City in September. Hitachi is presently seeking orders from the Kashima Port Offshore Wind Project for its 5MW turbines.
- Japan Steel Works (JSW) started producing 3MW class gearless PMSG type wind turbines.
- Toshiba started selling its 2MW wind turbine.

OUTLOOK FOR 2016 AND BEYOND

JWPA promotes wind power development in Japan and is making consistent efforts to achieve its target of 36.2 GW by 2030. Japan has installed 3 GW at the end of 2015. There are 2.3 GW of new wind power projects that have almost finished the lengthy EIA process and have acquired FIT approval. Presently, 6-7 GW of new projects have begun the EIA process.

With input from the Japanese Wind Power Association (JWPA) and the Japanese Wind Energy Association (JWEA)

1 Long-term Energy Supply and Demand Outlook: Agency for Natural Resources and Energy in METI http://www.meti.go.jp/english/press/2015/071601.html
2 JWPA's Emergency Proposal for Wind Power Mass Introduction. http://jwpa.jp/page201englishsite/jwpa/detaile.html 27-04-2015
3 JWPA issued "JWPA WindVision Report" 29-02-2016. http://jwpa.jp/page216englishsite/jwpa/detaile.html
4 Wind Power Energy Resources and Mid/Long Term Target: http://jwpa.jp/page196englishsite/jwpa/detaile.html

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MEXICO

MAIN MARKET DEVELOPMENTS IN 2015

In 2015 Mexico added 714 MW of new wind power to the country's electricity grid, bringing total capacity to 3,073 MW, representing about 4.7% of total generation capacity. The energy market reform that is currently being implemented in the country has led to rapid growth expectations, with installation projections of 800 MW for 2016, after which the market is expected to take off. Expectations for 2017 and 2018 are in the range of 2,500 MW or more per year as the old system is finished off with the build out of the second 'open season' programme for Oaxaca, and the new system gets established. The Mexican wind industry is determined to see 9,500 MW installed by the end of 2018, and then up to 15,000 MW by the end of 2022.

Most of Mexico's 37 wind farms are located in the states of Oaxaca, Baja California, Chiapas, Jalisco, Tamaulipas, San Luis Potosi, and Nuevo Leon.

The key players in the Mexican wind market are Acciona, Gamesa, Enel, Vestas, Iberdrola, GNF, Renovalia and Peñoles. To date, wind power has generated USD 6 billion (EUR 5.37 bn) of new investment and an investment of USD 13 billion (EUR 11.64 bn) is expected for the period of 2016-2018.

LATEST POLICY DEVELOPMENTS

Mexico's recently enacted energy reform is intended to foster competitiveness and private investment throughout the electric power sector value chain in order to support economic growth and job creation by delivering competitively priced, reliable, clean, and secure electricity. This means dramatic changes in the power sector: the system is moving from a completely state-owned national utility providing everything from generation to transmission, distribution and retail to a free energy market. The main features of the new system include the following:

- The former state-owned monopoly (CFE) is being transformed into several generation companies and ultimately into separate and independent distribution and retail companies.
- An independent system operator has been established which is responsible for both the regulation of the market and the planning and expansion of the system (CENACE).
- A wholesale market which is now being implemented for most of the country.
- Market access for IPPs.
- The possibility for private entities to get into the transmission business.
- An auction system, which is already oversubscribed for the first round, the winners of which will be disclosed on 31 March; and the second round which is supposed to follow shortly thereafter during 2016.
- A green certificate system along with a purchase obligation system.

AUCTIONS FOR RENEWABLES

Mexico's economy is expected to expand 2.4% this year and the government expects energy demand to increase 4% annually over the next decade[1].

That growth will be fuelled by the shift toward renewables, which will jump from 14% to 51% of total installed capacity by 2040, according to Bloomberg New Energy Finance. Much of that is expected to come from wind power.

To facilitate the transition, the government plans to hold annual energy auctions, with the first one set for March, 2016. Power producers will receive Clean Energy Certificates

1 Bloomberg New Energy Finance

2015 IN A NUTSHELL

WIND CAPACITY ADDED
714 MW

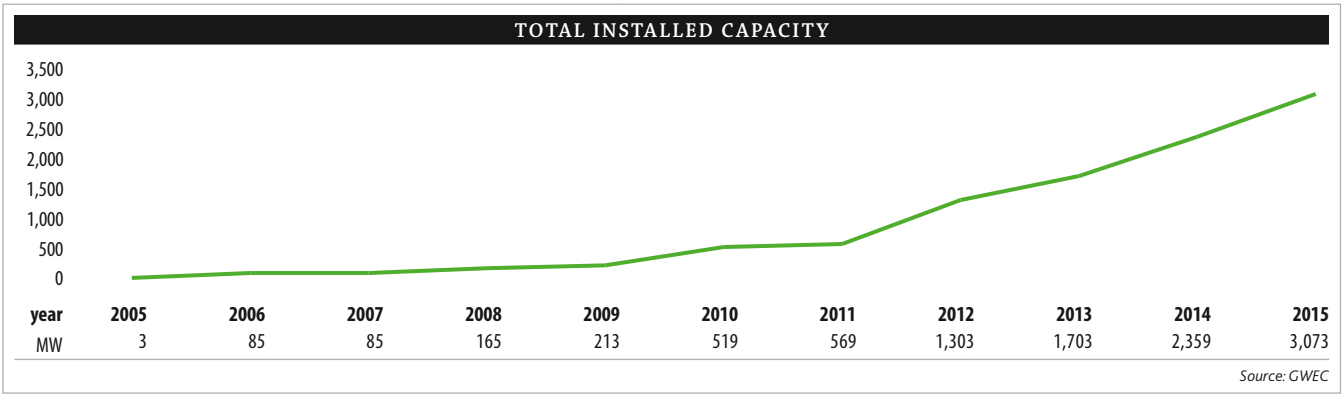
TOTAL INSTALLED CAPACITY
3,073 MW

NO. OF TURBINES
1,789

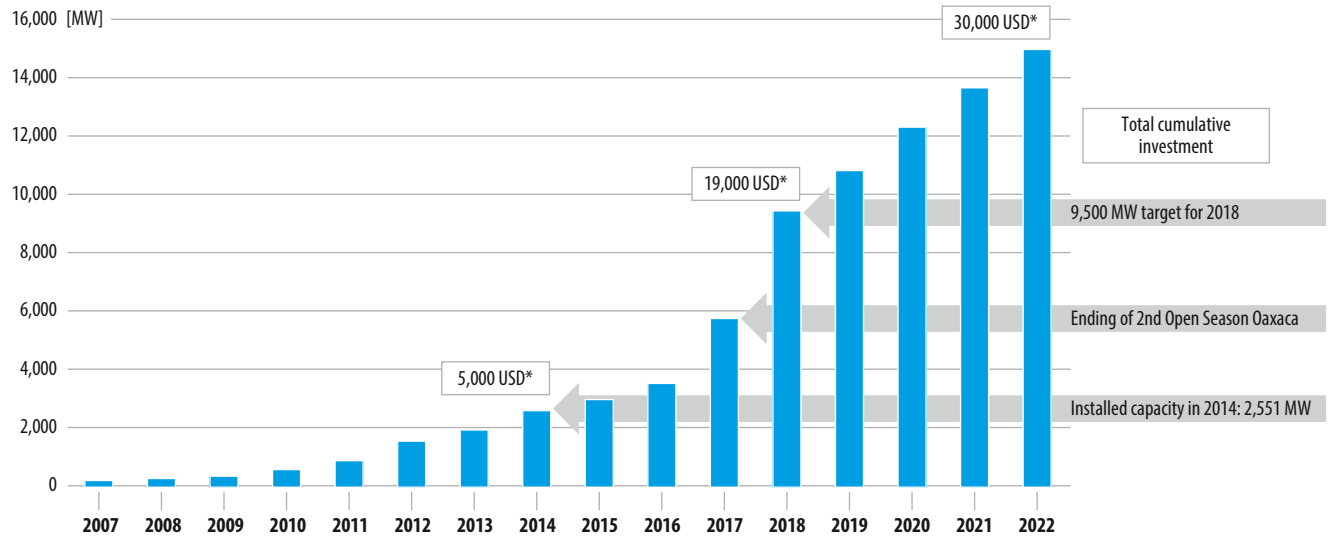
ELECTRICITY DEMAND COVERED BY WIND POWER
3.22%

PEOPLE EMPLOYED BY THE WIND INDUSTRY
1,300

MAIN TURBINE SUPPLIERS
Acciona, Gamesa, Enel, Vestas, Iberdrola, GNF, Renovalia, Peñoles



Expected growth of installed capacity and investment in US Dollars (millions)



*Amounts expressed in millions of US Dollars

(CLE's) for every megawatt-hour of clean energy generated, and will sell 20-year certificates through the auctions to large electricity users.[2]

Large consumers must get 5% of their power from clean sources by 2018. The government also set a mandate in 2012 to get 35% of the country's energy from non-fossil fuel sources by 2024, up from 21% now.

