GLOBAL WIND REPORT

ANNUAL MARKET UPDATE 2012

GWEC

GLOBAL WIND ENERGY COUNCIL

Table of contents

Local Content Requirements: Cost competitiveness vs. 'green growth'? 4

The Global Status of Wind Power in 2012 8

Market Forecast for 2013-2017 18

Australia 24

Brazil 26

Canada 28

PR China 30

Denmark 34

European Union 36

Germany 38

Global offshore 40

India 44

Japan 46

Mexico 48

Pakistan 50

Romania 52

South Africa 54

South Korea 56

Sweden 58

Turkey 60

Ukraine 62

United Kingdom 64

United States 66

About GWEC 70

FOREWORD

2012 was full of surprises for the global wind industry. Most surprising, of course, was the astonishing 8.4 GW installed in the United States during the fourth quarter, as well as the fact that the US eked out China to regain the top spot among global markets for the first time since 2009. This, in combination with a very strong year in Europe, meant that the annual market grew by about 10% to just under 45 GW, and the cumulative market growth of almost 19% means we ended 2012 with 282.5 GW of wind power globally. For the first time in three years, the majority of installations were inside the OECD. We think that in retrospect this will look like a blip on the graph, but it shows that although we are a maturing industry with an ever-broadening geographic scope, we are still susceptible to major variations in the major markets.

2013 will see that phenomenon played out again, as after a record 2012, US installations will drop dramatically in 2013, but by just how much is the single largest variable facing the industry at the moment. The Production Tax Credit which was extended by the US Congress on New Year's Day means that although the 2012 'boom' will be followed by the inevitable 'bust' in the world's largest economy, there is another boom of sorts on the horizon, probably in 2014. The retrenchment and consolidation of the Chinese market is the other major variable. The Chinese government is very optimistic about a robust recovery in 2013, although we expect it to take some more time; and the industry in the world's most populous country will emerge stronger after having seriously grappled with its grid, quality and safety issues. India's recovery after the lapse of both of its major support schemes will also take some time, with the Indian market probably not returning to significant growth until 2014.

All of this, combined with the wave of policy uncertainty in some key European markets has led us to paint a rather somber picture of the 2013 market, despite exciting new developments in Africa, Latin America and Asia outside of China and India. But the global figures are still primarily determined by the three major markets in Europe, the US and China.

As the market broadens, however, we face new challenges, or rather old challenges, but in new markets. Our special focus chapter looks at the impact of increasing local content requirements and trade restrictions in some of the most promising new markets, and the consequences of that trend for an industry which is still grappling with significant overcapacity and the downward pressure on turbine prices that result.

Finally, however, it must be said that our industry is becoming increasingly mainstream and increasingly competitive in an ever-expanding number of markets. Wind is more and more often the power technology of choice as utilities, energy planners and national governments seek to diversify their energy mix, reduce CO_2 emissions and air pollution, protect their economies from macroeconomic shocks associated with volatile fossil fuel prices, and to build new industries with the investment and employment opportunities that come as part of the package.

This is the eighth annual report on the status of the global wind industry by the Global Wind Energy Council. It provides a comprehensive snapshot of the global industry, now present in about 79 countries, with 24 countries having more than 1,000 MW installed. The data, insights and analysis for the country profiles in this report 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 close cooperation for future editions.

April 2013

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LOCAL CONTENT REQUIREMENTS: COST COMPETITIVENESS VS. 'GREEN GROWTH'?

While the global wind industry has grown enormously, it is still a relatively small player, continuously battered by the forces that govern global trade policy, and in some ways we are stuck between two conflicting imperatives: one, to generate the maximum quantity of clean, carbon free renewable electricity at the lowest possible cost, in order to be competitive with heavily subsidized incumbents in order to phase out feed in tariffs, subsidies, etc; and two, to help bring about 'green growth', which means creating new jobs in manufacturing in the country of the politician who is calling for it.

Fortunately, the nature of the wind business is such that many jobs are created through investment in wind power regardless of where the equipment is manufactured; and the size of the equipment means that at a certain stage and size of market local manufacture makes sense in purely economic terms. The more difficult issues arise in smaller markets which probably do not warrant a full fledged manufacturing industry. Every politician wants to bring a factory to town, but it's just not practical to do it in each case. In principle, of course, we are opposed to anything which hampers the development of the most efficient and cost-effective global supply chain. Political reality, however, is something different.

What follows is a discussion of the increasing use of local content requirements (LCRs) in both established and new markets for renewable energy, with a special focus on markets with commercial wind energy developments.

Background

From the late 1970s through the 1980s, the nascent commercial wind industry was the beneficiary of domestic industrial development policies in a few key OECD markets. However by the mid 1990s, the Uruguay Round of the General Agreement on Tariffs and Trade (GATT) was concluded under the aegis of the new World Trade Organisation (WTO); and the Trade Related Investment Measures (TRIMs) were negotiated by member countries[1]. The disciplines of the TRIMs Agreement focused on discriminatory treatment of imported and exported products.

A 'local content requirement' under the TRIMs refers to a government requiring companies operating in its jurisdiction to source all or part of the components for their manufacturing processes from domestic suppliers. This practice is prohibited under TRIMs Article III:4 – even if it is applied to domestic and foreign enterprises alike, on the grounds that it discriminates against imports in favour of domestic products. The prohibition is based on the 'national treatment' principle embodied in Article III of GATT[2].

In the past decade, we have seen a number of countries, both OECD and Non-OECD, use a wide range of policy mechanisms that include LCR provisions for promoting national green industrial policy strategies. Often the expectation is that LCRs will ensure the expansion of local manufacturing especially when the industry is in its infancy; occasionally the hope is that imposing LCRs will allow for technology transfer in priority sectors; and sometimes the expectation is that a LCR will create 'green jobs' which makes it easier for a government to sell the transition towards 'green economic growth' to their constituents.

In fact, LCRs often put a significant burden on investors and the industry. A central question then arises: how best can governments design their policy frameworks to build domestic supply chains without imposing onerous requirements on clean energy investors and the industries they are seeking to support? In the following section we examine some key case studies to highlight the nature of LCRs and wider circumstances in those markets.

Recent Cases of LCR Use in OECD and Non-OECD Wind Markets

Brazil:
Brazil introduced Local Content Requirements for wind in 2002 under the PROINFA programme, which began operation in 2004. Under PROINFA, local content requirements (so-called 'nationalisation indices') were stipulated for equipment and services of 60%. For a variety of reasons, this programme did not result in either the development of a local industry, or substantial growth in the wind market.

However, in the regulated procurement environment of the auctions, protectionist measures were introduced in the guidelines approved for the wind energy reserve tender in 2009. These included a stipulation prohibiting the import of wind turbines with nominal capacity below 1.5 MW (see Art. 3 of the MME Portaria No. 211, 28 May 2009, in the draft introduced by Portaria No. 242, 25 June 2009). This reduced

the restriction that had initially been set for wind turbines smaller than 2 MW.

Nevertheless, there are no similar measures to be found in the Portarias approving the guidelines for the subsequent auctions, and no nationalisation index is required to take part in this tendering process. However, the nationalisation index of 60% remains as a condition to access funding from the Brazilian Development Bank (BNDES), and since BNDES financing comes at a much lower cost, this condition established a *de facto* local content requirement similar to the ones stipulated under PROINFA and the rules for the wind-only auction in 2009.

The immediate result of this has been a rapid expansion of the local supply chain, attracting manufacturers who have become eligible for BNDES funding by fulfilling the local content requirements, as well as meeting deadlines for implementation and other conditions.

In addition, BNDES is indicating that it is likely to impose higher LCR rules in the near future. This will place onerous requirements on the wind manufacturing industry in Brazil and certainly drive up prices.

Brazil was in a position to take advantage of its exceptional wind resource due to a unique combination of factors including high quality resource, oversupply in the global wind market and downward pressures on costs in the industry. This was supported by regular auctions that have created a robust pipeline, bringing about economies of scale and a degree of long-term demand stability for wind power in the domestic market.

Brazil's national energy planning agency's (EPE) latest 10-year plan covering 2012-2021 forecasts 16 GW of installed wind capacity by the end of that period. In order to reach it, Brazil would need to contract 1.4 GW each year from 2013 until 2018 – as a minimum three-year and maximum of five-year construction period is required under the auction rules[3]. However, it remains to be seen whether the new BNDES requirements will slow down this process, how much they will drive up prices, and whether or not they will ultimately be challenged internationally.

Denmark © *Bent Nielsen and Danish Wind Industry Association*

Canada:

Ontario's Green Energy and Green Economy Act of 2009 (GEA) established a feed-in-tariff programme that offered payments for renewable energy power generation above market prices. The 2009 Act also introduced a local content requirement for solar and wind energy, known as "Buy Local" conditions.

The LCR provisions ensconced within Ontario's GEA developed into one of the high-interest cases whose details have been followed closely by the wind industry over the past two years.

Under Ontario's LCR, wind and solar electricity generators were obliged to use an increasing percentage of equipment sourced in Ontario in order to secure a feed-in-tariff contract: for solar power generators, the LCR was set at 60%, and for onshore wind power generators the threshold was set at 50%.

In the same year, the EU and Canadian government began negotiations on a Comprehensive Economic and Trade Agreement (CETA), wherein the EU highlighted the Green Energy Act as a barrier to trade. Negotiations were begun on the broader agreement including the GEA.

In 2010, Japan requested consultations with Canada through the WTO, flagging that the provisions of the GEA were inconsistent with the national treatment provisions under the TRIMs.

Bozcaada, Turkey © Turkish Wind Energy Association (TUREB)

Eventually, in 2011, Japan asked the WTO to establish a formal dispute resolution panel. Thereafter the EU lodged its own complaint with the WTO over the GEA local content requirement.

In late 2011, the European Wind Energy Association made a submission to the European Commission in support of the EU's challenge of the Ontario LCR. The submission highlighted the general inefficiency introduced by the LCR and the higher costs incurred by the wind industry, especially European OEMs. The submission urged the EU to ensure that local content requirements did not become established in non-EU markets, as LCRs were occurring in a number of non-EU markets in various forms and were complicating the efforts of European manufacturers and component suppliers to access these markets.

In March of 2012, the WTO launched formal public hearings on the matter. In May 2012, Canadian civil society and labour unions also filed their submissions with the WTO in support the Canadian government's defense of the Act.

In December of 2012, the WTO found that local content rules under the GEA 2009 violated non-discrimination clauses in the GATT and the agreement on TRIMs. Although this ruling was welcomed by the wind industry, it was not the end of the process. In February of 2013, the Canadian government notified the WTO of its intent to appeal the ruling against Ontario's GEA.

Although one can get lost in the legalese of the process for resolving international trade disputes, what is germane here is the demonstrable and inherent inefficiency of the local content requirement rules in a world where supply chains are globalized and manufacturers are seeking to restrict cost escalations for competing with highly subsidized conventional power generation.

China:

The Chinese government used local content requirements as leverage to spur international wind turbine manufacturers and component suppliers towards localization of their production facilities and supply chains.

There was a great deal of interest in the policy measures that China introduced between 2003 and 2009. These incentives and policy choices prompted its domestic market to go from being a nascent small-scale WTG manufacturing country to hosting four of the global top ten WTG manufacturers at the end of 2011.

In most media and research publications there seems to be a consensus about the effectiveness of the Chinese mix of financial incentives, a local content requirement and the benefits of the Clean Development Mechanism of the Kyoto Protocol, for being the drivers for making its limited domestic wind industry into the largest market in the world, both in terms of manufacturing and installed capacity.

The first government scheme that introduced the LCR was called the 'Ride the Wind' Program in 1997, which included a 20% LCR for two joint ventures. However the main growth period began after the introduction of the national Renewable Energy Support Law at the beginning of 2006 and continued up through 2009, after which the national feed-in-tariff scheme was introduced and the LCR was abolished.