The auction winners will be announced on 31 March 2016 by SENER. The new auction system seeks to:

- Provide attractive electricity rates through competition
- Ensure increased renewables capacity through stable and predictable remuneration that minimizes market risk for both investors and end users
- Meet the quality, efficiency, reliability and sustainability standards of the electricity industry

2 More information: http://refor.ma/dgkRd

KEY BARRIERS TO WIND ENERGY DEVELOPMENT

Some of the main challenges include:

- Improving the infrastructure for transmission lines in regions with wind development
- Providing long-term visibility to investors throughout the value chain

OUTLOOK FOR 2016 AND BEYOND

The Mexican wind industry expects to install about 800 MW in 2016 from the seven wind farms that are currently under construction. By 2018, the industry expects to see 9,500 MW installed, and up to 15,000 MW by the end of 2022.

With input from the Mexican Wind Energy Association (AMDEE)

The Netherlands is blessed with a relatively long coastline, and although it is a densely populated country, there is ample room for onshore wind development. The provinces with the best wind resources are Zeeland, North Holland, Flevoland, Leeuwarden and Groningen. Additionally, the Dutch part of the North Sea is ideally suited for offshore wind development thanks to its favourable wind conditions, relatively shallow waters, good harbour facilities, an experienced industry and a robust new support system.

NETHERLANDS

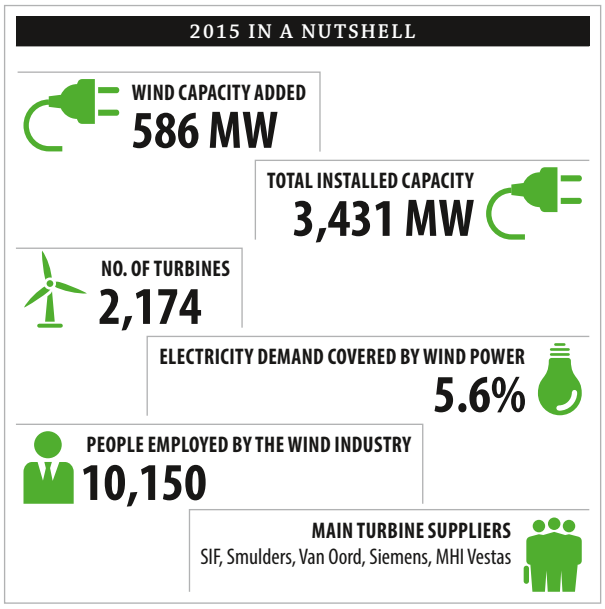
The Netherlands has good interconnectivity with its neighbouring countries. The operator of the Dutch grid, TenneT, builds and maintains the high-voltage grid that is used to transport large quantities of electricity in the Netherlands and a large part of Germany. TenneT also collaborates with its Danish counterpart Energinet.dk, and they are currently jointly installing a submarine high-voltage cable that will directly interconnect the electricity grids of the two countries. The 325 km COBRA cable will have a capacity of about 700 MW and will run from Eemshaven (the Netherlands) to Endrup (Denmark) via the German sector of the North Sea. The Dutch grid is also interconnected with the Norwegian grid by the NorNed cable and with the British grid via the BritNed cable.

The Netherlands enjoys wide public support for wind power. A recent opinion poll carried out by a Dutch polling agency[1] shows that Dutch people remain extremely positive about an increase of renewable energy generation by means of wind power. According to the poll roughly eight out of ten people want a larger share of wind energy in the Netherlands. It also shows that two-thirds of the Dutch would like to increase wind energy development in the country.

MAIN MARKET DEVELOPMENTS IN 2015

2015 marked a record year for the Dutch wind market with new installations totalling 586 MW, of which 180 MW was offshore. The Netherlands finished the year with a total of 3,431 MW, and wind energy now supplies 5.6% of the country's electricity demand (2014).

Overall, 110 turbines with a total capacity of 406 MW were added onshore last year, including the 201 MW Noordoostpolder wind farm, which once completed (a further 228 MW will be built) will be the country's largest onshore project. Furthermore, works were carried out at three offshore wind projects: the Luchterduinen wind farm with 43 turbines/129 MW became fully grid-connected; the Westermeerwind offshore wind farm was partially grid-connected with 17 turbines/51 MW; and foundations were laid for the Gemini offshore wind farm. When completed, the 600 MW Gemini offshore wind park located in the Dutch North Sea will be one of the world's largest offshore wind farms.



The main market players in the Dutch wind market are SIF, Smulders, Van Oord, Siemens and MHI Vestas.

LATEST POLICY DEVELOPMENTS

The Dutch incentive scheme for onshore wind energy was amended in 2015 to support production instead of capacity. The incentive scheme is now based on the average wind speed in the municipality where the wind-farm will be located. The country is divided into four tariff categories into which each municipality is placed according to its average wind speed. With this change, the cap on full load hours no longer applies.

Four wind categories for onshore wind power FIT:
- sites with winds stronger than 8 m/s are remunerated with €0,070/kWh
- sites with winds in the range 7.5-8 m/s: €0.076/kWh
- sites with winds in the range 7-7.5 m/s: €0.082/kWh
- sites with winds lower than 7 m/s: €0.093/kWh

For wind on dikes:
- sites with winds stronger than 8 m/s are remunerated with €0,075/kWh
- sites with winds in the range 7.5-8 m/s: €0.082/kWh
- sites with winds in the range 7-7.5 m/s: €0.087/kWh
- sites with winds lower than 7 m/s: €0.099/kWh

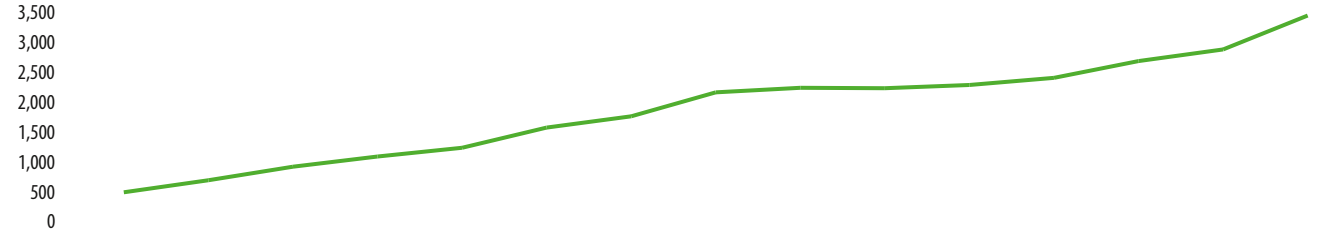
For wind projects in lakes the tariff is set at €0.114/kWh.

For offshore wind power a tender is expected to be launched during spring 2016 where a maximum of EUR 124/MWh can be bid.

OFFSHORE WIND POWER

There is at present 427 MW of offshore wind power installed in Dutch waters, consisting of three relatively small wind farms. The 600 MW Gemini wind farm, located north of the Wadden Islands, is expected to come online in the course of 2016. The Dutch wind industry

TOTAL INSTALLED CAPACITY



year	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
MW	481	682	908	1,078	1,224	1,561	1,749	2,149	2,225	2,218	2,272	2,391	2,713	2,865	3,431

Source: GWEC

OWEZ, first Dutch offshore windfarm ©Guido Hommel

expects to reach a total of 4,450 MW of offshore wind power by 2023.

A key challenge for the sector is to ensure smooth execution of the planned tenders for offshore wind energy. The first tender is expected to be held during spring 2016, a second one before the end of the year, and a further 1,400 MW are planned to be auctioned in the Borssele area at a later date. The industry also has a goal to reduce costs by 40% over the next five years. The Dutch North Sea has a huge potential to further develop large scale wind after the 2023 targets have been achieved; for instance, the *IJmuiden Ver* zone could accommodate 6,000 MW of offshore wind power.

KEY BARRIERS TO WIND ENERGY DEVELOPMENT

The main obstacles to onshore wind development in the Netherlands are linked to radar regulations, provincial policies, and public opposition in some areas. Currently, some coastal communities concerned about impacts on tourism and nature are opposing plans for offshore wind development, causing project delays.

OUTLOOK FOR 2016 AND BEYOND

The very low market prices for electricity in the Netherlands at the moment is the main concern with regard to the relatively high floor price for the incentive scheme for 2016.

The Dutch government aims to promote renewable energy and has set a target for 14% of all energy to be generated from renewable sources by 2020, rising to 16% by 2023. The Government hopes that wind power will play a significant role in meeting these targets and has set a target to reach 6,000 MW of onshore wind power by 2020, and 4,450 MW of offshore wind by 2023.

With input from the Netherlands Wind Energy Association (NWEA)

1 Motivaction research 19/01/2016; "Energievoorziening 2015-2050: publieksonderzoek naar draagvlak voor verduurzaming van energie" commissioned by the Ministry of Economic Affairs.

MAIN MARKET DEVELOPMENTS IN 2015

The pace of development of the wind energy sector in Poland has accelerated in recent years. In 2015, Poland added 1,266 MW to the country's electricity grid, bringing total installations up to 5,100 MW, representing annual market growth of nearly 40%. The record-breaking figure made Poland the second largest market in Europe in 2015, after Germany. All the new capacity was installed onshore, despite Poland's excellent offshore wind potential, which is estimated at 6 GW by 2030.