The requirements began in 2003 by requiring 50% LCR, which increased to 70% in 2004. In selecting winning projects under these rules, LCR percentages (above the minimum standards of 50-70%) were a key basis of the evaluation. Under this scheme the tendered projects could get a score from 0.20 in 2005 to 0.35 in 2007 (out of a total of 1.0) for complying with the LCR. By 2007 the 70 % LCR applied to all wind farms being developed in China. Although the LCR for tendered projects

was not mandatory, since the LCR score counted for 20-35% of the final evaluation of the bid, it was nearly impossible to win a bid without complying (Wang, 2009[4]).

Although China used LCR for promoting its wind industry, the underlying factors that allowed this tool to be successful were extraordinarily diverse. China has an enormous domestic wind energy resource, which is estimated at between 700 and 1200 GW exploitable capacity onshore and offshore (GWEC 2012). But most important is the enormous size of the market due to its large population, large manufacturing industry and (formerly) export- driven economy, as well as the world's largest (and growing) electricity consumption.

Given this combination of factors, China was in a position to provide stable long-term demand for wind turbines in the domestic market, under which establishing local manufacturing made business sense, regardless of the requirement.

Does LCR have no purpose today or is it also a question of design?

In submissions from the wind industry, the broader literature, and media coverage of LCR, it appears that LCR can work, but only when the proportion of required domestic content has been gradually phased in.

Lewis and Wiser see a role for LCR only if it is introduced progressively, in stable markets with sufficient potential. Otherwise, domestic and foreign investors and manufacturers will not be keen on investing in domestic manufacturing. In addition to market stability, they see a sufficient market size as an important precondition to generate welfare effects from the use of LCR[5].

At the end of the day, LCRs can have the desired effect, but only when governments offer a stable, long-term, fixed volume policy and clear incentives for wind power generation. If such demand is not there, the higher costs as a result of LCR tend to keep potential investors out of the market and growth is severely constrained.

2013 – 2020: Time for a Local Content Incentive?

Most governments and policy makers tend to perceive local content requirements as a means to create new green jobs and promote local manufacturing capacity and supply chains. Although local content requirements may seem appealing, the long-term impacts are usually unclear, and whether or not they achieve the desired result is more a side-effect of other policy, and they may contravene international trade laws.

In summary, heavy-handed policy design approaches like the LCR tend to distort the market, raise prices, and delay clean energy investments. Perhaps a basic re-think is needed, especially in the field of clean energy technologies. Further, current over-capacity in wind turbine manufacturing means that fulfillment of LCRs merely exacerbates an already severe problem. Ideally, of course, we would like unfettered trade in renewable energy technologies, but we're a long way from that.

Perhaps a middle ground could be found. The local content approach for promoting domestic production and employment opportunities can be brought about by a positive incentive scheme, perhaps incentivizing local content through manufacturing tax credits, or an adder on top of the FIT for locally sourced components?

But in the interim, the top-down enforcement of LCR is likely to do more harm than good for both the local and the international wind industry and our outlook for a sustainable clean energy future.

With input from Sean Whittaker (IFC), Elizabeth Salerno (AWEA), Pierre Tardieu (EWEA) and JF Nolet (CanWEA)

1 The compromise that eventually emerged from the negotiations is essentially limited to an interpretation and clarification of the application to trade-related investment measures of GATT provisions on national treatment for imported goods (Article III) and on quantitative restrictions on imports or exports (Article XI). Thus, the TRIMs Agreement does not cover many of the measures that were discussed in the Uruguay Round negotiations, such as export performance and transfer of technology requirements. The term "trade-related investment measures" ("TRIMs") is not defined in the Agreement. However, the Agreement contains in an annex an Illustrative List of measures that are inconsistent with GATT Article III:4 or Article XI:1 of GATT 1994. www.wto.org

2 TRIMs Article III: 4 states that "the products of the territory of any contracting party imported into the territory of any other contracting party shall be accorded treatment no less favourable than that accorded to like products of national origin in respect of all laws, regulations and requirements affecting their internal sale, offering for sale, purchase, transportation, distribution or use." www.wto.org

3 Brazil wind sector eyes 2013 demand, 01-04-2013, RechargeNews http://www.rechargenews.com/wind/article1322100.ece

4 Wang, Bo. "Can the CDM bring technology transfer to developing countries? An empirical study of technology transfers in China's CDM projects." The Governance of Clean Development, 2009 http://www.uea.ac.uk/international-development/research/gcd/Wang+2009

5 Lewis, Joanna, and Ryan Wiser. "Fostering a Renewable Energy Technology Industry." Environmental Energy Technologies Division, Ernesto Orlando Lawrence Berkeley National Laboratory,2005, 30

THE GLOBAL STATUS OF WIND POWER IN 2012

The 2012 global wind power market grew by more than 10% compared to 2011, and the nearly 45 GW of new wind power brought on line represents investments of about € 56 billion[1].

The new global total at the end of 2012 was 282.5 GW, representing cumulative market growth of more than 19%, an excellent industry growth rate given the economic climate, even though it is lower than the annual average growth rate over the last 10 years of about 22%.

At the end of 2011, the expectations for wind power market growth were mixed, as continued economic slowdown in Europe and the political uncertainty in the US made it difficult to make projections for 2012. Nevertheless 2012 turned out to be a record year for wind power installations in the traditional markets of North America and Europe.

Conversely, China the largest market for wind since 2009, saw a slower market, which meant that the US regained the top spot in 2012. But installations in Asia still led global markets, with North America a close second, and Europe not far behind.

A result of this was that in 2012 the majority of wind installations globally were inside the OECD for the first time since 2009. This outcome was largely a result of the exceptionally robust US market combined with a stronger than expected European market.

By the end of last year the number of countries with more than 1,000 MW installed capacity had risen to 24: including 16 in Europe[2]; 4 in Asia-Pacific (China, India, Japan & Australia); 3 in North America (Canada, Mexico, US) & 1 in Latin America (Brazil).