POLAND

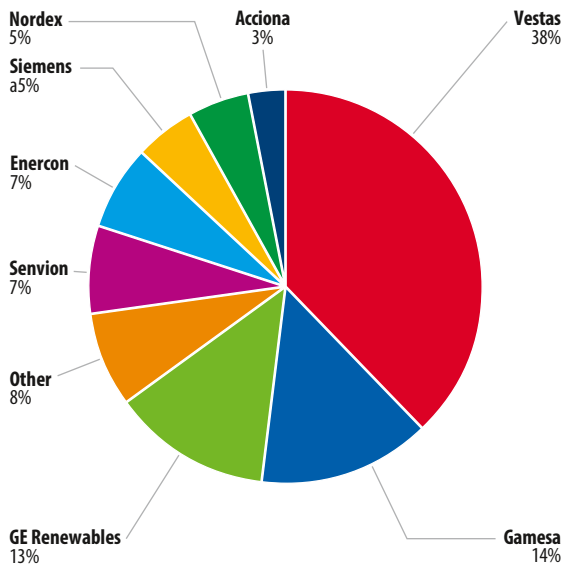
In 2015, wind farms produced 10,041 GWh of electricity, representing 6.22% of domestic electricity consumption.

The key players in the Polish wind market in 2015 were Vestas (> 700 MW) and GE (> 300 MW), with a total share of 79% of the annual market.

In cumulative terms, Vestas dominates the Polish wind market with 38% share of the market, followed by Gamesa (14%) and GE (13%).

Most of the wind capacity in Poland has been developed through Independent Power Producers (IPPs). This trend is changing slightly as state owned companies are gradually developing a number of wind projects as well. As of end of 2015, about 19% of the total wind capacity was developed by state-owned companies (PGE Energia Odnawialna (529 MW), Tauron Ekoenergia (201 MW), Energa (185 MW) and ENEA (56 MW).

Key market players in the Polish wind market in 2015 (cumulative)



Source: PWEA

2015 IN A NUTSHELL

WIND CAPACITY ADDED
1,266 MW

TOTAL INSTALLED CAPACITY
5,100 MW

NO. OF TURBINES
2,600

ELECTRICITY DEMAND COVERED BY WIND POWER
6.22%

PEOPLE EMPLOYED BY THE WIND INDUSTRY
8,400

MAIN TURBINE SUPPLIERS
Vestas, Gamesa, GE, Senvion, Enercon

Wind power, the leading renewable energy technology in Poland, boosts the country's economy without burdening the environment, enables fossil fuel savings and plays a significant role in improving the country's energy security.

The 10 TWh of wind energy produced in Poland in 2015 allowed for savings of about 3.26 million tons of coal, equivalent to 30% of its imports, reducing CO_2 emissions by about 80 kt. To date, wind energy investments in Poland accounted for EUR 5.6 billion (USD 6.3 bn) of which about 27% remain in the country. By 2020, investments in the wind sector are expected to account for EUR 20.2 billion (USD 22.6 bn), of which EUR 5.1 billion (USD 5.7) will have a direct impact on Poland's economic growth[1]. The Polish wind industry employed 8,400 people in 2014, and this is expected to increase up to 42,000 jobs by 2030[2].

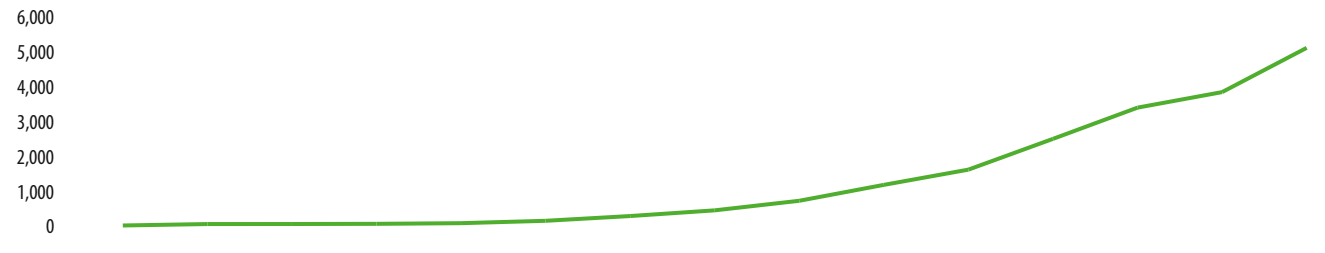
Wind energy is widely supported by the public in Poland, and according to a survey conducted by the Marketing Research Centre, if people could choose which power technology would supply electricity to their homes, 72% would choose wind power.

LATEST POLICY DEVELOPMENTS

The Polish government prepared the new law *RES Act* over the last four years which seeks to guarantee full implementation of the EU Renewables Directive into Polish law. The majority of the new regulations took effect on 4 May 2015. However, some important measures regarding a new support mechanism for renewables were postponed from 31 December until 1 July 2016. This caused a rush to install as much as possible before the end of the year which was a driving force for record installations in 2015, but left no projects in the pipeline for 2016.

The new RES Act introduces a transition from the tradable certificates system to an auction based system, based on the European Commission recommendations and guidelines[3]. The auction system will apply to all installations commissioned after 1 July 2016.

TOTAL INSTALLED CAPACITY



year	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
MW	18	59	60	65	84	152	288	451	725	1,180	1,616	2,496	3,390	3,834	5,100

Source: GWEC

The auctions will be divided by technology, and also by capacity (below and above 1 MW) and the capacity factor of each installation (below and above 4,000 hrs/year). Auctions for producers who resigned from the green certificates scheme in favor of the new scheme will be organised separately. The RES Act also requires that at least 25% of the volume allocated to auctions to be produced from small installations with a capacity no higher than 1 MW.

KEY BARRIERS TO WIND ENERGY DEVELOPMENT

Some of the key barriers to wind development in Poland include:

- Serious oversupply of green certificates, which is systematically increasing. At the end of 2015 it amounted to 18 724 GWh, which accounts for more than 100% of expected annual demand for green certificates in 2015;
- Transition to an auction based support system which causes an investment gap;
- Defining zones for wind development at regional level due to conflicting stakeholder interests;
- Extensive environmental and health assessments that cause delays;
- Regulation on turbine distance from housing and agricultural biogas plants;
- Anti-wind protests which are often caused by the lack of information.

OUTLOOK FOR 2016 AND BEYOND

Due to the new RES Act which changes the design for the support scheme for renewables as of 1 July 2016, only a few new wind energy installations are expected to be built in 2016. The Polish Wind Energy Association estimates only 100 MW of new wind power will be added in 2016, with no new installations in the second half of 2016 and much of 2017. This is caused by the time lag between the first auction and the commissioning of the first installations under the new scheme.

However, recent studies show that renewables could reach up to 40% share of Poland's electricity mix by 2030, and as much as 82% by 2050,[4] bringing considerable economic and environmental benefits to the country.

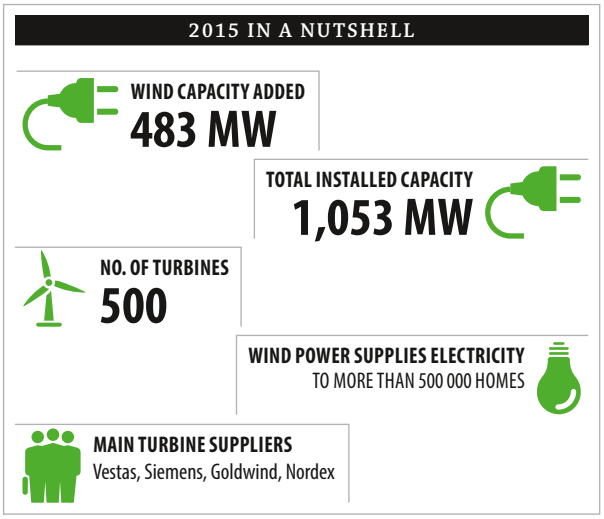
© Wind Power Works

With input from the Polish Wind Energy Association (PWEA)

1 "Offshore wind energy - analysis of the advantages for the Polish economy and development conditions", EY report, 2013
2 "The impact of wind power on the Polish labour market", the report of the Warsaw Institute of Economic Studies, November 2015
3 "European Commision guidance for the design of renewables support scheme", SWD (2013) 439 final, https://ec.europa.eu/energy/sites/ener/files/documents/com2013publicinterventionswd04_en.pdf ; „Wytyczne w sprawie pomocy państwa na ochronę środowiska i cele związane z energią w latach 2014-2020" http://eur-lex.europa.eu/legal-content/PL/TXT/PDF/?uri=CELEX:52014XC0628%2801%29&from=EN
4 Low-emission Poland 2050: scenario of distributed integration corresponding to Energy Union's assumptions – 82% share RES in electricity balance

2015 was another big year for the South African wind industry. A total of 483 MW of wind power was added to the country's electricity grid, bringing the cumulative capacity to 1,053 MW. After taking a decade for the first 10 MW of wind power to be installed, there's presently more than 3,000 MW at different stages of development.

The development of South Africa's wind industry has taken place within a relatively short period of about four years, placing South Africa amongst the leading new wind markets globally. The wind industry and its supply chain are becoming firmly established with several large wind farms now fully operational, and many more under construction.



SOUTH AFRICA

MAIN MARKET DEVELOPMENTS IN 2015

With bidding for the first four rounds of South Africa's Renewable Energy Independent Power Producer Procurement Programme (REIPPPP) completed, and after three rounds of preferred bidders have reached financial close, the wind industry has established itself as a major new infrastructure sector and is now worth about ZAR 75 billion (EUR 4.3/USD 4.9 bn).

The first three rounds of the REIPPPP totalling 1984 MW have reached financial close. Financial close for another 1,363 MW (REIPPP Round 4(a) and (b)) is pending while the preferred bidders for the Expedited REIPPPP Round 4, with at least 800 MW, are expected to be announced shortly.

South Africa has excellent wind resources, detailed in the wind map[1] developed by WASA. Upscaling renewables development in the country has become a necessity, as renewable energy is the only source of new power that can be deployed fast enough to help ease South Africa's chronic electricity shortages.

The Integrated Resource Plan has a goal to develop 9,000 MW of wind power by 2030. However, the South African Wind Energy Association expects this figure to be exceeded by a wide margin and projects about 15,000 MW to be installed by 2030. The IRP blueprint will be updated in the course of 2016.

It is understood that the IPP Office has allowed some applications to sell equity in the REIPPP Projects (there is usually a three year lock-in clause). This has started to open the door for a secondary market in South Africa.

The procurement rules include a strong government ambition to create a high level of local content, with an incentive to boost employment and to support local communities.

Many of the large international developers and utilities are active in the South African market. The key manufacturers are Vestas, Siemens, Goldwind and Nordex.

The wind industry, jointly with other renewable energy industries in the country, is supporting pioneering innovations in the field of sustainable development, community development, community ownership, socio-economic development and enterprise development and have committed about ZAR 8 billion (EUR 463/USD 520 mn) to these sectors over the over the next twenty years.

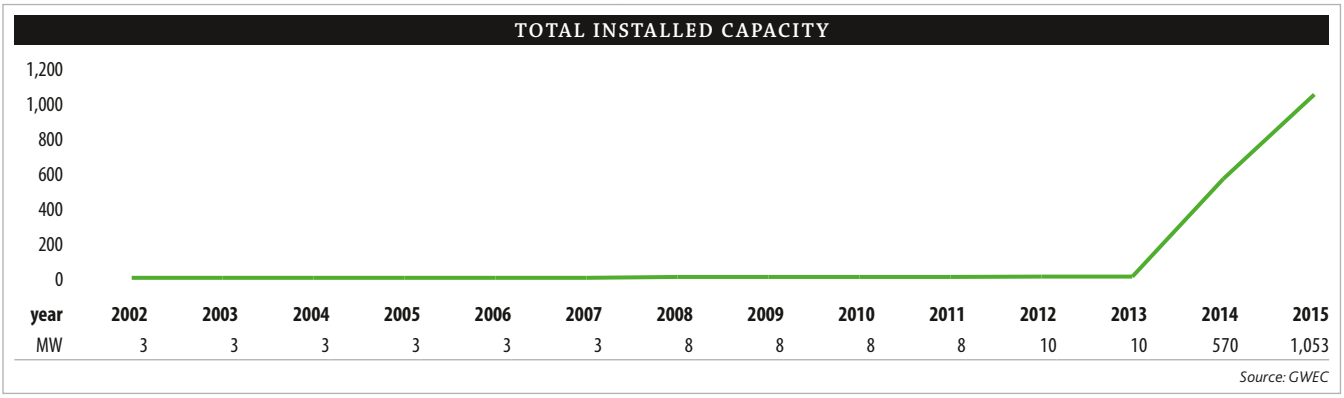
Wind power cheapest source of electricity

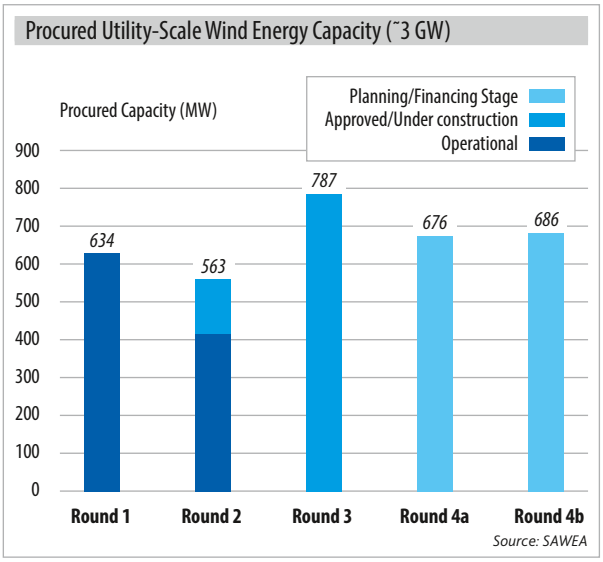
South Africa has the world's seventh largest coal reserves, and coal supplies about 77% of South Africa's primary energy, followed by oil and solid biomass and waste. South Africa's energy balance also includes relatively small shares of natural gas, nuclear, and hydroelectricity. South Africa's dependence on hydrocarbons, particularly coal, has made the country the world's 13th largest CO_2 emitter.

The maintenance of the coal fleet has been challenging and capacity factors are down to about 70%, leading to regular electricity shortages, which could be eased by rapid deployment of renewable energy, especially wind power.

Historically, South Africa had had very low electricity prices, but in recent years they have been rising quickly. The price for wind power has dropped well below the cost of new coal power. The average selling price of electricity is around ZAR 78 cent/kWh (EUR 4.5/ USD 5.1 cent). Wind power was procured in the round 4 bids below ZAR 70 cent/kWh (EUR 4.1/USD 4.5 cent), making wind power the lowest cost source of new electricity in the country. New coal based power is likely to cost ZAR 1.05 cent/kWh (EUR 6/USD 7 cent) if not cross-subsidised from existing plants. At present, the National Energy Regulator (NERSA) is hearing an application from Eskom that may result in a 16% price increase for Eskom in 2016.

In 2015, a new report[2] by the Council for Scientific and Industrial Research (CSIR) showed less-than-zero costs





for renewable energy to the country. According to CSIR, wind and solar power combined saved ZAR 4 billion from January to June 2015. Wind energy produced net savings of ZAR 1.8 billion and was also cash positive for Eskom by ZAR 300 million.

KEY BARRIERS TO WIND ENERGY DEVELOPMENT

Some remaining obstacles to the wind industry include:

- The Integrated Resource Plan (IRP) is the energy master plan for the country out to 2030. It will be reviewed in 2016 and is likely to be heavily contested.
- The extensive works to facilitate grid integration are under the responsibility of the country's power utility, Eskom, who had previously subsided the associated costs. However, these costs are now increasingly being transferred to project developers resulting in more costly projects. Additionally, extended transmission and distribution works are needed, and the cost recovery rules for this are not yet transparent or consistent. This issue is currently being addressed by the South African Renewable Energy Council through the Grid Code Advisory Committee.
- The costs involved in tendering for the procurement programme are high and create a challenge for smaller players.

Hopefield Wind Farm © Umoya Energy

- South Africa's economy is stagnating, and exchange rate fluctuations cause challenges to the REIPPPP by exerting upward pressures on bid prices. It also creates challenges for foreign investors hoping to evacuate hard currency from South African projects. A change in the sovereign credit rating may impact the risk premium foreign investors require.

OUTLOOK FOR 2016 AND BEYOND

The wind industry in South Africa is in a very rapid growth phase. The country's chronic power shortages mean that the REIPPP is likely to be expanded. South Africa is moving towards a large wind industry with a domestic installed capacity in excess of 6,000 MW by 2020, if not sooner.

With input from the South African Wind Power Association (SAWEA)

1 http://www.wasaproject.info/
2 http://www.csir.co.za/media_releases/docs/Financial%20benefits%20of%20Wind%20and%20PV%202015.pdf

MAIN MARKET DEVELOPMENTS IN 2015

During 2015 Turkey added a record 956 MW of new wind power to the country's electricity grid, bringing total capacity up to 4,694 MW spread over 113 wind farms. Turkey's installed capacity has grown at over 500 MW per year since 2010 and is expected to continue at about 1,000 MW per year in the coming years. Overall, wind power supplied about 6% of Turkey's electricity consumption in 2015.