Looking ahead, the picture is complex across various regions. Although the Production Tax Credit has been renewed for one more year (effectively almost 2 years) in the US, the broader market conditions and politics may impact the level of support available to renewables in the country in the short to medium term. Europe's framework legislation and its 2020 targets ensure a degree of stability, but a recent wave of policy uncertainty combined with the on-going sovereign debt crises mean that the outlook for the 2013 market is uncertain.

Market consolidation and rationalisation in China, and a lapse in policy in India were the main reasons for the significant slowdown in Asia in 2012, but these conditions are expected to be short-lived, and Asian dominance of global wind markets is expected to continue. Canada, Brazil and Mexico are expected to have strong years in 2013, and a few hundred megawatts from sub-Saharan Africa will come online for the first time: in South Africa, Ethiopia and possibly Kenya; and global installations will be further augmented by new projects coming on line in Mongolia, Pakistan, the Philippines and Thailand.

Asia: China and India continue to lead

For the fifth year in a row, Asia was the world's largest regional market for wind energy, with capacity additions totaling just over 15 GW.

In terms of annual installations **China** ceded its leadership position to the US this year, albeit with less than 200 megawatts difference between them. China added 12.96 GW of new capacity in 2012, a significant drop when compared to the exceptional annual installation figures for the past three years.

In 2012, wind-generated electricity in China amounted to 100.4 billion kWh, accounting for 2% of the country's total electricity output last year, up from 1.5% in 2011[3].

The Chinese market almost trebled its capacity from 25.8 GW in 2009 to reach 75.3 GW by the end of 2012, allowing China to continue maintaining its lead in terms of global cumulative installed wind power capacity. By the end of 2012, wind energy was the third largest source of electricity after thermal and hydropower in China, surpassing nuclear during the course of the year.

The astonishing growth of China's wind sector since 2006 has managed to surprise even many optimists in the industry, but the Chinese wind power market is now beginning to enter a more steady development and refinement stage. The pace of growth in the Chinese wind energy market has for now outstripped the ability of the grid and system operators to manage it. Curtailment of electricity generation has become the new challenge for wind power.

According to a recent announcement, China's National Energy Administration (NEA) expects installations of about 18 GW of

Global installed wind power capacity (MW) – Regional Distribution

AFRICA & MIDDLE EAST	End 2011	New 2012	Total (End of 2012)
Tunisia	54	50	104
Ethiopia	-	52	52
Egypt	550	-	550
Morocco	291	-	291
iran	91	-	91
Cape Verde	24	-	24
Other [1]	23	-	23
Total	1,033	102	1,135
ASIA			
PR China	62,364	12,960	75,324
India	16,084	2,336	18,421
Japan	2,536	88	2,614
Taiwan	564	-	564
South Korea	407	76	483
Pakistan	6	50	56
Other [2]	109	-	108
Total	82,070	15,510	97,570
EUROPE			
Germany	29,071	2,415	31,308
Spain	21,674	1,122	22,796
UK	6,556	1,897	8,445
Italy	6,878	1,273	8,144
France	6,807	757	7,564
Portugal	4,379	145	4,525
Denmark	3,956	217	4,162
Sweden	2,899	846	3,745
Poland	1,616	880	2,497
Netherlands	2,272	119	2,391
Turkey	1,806	506	2,312
Romania	982	923	1,905
Greece	1,634	117	1,749
Ireland	1,614	125	1,738
Austria	1,084	296	1,378
Rest of Europe [3]	3,815	1,106	4,922
Total Europe	97,043	12,744	109,581
of which EU-27 [4]	94,352	11,895	106,041
LATIN AMERICA & CARIBBEAN			
Brazil	1,431	1,077	2,508
Argentina	113	54	167
Costa Rica	132	15	147
Nicaragua	62	40	102
Venezuela	-	30	30
Uruguay	43	9	52
Carribean [5]	271	-	271
Others [6]	229	-	229
Total	2,280	1,225	3,505
NORTH AMERICA			
USA	46,929	13,124	60,007
Canada	5,265	935	6,200
Mexico	569	801	1,370
Total	52,763	14,860	67,576
PACIFIC REGION			
Australia	2,226	358	2,584
New Zealand	623	-	623
Pacific Islands	12	-	12
Total	2,861	358	3,219
World total	**238,050**	**44,799**	**282,587**

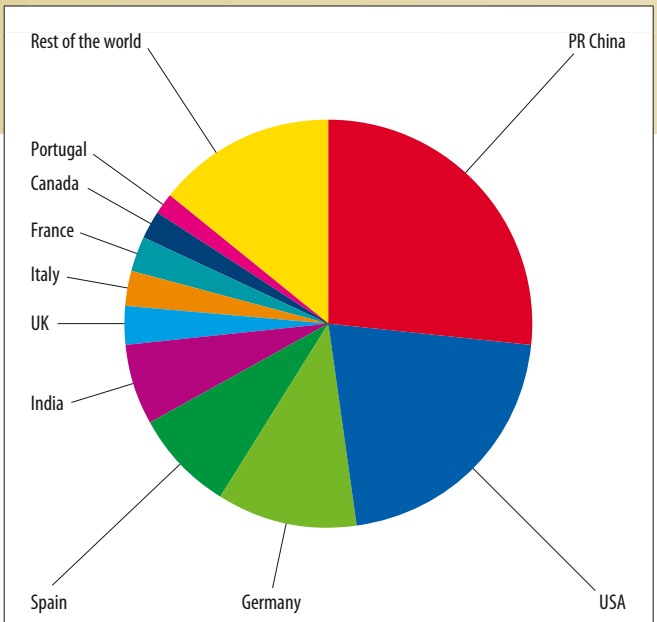
1 Israel, Jordan, Kenya, Libya, Nigeria, South Africa
2 Bangladesh, Indonesia, Philippines,Sri Lanka,Thailand, Vietnam
3 Bulgaria, Croatia,Cyprus, Czech Republic, Estonia, Finland, Faroe Islands, FYROM, Hungary, Iceland, Latvia, Liechtenstein, Lithuania, Luxembourg,Malta,Norway, Romania, Russia, Switzerland, Slovakia, Slovenia, Ukraine
4 Austria, Belgium, Bulgaria, Cyprus, 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, Dominican Republic, Guadalupe,Honduras, Jamaica, Martinica
6 Colombia,Chile,Ecuador,Peru