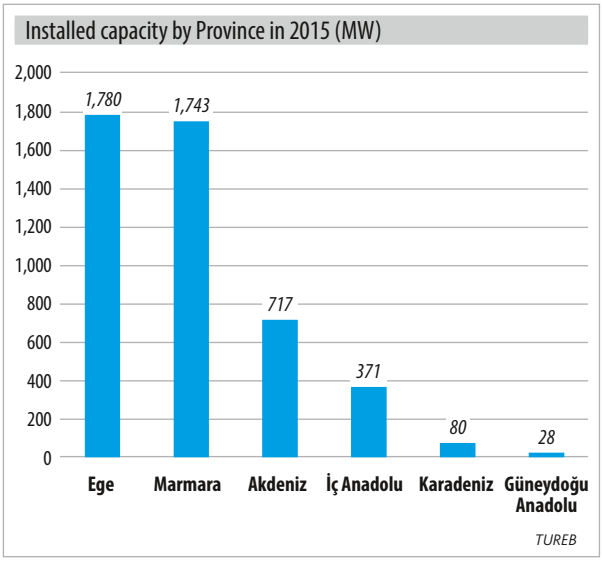
TURKEY

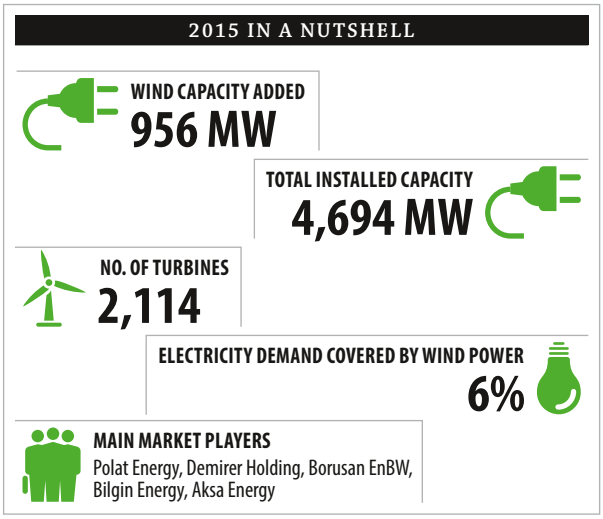
The Turkish market at present has a large pipeline of projects. The Turkish Wind Power Association estimates that under the current regulatory framework a total installed capacity of about 10 GW will be reached within the next ten years, but it could be as high as 20 GW with the right amendments to the regulatory framework. Turkey has become one of the leading players in the European wind market and globally, and was the 10th largest annual market in 2015.

Turkey's wind resources are estimated at more than 48 GW from areas with >7 m/s wind speeds at 50 meters. As of the end of 2015, the Aegean region (EGE) had the highest installed wind capacity with a total of 1,780 MW, followed by the Marmara region with 1,743 MW and the Mediterranean region (Akdeniz) with 717 MW.

The Turkish wind market is dominated by local developers: the 685 MW currently under construction is divided between Türkerler (343 MW), Güriş (255 MW) and Bilgin Enerji (87 MW).

The leading players in the Turkish wind market are Polat Energy (551 MW), Demirer Holding (368 MW), Borusan EnBW (319 MW) and Bilgin Energy (312 MW), followed by Aksa Energy (269 MW).





Turkey is one of the fastest growing power markets in the world. With very limited oil and gas reserves, Turkey is increasingly turning to renewable energy sources to improve its energy security, seeking to provide 30% of its electricity from renewable energy by 2023. However, to match rapidly growing energy demand, more investments are needed.

LATEST POLICY DEVELOPMENTS

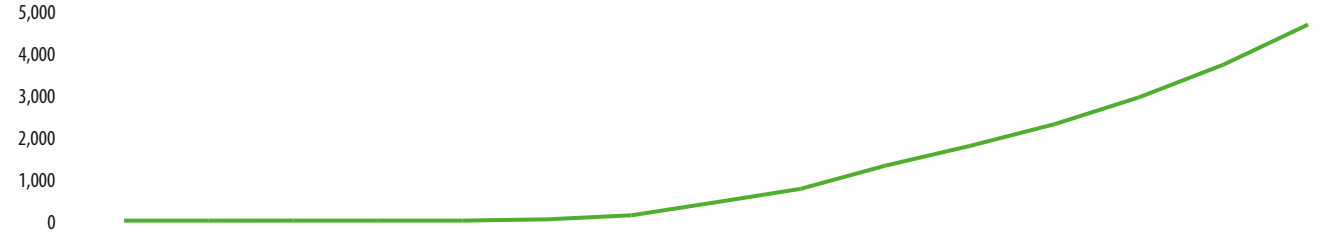
Turkey's Renewable Energy Law, which came into force in 2005 and was amended in 2010, sets the legal framework for the promotion of electricity generation from renewable sources. The feed-in tariff for wind power is set at USD 7.3 cent/kWh (EUR 6.5 cent/kWh) for a period of ten years and will apply to power plants that come into operation before 31 December 2020. The law allows an additional bonus of up to USD 3.7 cent/kWh (EUR 3.3 cent/kWh) for up to five years for using locally manufactured components. Wind power producers are also free to sell to the national power pool or engage in bilateral power purchase agreements.

Additionally, another incentive is the 85% discount for the right of easement on State owned land for transportation and transmission. This incentive applies to facilities that begin operations before 31 December 2020. The discount will apply during the first ten years after the establishment of the wind farm. The amended law also allows for the construction of renewable energy projects in national and natural parks, protected regions, conserved forests, wildlife development zones, special environmental protection zones and natural protected areas, provided that the necessary permissions are obtained from the Ministry of Environment and/or regional protection boards.

The Energy and Electricity Market Law, published in April 2013 and amended in December 2015, included a new Electricity Market License regulation which entered into force in November 2013.

According to this regulation, wind projects that exceed 1 MW are required to obtain a generation license from Turkey's Electricity Market Regulatory Authority (EMRA).

TOTAL INSTALLED CAPACITY



year	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
MW	19	19	20	20	20	51	147	433	777	1,305	1,781	2,288	2,934	3,738	4,694

Source: GWEC

© myclimate

There are two stages for the licensing procedure: pre-license and license. In the pre-license period, applicants are given 24 months (can be extended to 36 months under certain conditions) to seek the necessary permits for urban planning, construction, land acquisition etc. If the necessary permits cannot be obtained over a period of 24 months, or the requirements specified by EMRA cannot be fulfilled, the applicant will not be granted an electricity generation license.

Each year on a fixed date, the Turkish Electricity Transmission Company (TEIAS) announces transformer capacity for wind projects which is established on a regional basis and determines how much wind power can be connected to the regional grid system.

Grid connection

There is an ongoing process to add 3,000 MW of new capacity across Turkey by 2018. Turkey's Electricity Market Regulatory Authority has received more than 1000 pre-license applications which are currently under technical evaluation.

KEY BARRIERS TO WIND ENERGY DEVELOPMENT

Although many improvements have been achieved in the regulatory framework and new steps towards a more liberalised power market have been taken, some barriers to wind development in Turkey still remain, including:

- immature electricity and gas market, which impedes the predictability of market prices;
- technical difficulties in transmission and lack of continuous and predictable grid connection capacity allocation; and
- long administrative procedures with the involvement of numerous central and local authorities.

OUTLOOK FOR 2016 AND BEYOND

The Turkish Wind Energy Association expects Turkey to install about 1.5 GW in 2016. To ensure that this target is met, the transmission system operator has announced investments in grid reinforcements for the period from 2015 to 2020.

With input from the Turkish Wind Power Association (TUREB)

Wind power development in Uruguay has been a real success story. Uruguay went from having almost no wind power in 2007 to double digit capacity in less than a decade.

URUGUAY

This rapid development began in 2010 when a new energy policy was defined for the country, adding wind power and other renewables as one of its key pillars. In 2011, about 950 MW of wind energy was awarded as a result of three consecutive competitive tenders.

In 2012, the state owned electricity company (UTE), awarded two wind farms of 65 MW and 67 MW capacity, one of which is in partnership with the Brazilian company Electrobras. Both of these wind farms are operational today.

In 2013, UTE awarded three wind farms of 70 MW and another one of 140 MW, and all of these four wind farms are now under construction. In 2014, an extension of the three existing wind farms was approved, representing a further 150 MW. Additionally, construction began in 2015 on several small wind farms with a combined capacity of 70 MW by private entrepreneurs.

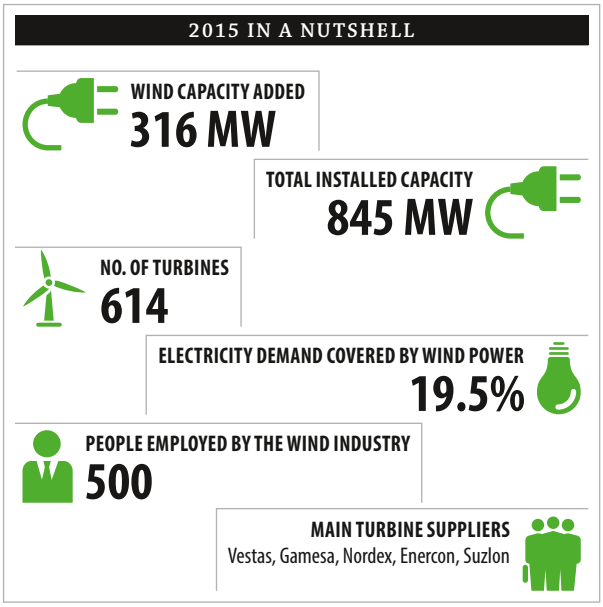
The Uruguayan electrical system's historical consumption peak is 1,950 MW. In 2015, the total domestic annual electricity consumption stood at 10,500 GWh. Uruguay has 1,550 MW of hydroelectric power plants, and an interconnection with Argentina of 2,000 MW and two interconnections with Brazil of 500 and 70 MW. The frequency of electricity used in the South American countries vary; Uruguay and Argentina use a 50Hz frequency while Brazil uses 60Hz, which makes the Brazilian connections more difficult and costly.

MAIN MARKET DEVELOPMENTS IN 2015

In 2015, Uruguay's new installations totalled 316 MW, bringing the total wind power capacity to 845 MW, and supplying 19.5% of the country's electricity demand. The biggest private wind project, the 117 MW Peralta wind farm, located in Tacuarembó in central Uruguay, began operating in June 2015.

The key market players in the Uruguayan wind market are Vestas with 507 MW, followed by Gamesa with 390 MW, Nordex (307 MW), Enercon (167 MW) and Suzlon (65 MW).

There are currently no relevant new entrants in the market because no competitive auctions are expected to be held in the next 2 to 3 years. However, Chinese manufacturer Goldwind plans to install a 10 MW wind farm in San José and possibly they will also add some turbines to one of the existing wind farms, under an existing contract.



There are no wind turbine or major component factories in Uruguay due to the small market size, with the exception of a concrete tower plant.

Financing for wind power projects in Uruguay has mostly come from international banks such as the Inter-American Development Bank (IDB), Development Bank of Latin America – Corporación Andina de Fomento (CAF), KfW Development Bank and the Uruguayan State owned bank Banco República Oriental del Uruguay.

Support framework for wind energy

Since wind power development is supported by the state, the government has led the introduction of wind power through public tenders for power purchase agreements (PPA) with UTE; or through competitive bidding made directly by UTE; or as investments by companies sponsored by UTE (trust funds, corporations).

The price level of the competitive bidding was USD 85/MWh (EUR 75.7/MWh) for the first 100 MW and USD 63.5/MWh (EUR 56.5/MWh) for the following competitive bids and for UTE's wind farms.

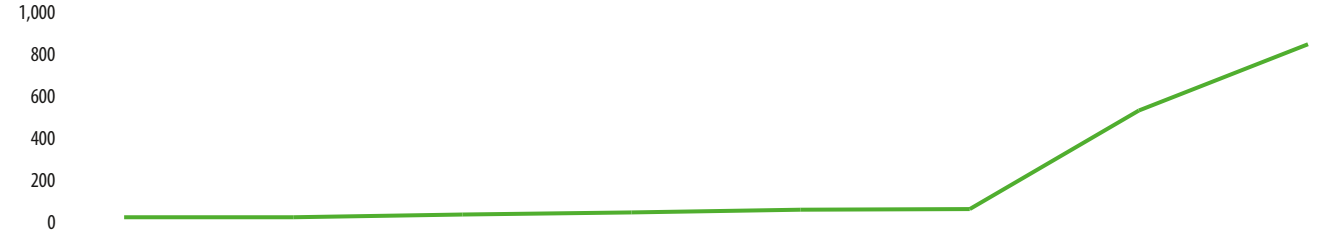
The amount of wind energy introduced in the Uruguayan electric system is considered as sufficient until 2020. Nevertheless, there are still many sites available with good wind resources.

CONDITIONS AND ROLE OF WIND ENERGY

Uruguay has rich wind resources, in particular in the high zones crossing almost the entire territory. A capacity factor over 40% is usually reached with modern wind turbines.

The territory can be divided into three strips: *the northern strip* situated north of Tacuarembó city; *the central strip,* between Minas and Tacuarembó cities; and *the southern strip,* located near the Río de la Plata river and the Atlantic Ocean.

TOTAL INSTALLED CAPACITY



year	2008	2009	2010	2011	2012	2013	2014	2015
MW	20	20	33	43	56	59	529	845

Source: GWEC

© GWEC

Wind farms currently in operation/ under construction are located in:

- 417 MW in the southern strip
- 883 MW in the central strip, and
- 139 MW in the northern strip

The country's largest wind farms are the 117 MW Peralta and 140 MW (once ready) Pampa wind farms. The rest are smaller, i.e., 10 to 70 MW.

It is estimated that about 500 people will be working for the wind sector in the future, when the wind farms currently under construction come online, mostly in operation, O&M and services.

Wind power and its integration in the national grid is widely supported by general public and across all political parties. Society sees wind power development in the country as a positive trend.

KEY BARRIERS TO WIND ENERGY DEVELOPMENT

There have not been any significant problems in the introduction of wind power in Uruguay. Wind power has been considered as a state policy and the society has seen it as a solution to the problem of droughts and protection from volatile oil prices affecting the cost of energy and public finance.

OUTLOOK FOR 2016 AND BEYOND

For 2016, the industry expects that wind farms currently under construction will become operational and that the government will make energy exchange agreements with Argentina and Brazil, considering that wind power will exceed the country's domestic needs.

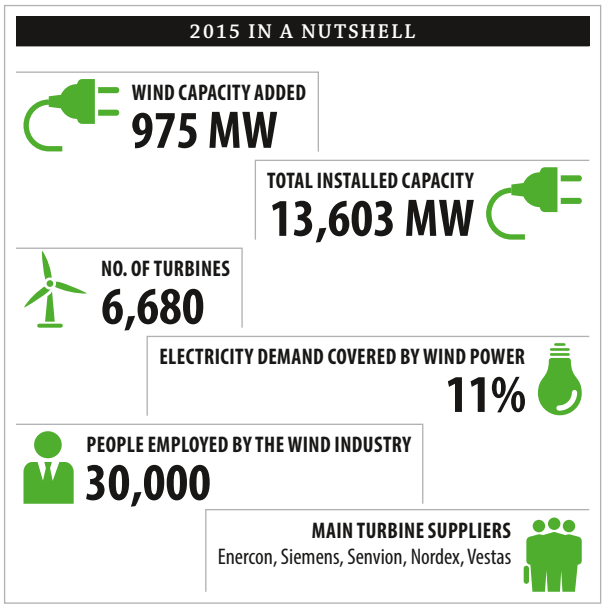
Grid management policies are being developed to adapt demand to wind generation variability through hourly rates and smart grids, increasing the consumption during night time when the wind is stronger and providing incentives to electric vehicles. Additionally, the state owned electricity company UTE is conducting a study on pumped storage plants to help balance wind energy variability.

With input from the Uruguayan Wind Energy Association (AUDEE)

MAIN MARKET DEVELOPMENTS IN 2015

In 2015, the UK wind market delivered a solid performance, but was on a rollercoaster in terms of policy development following the election of a majority Conservative government in May.

At the end of 2015, the UK's wind power capacity stood at 13.6 GW, made up of 8.5 GW of onshore and 5.1 GW of offshore wind. In 2015, a total 403 MW of onshore wind capacity was added, less than in any year since 2008, and much lower than the 1 GW+ in the previous three years. No exceptional projects were delivered in 2015, with the largest single project totalling only 12.5 MW and only six projects totalling over 10 MW. However, this would appear to be the calm before the storm, with over 2,500 MW of capacity under construction, seeking to be in operation before the closure of the Renewables Obligation on 31 March 2017. Notable giants currently under construction include ScottishPower Renewables' 239 MW Killgallioch, Vattenfall's 228 MW Pen y Cymoedd and SSE's 172 MW extension to its Clyde wind farm



UNITED KINGDOM

Offshore wind saw a larger delivery of capacity, with 572 MW, bringing the cumulative total to 5,067 MW. The delivered capacity consisted of parts of RWE's 576 MW Gwynt y Mor project, while Eon's 219 MW Humber Gateway and Dong Energy's 210 MW Westermost Rough were also notable. The latter project saw the first significant deployment of Siemens' 6 MW direct drive turbine. At the time of writing over 4 GW of projects are fully contracted and will be delivered over the next four years, with a further 1 GW anticipated to reach financial close within weeks.

2015 also saw a number of new wind generation records: wind power provided 11% of the UK's total electricity supply, breaking the 10% barrier for the first time. Moreover, in an exceptionally windy end to the year, in the final quarter 13% of all UK electricity was generated by wind power, and a monthly record of 17% was set in December. In the final week of the year, one unit in every five used in the UK was generated by wind.

The UK wind turbine market is dominated by the mainstream European OEMs. In the period from July 2014 to June 2015, the top five manufacturers of onshore turbines were Enercon (29%), Siemens (22%), Senvion (16%), Nordex (11%) and Vestas (11%). In the same period, Siemens dominated the offshore wind market with 81%, while Vestas picked up the other 19%.

Conditions and role of wind energy

The UK has an excellent wind resource, concentrated in the north and west of the country; and this is shown most clearly in the distribution of onshore wind around the constituent nations of the UK. Scotland is clearly dominant here, showing the effect of the higher wind speeds and lower population density that prevail there. Given the smaller land area available, Wales and Northern Ireland also make significant contributions.