** *Provisional Figure*

Please note: Project decommissioning of approximately 263 MW and rounding affect the final sums

Source: GWEC

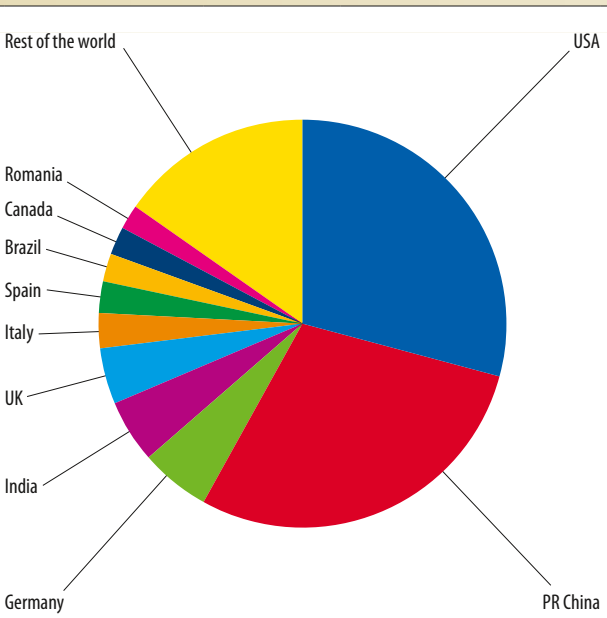
Top 10 Cumulative Capacity (December 2012)



Country	MW	% SHARE
PR China	75,324	26.7
USA	60,007	21.2
Germany	31,308	11.1
Spain	22,796	8.1
India	18,421	6.5
UK	8,445	3.0
Italy	8,144	2.9
France	7,564	2.7
Canada	6,200	2.2
Portugal	4,525	1.6
Rest of the world	39,853	14.1
Total TOP 10	242,734	85.9
World Total	**282,587**	**100.0**

Source: GWEC

Top 10 New Installed Capacity (Jan-Dec 2012)



Country	MW	% SHARE
USA	13,124	29.3
PR China	12,960	28.9
Germany	2,415	5.4
India	2,336	5.2
UK	1,897	4.2
Italy	1,273	2.8
Spain	1,122	2.5
Brazil	1,077	2.4
Canada	935	2.1
Romania	923	2.1
Rest of the world	6,737	15.0
Total TOP 10	38,062	85
World Total	**44,799**	**100.0**

Source: GWEC

new wind power capacity in 2013. In the meantime, however, the NEA and State Grid are working to solve the transmission bottlenecks and other grid issues. The NEA is also actively encouraging wind farm development in lower wind zones that are closer to load centers.

India today is a key market for the wind industry, presenting substantial opportunities for both international and domestic players. Although in 2011 the Indian wind sector experienced its strongest annual growth ever, with over 3 GW of new installations, 2012 was a slower year due to a lapse in policy.

Nonetheless, India saw new wind energy installations reach 2,336 MW by the end of 2012, for a cumulative total of 18,421 MW. This pace of growth kept the Indian wind power market firmly in the top five rankings globally. As of January 2013, total wind installations had risen to 18,552 MW bringing total renewable energy installations in the country to 26,920 MW[4].

By the end of 2012, renewable energy accounted for over 12 % of total installed capacity, and about 6% of electricity generation, up from 2% in 1995. Wind power accounted for about 69% of total renewable energy capacity or about 8% of the total installed capacity[5] in India. With the acute need for electrification and rising power consumption in the country, wind energy is going to provide an increasingly significant share of India's electricity supply.

While the rest of Asia did not make much progress in 2012, there are some favourable signs on the horizon. The **Japanese** market saw new installations of 88 MW in 2012 to reach a cumulative capacity of 2,614 MW. This represents around 0.5 % of the total power supply in Japan. After the Fukushima accident in March 2011, 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 a long time.

Wild Horse Wind Power Project, Kittitas County, Washington state. Total generating capacity 228.60 MW *© American Wind Energy Association (AWEA)*

Offshore wind development is a promising prospect for the future.

The Government of **South Korea** has made "green growth" one of its national development priorities. Although wind power is still a relatively young energy generation technology in South Korea, there were 76 MW of new onshore installations in 2012, which brought the total installed capacity to 483 MW. A Renewable Portfolio Standard was introduced in 2012, which is likely to expedite the development of new wind projects in the future, and the government expects this to yield more than 15 GW of new wind power by 2022.

Finally, 2012 saw **Pakistan** commission its first large-scale commercial wind farm of 50 MW in the province of Sindh. The total installed capacity reached 56 MW by the end of 2012. While this is a small development, it is the harbinger of major developments to come. Almost 150 MW of new capacity is under construction currently and projects totaling 700 MW are likely to achieve financial closure by the end of 2013.

The first commercial wind farm of 50 MW will be commissioned this summer in **Mongolia**. As for the rest of Asia, we expect new projects to come on line in Thailand and the Philippines in 2013.

North America: Record US installations

Uncertain federal policies in the **US** have caused a 'boom-bust' cycle in wind energy development for over a decade. Nonetheless the US wind energy industry had its strongest year ever in 2012, making it the market leader in terms of new wind installations globally. The US connected over 13.1 GW of new wind power capacity from 190 projects, which leveraged $25 billion (€ 19 billion) in private investment. The country now is home to 60 GW of total wind power capacity, up from 46.9 GW in 2011.

In 2012, wind energy was the largest source of new US electricity generation, providing some 42% of all new capacity. In fact, 2012 was a robust year for all renewables, as together they provided over 55% of all new generating capacity in the country.