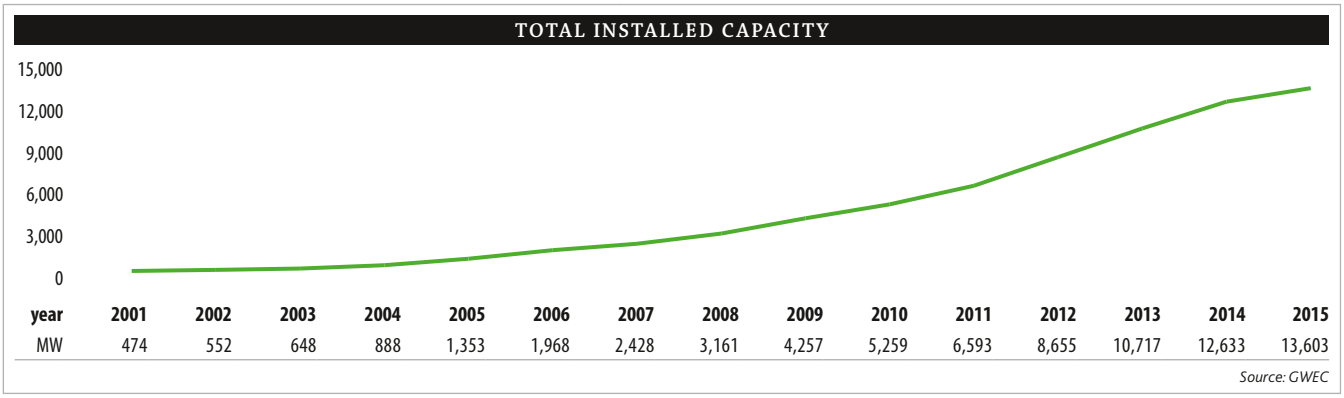
With offshore wind, however, development has been concentrated primarily around the English coast. This is helpful to smooth out the output of the wind portfolio overall due to the geographic diversification effect.

The UK wind industry supports over 30,000 full-time jobs, about equally split between direct and indirect employment. Public support is also high, according to Government's own Public Attitudes Tracking Survey: support for renewables overall stands at 75%, while onshore wind alone gains the thumbs-up from 66% of the population and offshore 73%.

LATEST POLICY DEVELOPMENTS

With the high levels of public support, it would be natural to think that renewables would be the beneficiary of stable policy frameworks; unfortunately this is not the case, and the advent of a majority Conservative Government in May 2015 has led to considerable policy turmoil, especially since the Conservatives manifesto included a commitment to 'halt the spread' of onshore wind.

The large majority of wind generation in the UK is supported through the Renewables Obligation. At present, new onshore projects receive 0.9 Renewable Obligation Certificates (ROCs) per MWh and offshore 1.9 ROC/MWh, dropping to 1.8 on 1 April 2016. Each ROC is worth about GBP 40 (EUR 52/USD 57), and the ROC income is on top of wholesale power revenue, currently in the range GBP 30-40/MWh. The RO is due to close to all new projects on 1 April 2017, and the system will then continue to support accredited projects until 2037, when the system will expire.



year	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
MW	474	552	648	888	1,353	1,968	2,428	3,161	4,257	5,259	6,593	8,655	10,717	12,633	13,603

Source: GWEC

Early on in its term, the new Government said that it would close the RO to onshore wind one year early, in April 2016. It has since been legislating for that closure, and also a grace period that allows projects that held planning permission and a grid connection agreement on 18 June 2015 to enter the RO up to 1 April 2017. While a number of projects have been caught on the wrong side of this cut-off date, a relatively small amount of capacity is not going ahead which would have under the existing closure arrangements.

While the RO remains open to offshore wind, only a very few projects are now able to enter it given the time constraints.

The RO is being replaced with the Contract for Difference (CfD), which is a 15-year, fixed-price contract awarded by auction. One auction round has been held, with 2.1 GW of capacity awarded contracts in February 2015; with over 1,100 MW of offshore and 750 MW of onshore, wind was the big winner, scooping 90% of the capacity. The onshore 'strike prices' came in at GPB 82.50/MWh (EUR 107/USD 117) for most capacity, while the two offshore projects that won secured prices of GBP 119.89/MWh (EUR 155/USD 171) (for ScottishPower's 714 MW East Anglia One) and GBP 114.39/MWh (for Mainstream's 448 MW Neart na Gaoithe).

The new Government has not yet fully clarified its intentions for future CfD allocation rounds. The position of onshore wind (and indeed large-scale solar) in the CfD has not been made clear either, with no promises to run auctions for the 'established' pot of technologies (offshore wind is classed as 'less-established'). The industry is making the case that denial of access to the CfD is not removal of subsidy but is in effect shutting onshore wind out of the market altogether given that no generating technology can be delivered at the current wholesale price. While the logic is unimpeachable, it remains to be seen whether it will be politically possible to deliver allocation rounds for onshore wind.

Alongside these main changes, there have also been significant changes made to the small-scale feed-in tariff, the removal of exemption from the Climate Change Levy, a business tax on energy use, and more restrictive planning rules have been imposed in England. In general, therefore, the industry has had a year of significant policy change and remains in a state of some uncertainty.

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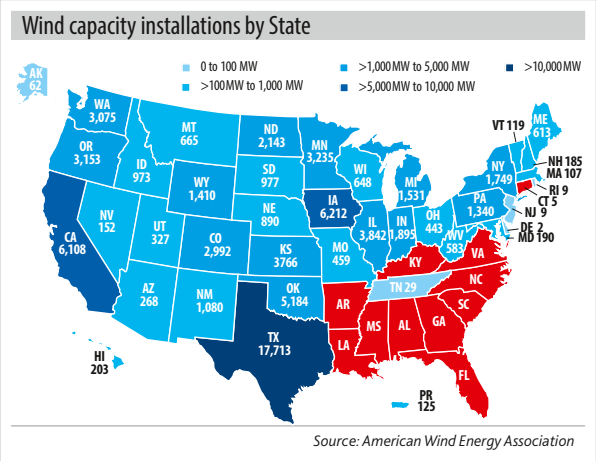
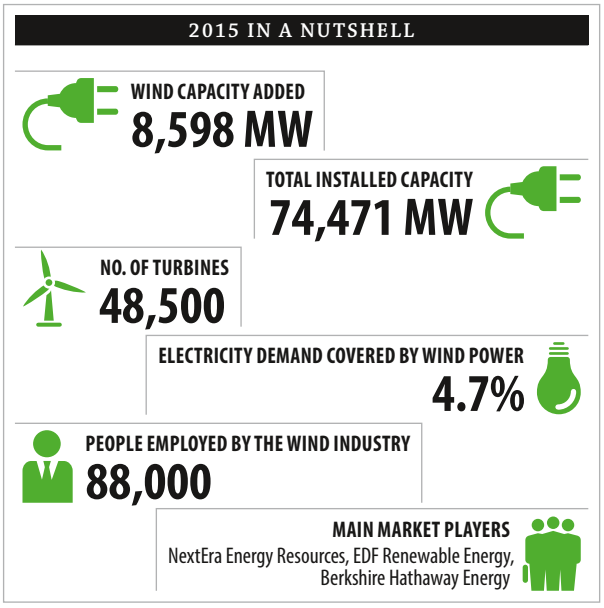
OUTLOOK FOR 2016 AND BEYOND

A considerable delivery of onshore wind is expected in 2016 and 2017 as developers seek to meet RO closure deadlines. After this, the 750 MW of projects that received CfDs are mostly due to be commissioned in 2018. The prospect beyond that date is a complete collapse of delivery unless there are further CfD allocations. However, the UK Government is still publicly committed to the system of Carbon Budgets legislated under the 2008 Climate Change Act. The advice from the statutory Climate Change Committee for the fifth Carbon Budget, covering 2027-32, implies delivery of about 20 GW of onshore wind by 2030. If Government is persuaded of this need, then there is a case for shorter term CfD allocation to retain the pipeline of projects and the supply chain capability.

With the CfDs handed out early under the FID-ER programme and the first allocation round, the pipeline for offshore wind is solid up to 2020, with the prospect of a doubling of capacity from the current 5 GW to 10 GW in that time. Government has set an ambition for a further 10 GW of offshore across the 2020s, and the intention to hold three allocation rounds. This is contingent on an as-yet unspecified cost reduction trajectory being met, so risk does remain, however.

With input from RenewableUK





UNITED STATES

MAIN MARKET DEVELOPMENTS IN 2015

In 2015, the US wind industry installed 8,598 MW of new capacity across 20 states – a 77% increase over 2014 and the third highest annual total in history. The new installations bring total wind power capacity in the US up to 74,471 MW, enough to power 20 million average American homes.

Wind energy has supplied 30% of all new power capacity additions over the last 5 years and in 2015 represented 41% of new capacity additions. Over the past six years wind power's cost has dropped an impressive 66%, according to the Department of Energy's 2014 Wind Technologies Market Report[1].

As a result of advancing technology and domestic manufacturing, wind has become one of the most affordable sources of electricity today in the US and one of the leading choices for new generation by utilities. Wind has also become a major economic contributor: since 2008, over USD 114 billion (EUR 104 bn) in private investment has flowed into the US wind industry. NextEra Energy Resources installed the most new wind capacity in 2015 with 1,032 MW, followed by EDF Renewable Energy and Berkshire Hathaway Energy each installing more than 500 MW.

LATEST POLICY DEVELOPMENTS

The first major policy development occurred on 3 August, 2015, when the Environmental Protection Agency (EPA) released the final rule of the Clean Power Plan (CPP). The CPP mandates emissions reductions from most existing fossil generating units. The rule is estimated to reduce carbon emissions 32% from 2005 levels by 2030. According to economic analysis from the US Energy Information Administration of the Clean Power Plan, wind can supply the majority of the lowest-cost Clean Power Plan compliance mix.[2]

The second major policy development occurred late in 2015 when Congress passed a multi-year extension of the Production Tax Credit (PTC) and Investment Tax Credit (ITC) as part of a bipartisan-supported government spending bill, securing the predictable business environment needed to keep US factories open and further scale up American wind power. In combination with the upcoming carbon reduction targets in the Obama administration Clean Power Plan, the next five years should be a period of robust growth in the US wind industry.

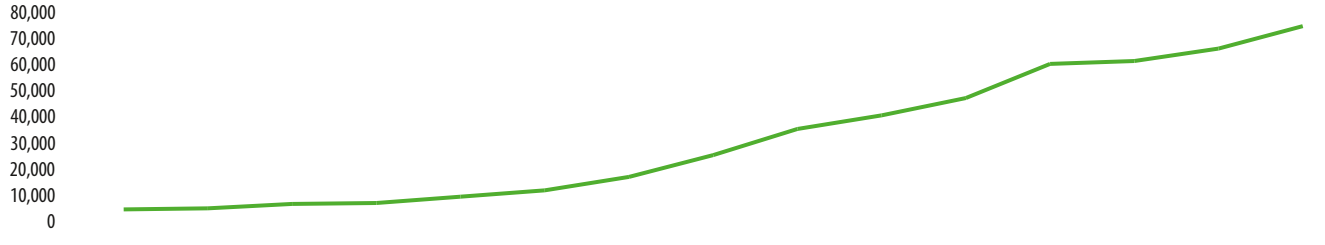
Another important development in 2015 was the release of the US Department of Energy's Wind Vision: A New Era for Wind Power in the United States.[3] The report shows that wind energy can supply the US with 10% of the country's electricity by 2020, 20% by 2030, and 35% by 2050 and provides a road map for how to get there. By providing 20% of the nation's electricity by 2030, wind energy would support 380,000 jobs, USD 650 million (EUR 592 mn) in annual lease payments to landowners, and nearly USD 1.8 billion (EUR 1.6 bn) a year in tax payments to communities.

One benefit that often goes unnoticed is the water saving from using wind energy - a key benefit in drought-prone parts of the US; and the associated enhancement of reliability during heat waves. Droughts from the Southeast to the West Coast have highlighted the US electricity system's dependence on fresh water. The Wind Vision report which showed the feasibility of reaching 20% wind by 2030 also found that this would save 4 trillion gallons of water, more than the annual consumption of 9 million Americans.

KEY BARRIERS TO WIND ENERGY DEVELOPMENT

The recent stay of the Clean Power Plan by the US Supreme Court introduces a degree of long-term policy instability. Wind energy has repeatedly been shown to be one of the lost-cost compliance options for reducing emissions. Should the CPP be ultimately struck down,

TOTAL INSTALLED CAPACITY



year	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
MW	4,275	4,685	6,372	6,725	9,149	11,575	16,725	25,076	35,086	40,298	46,929	60,007	61,110	65,877	74,471

Source: GWEC

Glenrock wind farm © Brad Romano

utilities will have less need for clean wind power to replace carbon intensive generation resources.

Providing adequate transmission is a key to continue to enable the build out and delivery of wind power to all parts of the country. Value needs to be placed on proposed long-distance, high-voltage lines connecting wind energy resource areas to population centers.

OUTLOOK FOR 2016 AND BEYOND

Combining the multi-year tax credit extension with the Clean Power Plan, the US wind industry expects robust growth to continue in 2016 and beyond. As of the end of 2015, over 9,400 MW of wind power was under construction in 22 US states and Guam. Over half of this activity is located in Texas, while many Midwestern and Plains states have construction activity underway. Additionally, approximately 5,000 MW of projects with power purchase agreements (PPAs) or firm turbine orders already in place have not yet started construction, but are on track to do so in 2016 or early 2017. The EPA's proposed carbon regulations also are a strong signal that America needs wind power.

Many states will find wind energy to be one of the fastest and cheapest ways to comply as their implementation plans are prepared in the coming two years. According to Lazard's Levelized Cost of Energy Analysis[4] report from November 2015, wind is by far the most cost-effective generation option for reducing emissions. The 74,000-plus megawatts now producing zero-emission electricity represent enough displaced fossil generation to avoid the carbon pollution of over 35 million cars.

Meanwhile, utilities continue to sign some of the lowest cost long-term contracts ever seen for wind energy. Since the beginning of 2015, there have been more than 4,000 MW of PPAs for wind power signed across 12 states and the District of Columbia. In total, over 14,300 MW of long-term contracts for wind power have been signed since the start of 2013. These PPAs include purchasers such as Amazon, General Motors, Google, Microsoft, Procter & Gamble, Walmart and Yahoo, who are turning to wind energy to provide clean, stably-priced electricity for their operations.

American offshore wind energy is at last becoming a reality, bringing an energy source familiar in Europe to the US for the first time.

In today's rapidly shifting US environmental and energy policy landscape, an important goal of the wind industry is to secure a policy framework that provides certainty to the industry and appropriately values its attributes, including zero emissions power, zero water consumption and electricity price stability. A policy environment that values such attributes will free the industry to realize the DOE's Wind Vision, doubling its contribution by 2020, reaching 20% by 2030, and providing over a third of the nation's electricity by 2050 while saving consumers money.

With input from the American Wind Energy Association (AWEA)

1. http://energy.gov/eere/wind/downloads/2014-wind-technologies-market-report http://
2 www.eia.gov/analysis/requests/powerplants/cleanplan/pdf/powerplant.pdf
3 http://energy.gov/eere/wind/maps/wind-vision
4 https://www.lazard.com/media/2390/lazards-levelized-cost-of-energy-analysis-90.pdf

ABOUT GWEC

OPENING UP NEW MARKETS FOR BUSINESS

GWEC is a member-based organisation that represents the entire wind energy sector. The members of GWEC represent over 1,500 companies, organisations and institutions in more than 80 countries, including manufacturers, developers, component suppliers, research institutes, national wind and renewables associations, electricity providers, finance, insurance companies and law firms.

Our mission is to ensure that wind power establishes itself as the answer to today's energy challenges, providing substantial environmental and economic benefits.

GWEC works with national and international policy makers and industry associations to help open new markets for wind power i.e. UNFCCC, the IEA, international financial institutions, the IPCC and IRENA. GWEC has a proven track record of success in helping to build the wind power industry in emerging markets around the world, including Brazil, China, India, Mexico and South Africa.

MOVE AHEAD INTO NEW MARKETS AND JOIN GWEC TODAY!

> Vaisala's GWEC membership directly supports the growth of our renewable energy measurement and consulting business. Through innovative programs, industry events, and policy development work at international events such as COP21, we view GWEC as a key partner in the growth of our business, the renewable industry and betterment of our planet
>
> **Kjell Forsen, Vaisala CEO**

GWEC MEMBERSHIP BENEFITS

- **Access to first-hand market analysis** – we provide authoritative research and analysis on the wind power markets around the world.
- **Speaking opportunities** at leading industry events attended by government officials and influential industry players
- **Exclusive networking opportunities,** including contacts with companies, national governments and trade associations around the world, which help GWEC members stay one step ahead of the competition.
- **Tailor-made communication** advice and tools for members to optimise global reach as well as target specific emerging markets.
- **Optimisation of your marketing budget** with discounts to events (booths and delegate passes), advertising space with our major industry media partners and on GWEC's communication channels.

Find out more about GWEC's policy work, publications, events and other membership benefits on our website.

www.gwec.net

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we all know

there's no Planet B. Lets make this one better.

Fossil fuels are still a dominant way of generating electricity and for the industrial world to manufacture goods, creating too much CO_2 and polluting the only planet we have – our home!

By joining forces with us, you will add your voice to thousands who, like us, believe that a cleaner, more sustainable world is possible.

HERE ARE SOME OF THE REASONS WHY OTHERS, LIKE YOU AND I, AROUND THE GLOBE ARE JOINING US:

"It helps the world and its people!"
MATHIAS THAMBAIN, BUENOS AIRES, ARGENTINA

"It will help us move to a sustainable energy economy."
JAMES SMITH, KITTY HAWK, NEW YORK CITY, USA

"I believe in a better and sustainable future",
RAMON LOPEZ, MADRID, SPAIN

"It is my life."
HIKARU MATSUMIYA, TOKYO, JAPAN

"We need a better world to live in."
PHILIPS LEMOS, SOROCABA, BRAZIL

"Pollution-free power that can free us of polluting technologies."
V. SUBRAMANIAN, NEW DELHI, INDIA

"It is a lifetime challenge."
HORACIO CACERES, CORDOBA, ARGENTINA

"I believe in a better and sustainable future."
RAMON LOPEZ, MADRID, SPAIN

"It is cheap, safe and helps to protect our planet and civilization!",
BERHARD MÜLLER, SHANGHAI, CHINA

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