An unprecedented 8.4 GW of wind power was installed in the fourth quarter alone, making it the strongest quarter in the country's long wind power history. This was due in large part to impending expiration of the federal Production Tax Credit (PTC). It was slated to end on December 31, 2012, but was extended by Congress on January 1, 2013, as part of the 'fiscal cliff package,' or the American Taxpayer Relief Act of 2012. The '13th hour' extension of the tax credit means that although the

Wind farm Mojave Desert, US © *Reinhard Tiburzy*

US market will slow substantially in 2013, it is unlikely to be as much of a slowdown as was expected, and the nature of the extension bodes well for the 2014 market.

In terms of new capacity added in 2012, Texas again led the Top-5 rankings with 1,826 MW, followed by California (1,656 MW), Kansas (1,440 MW), Oklahoma (1,127 MW) and Illinois (823 MW). As of February 2013, 29 of the 50 states have Renewable Portfolio Standards, and seven states have renewable energy goals.

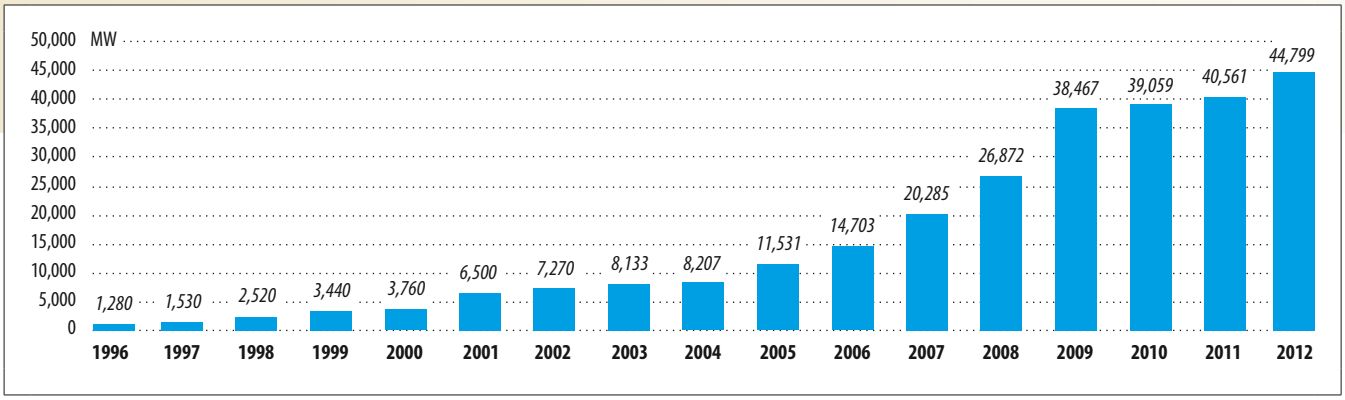
A total of 66 utilities bought or owned wind power in 2012, a significant increase from 42 in 2011. New wind power purchasers last year included at least 18 industrial buyers, 11 schools and universities, and 8 towns or cities, showing a significant trend toward non-traditional power purchasers.

Canada saw 935 MW of new wind capacity come online, making it the ninth largest market in 2012. Compared to 1,267 MW in 2011, Canada's wind power market saw a slight slowdown in 2012, but it was still the second best year ever.

Ontario leads in wind energy installed capacity with more than 2,000 MW now supplying over 3% of the province's electricity demand. The Canadian industry expects to see a record year in 2013 for new installations with the addition of almost 1,500 MW of new capacity that will drive over $3 billion (€ 2.3 billion) in new investments. Ontario and Quebec are expected to lead in new wind energy installations. New contracts were also awarded in 2012 for projects in Saskatchewan, Nova Scotia and Prince Edward Island.

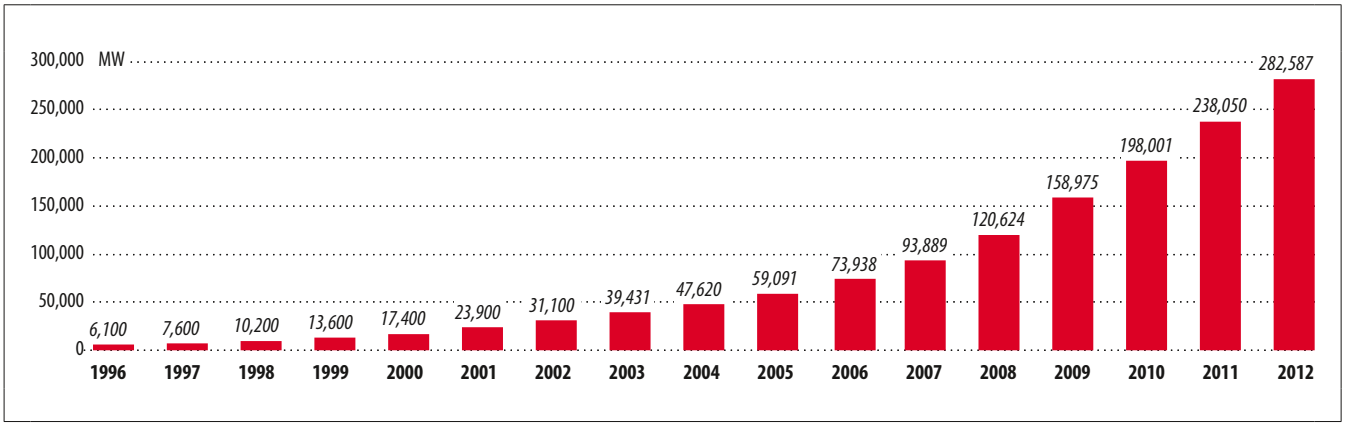
Mexico more than doubled its installed capacity in 2012, installing 801 MW for a total of 1,370 MW joining the list of countries (now 24) with more than 1,000 MW of wind power capacity.

Global Annual Installed Wind Capacity 1996-2012



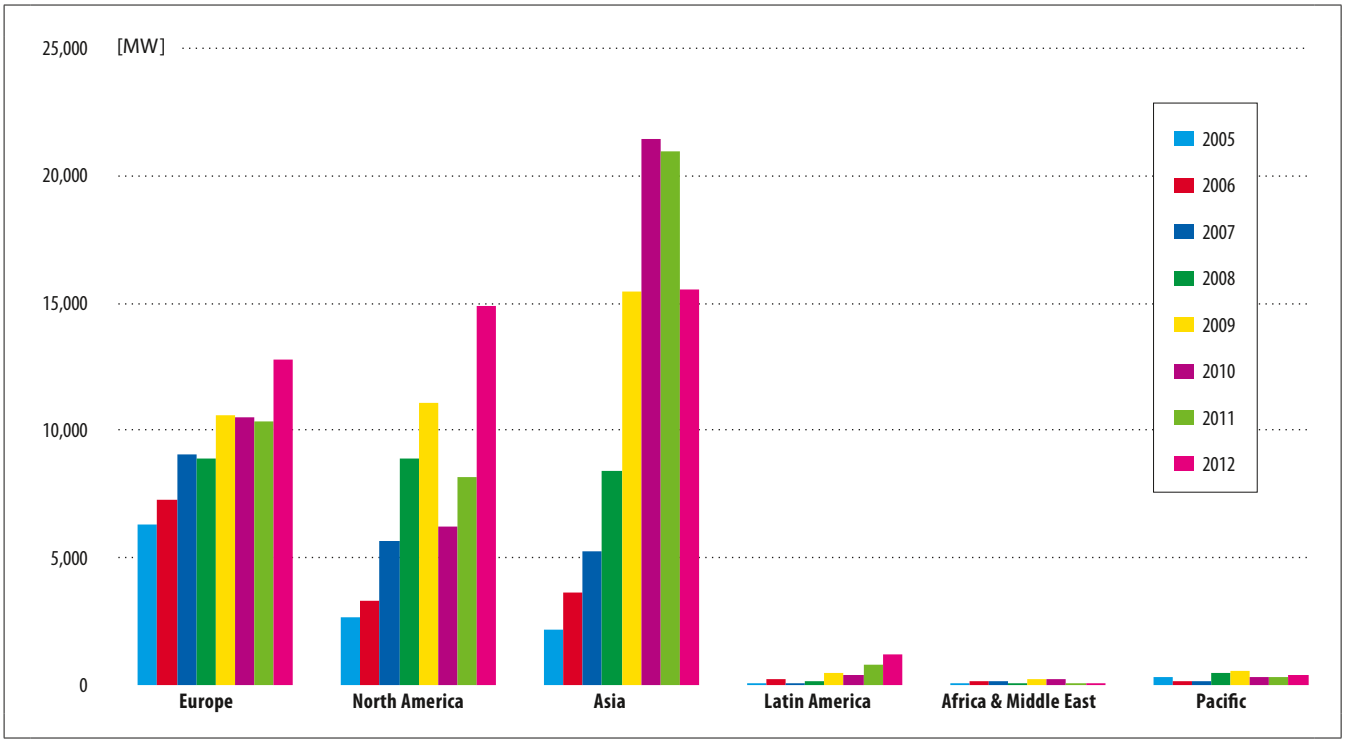
Source: GWEC

Global Cumulative Installed Wind Capacity 1996-2012



Source: GWEC

Annual Installed Capacity by Region 2005-2012



Source: GWEC

Europe: Stronger than expected market

During 2012, 12,744 MW of wind power was installed across **Europe**, with European Union countries accounting for 11,895 MW of the total. However, the 2012 figures reflect orders made before the wave of political uncertainty that has swept across Europe since 2011, which is having a negative impact on the wind energy sector.

Wind energy represented 26% of all new EU power capacity installed last year, and investments of between €12.8 billion and € 17.2 billion. Wind is now meeting 7% of Europe's electricity demand, up from 6.3% at the end of 2011 and 4.8% in 2009.

Last year, wind energy installations were led by Germany (21% of all new wind power capacity), the UK (16%), Italy (11%), Romania (8%) and Poland (8%). In terms of total installed capacity, Germany leads again (30% of total wind power capacity), followed by Spain (22%), the UK (8%), Italy (8%) and France (7%).

Currently, the wind industry is being hit by the economic crisis and austerity measures being implemented across Europe. The year ahead will be tough, but the long-term prospects for the wind industry are bright, with European Commission and GWEC scenarios showing wind energy as the leading power generation technology by 2050.

However, the most important long-term signal that the EU can give to investors now is the formalization of 2030 Renewable Energy Targets. Overall, the EU is almost 2 GW (1.7%) under its National Renewable Energy Action Plan forecasts for 2012. 18 Member States are falling behind, including the Czech Republic, France, Hungary, Greece, Portugal and Slovakia.

The **German** wind energy market continued its steady growth in 2012. The German wind industry expects to be able to provide a stable outlook for 2013 as well. However, the latest plans for reforming the feed-in tariffs for renewable energy proposed by Environment Minister Peter Altmaier could negatively impact investor confidence in future wind projects in Germany[6].

The other concern of the wind industry was the lack of clarity on interconnection rules for offshore projects. German offshore wind projects saw 16 new wind turbines with a capacity of 80 MW connect to the grid in 2012, bringing the total number of wind turbines in the German part of the North and Baltic Seas to 68 with a combined capacity of 280 MW. Last year, approximately 109 foundation structures were installed in the sea while 6 large offshore wind farms are currently under construction. In the coming months the market should be able to better determine whether the difficulties surrounding grid connection for offshore wind farms have been satisfactorily resolved through the latest clarification of liability issues.

The **United Kingdom** has the best wind resources in Europe, and installed 1,897 MW in 2012 – 16% of all new wind capacity in Europe, 1,043 MW onshore and 854 MW offshore. This puts the UK 2nd in terms of new deployment last year and the UK's wind energy output increased by 33% in 2012 compared to the previous year. Overall wind power generated 5.5% of the UK's electricity needs in 2012, up from 4% in 2011[7].

In a recent move, the UK government tabled an amendment to the Energy Bill, which would require the Government to set a decarbonisation target for the power sector in April 2014. If the amendment were to be introduced, it would limit the maximum amount of carbon emitted from 2030 onwards. The currently recommended limit is of 50 grams / kWh or 90% lower than current levels[8]. RenewableUK, the UK's renewable energy trade association stated that this would secure more than 76,000 jobs in the wind industry by 2021, and have a transformative impact on the UK manufacturing sector.

Another regional development that will have long-term positive outcomes for the wind industry was the signing of the MOU between the Irish and UK governments in January 2013. The MOU will initiate detailed analysis of how Irish renewable energy resources, onshore and offshore, might be developed to the mutual benefit of Ireland and the UK[9]. Based on this analysis, the parties will develop an inter-governmental agreement for signing by 2014.

Italy now has a total installed capacity of 8,144 MW, up from 6,737 MW in 2011; and is the seventh largest wind market globally. The financial crisis and backtracking on renewable energy support legislation in **Spain** meant that installations dropped to 1,112 MW, with no prospects of recovery in the near future. **France**'s wind capacity is growing steadily and has now reached 7,564 MW. The French government has called for 25 GW by 2020, but at this stage it looks like it will be hard pressed to deliver on this target.

noa Quebrada Wind Farm, Ceará, Brazil © ABEEolica'

Latin America: Led by the Brazilian boom

Wind power is now finally reaching critical mass in a number of Latin American markets, and the region has begun developing a substantial wind power industry to complement its rich hydro and biomass (and potentially solar) resources. In the medium to long-term, the demand for energy security and diversity of supply is expected to foster the growth of wind power in Latin America.

For the first time the Latin American market installed over 1 GW of new capacity. Last year six markets in the region installed 1,225 MW of new wind capacity for a total installed capacity of just over 3.5 GW.

Brazil led Latin America with 1,077 MW of new capacity, pulling the country into the small club of wind energy markets with annual installations of over 1 GW globally. Brazil has a strong pipeline of almost 7 GW to be completed by 2016.

Brazil is one of the most promising onshore markets for wind energy, for at least the next five years. The country's support framework and the sector's experience have been adapted to meet local conditions. This puts Brazil in an excellent position to be the regional leader in wind energy generation and development. However, achieving sustained development requires a new regulatory framework, which would provide certainty in terms of development volumes in the medium and long term, legal security in the processing of projects, and a support system, which would further enhance competitiveness. Current government projections foresee 16,000 MW of wind power installed in the country by the end of 2021.

Argentina added 54 MW of new capacity last year to bring its total installed capacity up to 167 MW. Argentina is a promising market, which has massive wind resources. A number of wind power projects are under development, and they are needed to help alleviate chronic electricity shortages in the country. Some analysts claim that the winds in Argentina are sufficient to supply Latin America's entire electrical demand seven times over.

2012 marked the commissioning of **Venezuela**'s first commercial wind farm of 30 MW. **Uruguay** added to its total tally with the commission of 9 MW of new capacity, bringing its total installed capacity up to 52 MW.

In Central America and the Caribbean, Nicaragua and Costa Rica added new capacity. **Nicaragua** installed 40 MW, bringing its total tally up to 102 MW, and 15 MW was installed in **Costa Rica**, which brought its total tally up to 147 MW.

Pacific: Australia continues to lead

The region saw its total installed capacity cross the 3 GW mark last year. The **Australian** market added 358 MW in 2012 (up from 234 MW in 2011), bringing the total installed capacity up to 2,584 MW. New Zealand currently has one 60 MW project under construction, but flat power demand means that there is no market for the 1500 MW or so of new wind projects which have been consented.

According to recent research conducted by Australia's Clean Energy Council, wind farms have reportedly generated more than A$ 4 billion in investment in Australia since their introduction[10].

The Australian Government's Renewable Energy Target Scheme is designed to deliver 20% of Australia's electricity supply from renewable sources by 2020. The Large-scale Renewable Energy Target and the Small-scale Renewable Energy Scheme provide incentives designed to bridge the gap between the price of black electricity and renewable energy, and are expected to yield more than 45,000 GWh in 2020.

Australia last year started charging its biggest polluters a price of A$23 (€18.2) a metric ton for their carbon emissions to discourage the use of fossil fuels and fight climate change. In August 2012, the Australian government and the European Commission reached an agreement to link their carbon trading platforms in a shared marketplace[11].

However, the most interesting piece of news in 2012 was that wind is now cheaper than fossil fuels in producing electricity in Australia. According to a recent Bloomberg New Energy Finance report[12], a new wind farm in Australia can supply electricity at a cost of A$80 (€ 64) per MWh, compared with A$143 (€ 114) a MWh from a new coal-fired power plant or A$116 (€ 92) from a new station powered by natural gas when the cost of carbon emissions is included.

Scroby Sands Offshore Wind Farm, Great Yarmouth, UK © *RenewableUK*

Africa and the Middle East

Africa and the Middle East are beginning to exploit their enormous wind power potential, although growth in 2012 was still small in absolute terms, with just over 100 MW installed across the region. However, several countries have announced long-term plans for installing large quantities of commercial scale wind power; this includes **South Africa, Ethiopia, Morocco, Kenya** and **Saudi Arabia**, among others.

Africa's wind resource is best around the coasts and in the eastern highlands, but until last year it was in North and East Africa that wind power has been developed at scale. This, too, is where current national policies are set to grow the sector further. At the end of 2012, over 98% of the region's total wind

installations of just over 1,135 MW were to be found across six countries - Egypt (550 MW), Morocco (291 MW), Tunisia (104 MW), Ethiopia (52 MW), Iran (91 MW) and Cape Verde (24 MW).

2012: An Exceptional year under stressful conditions

In an increasingly tight market, with tremendous downward pressure on prices through oversupply in the turbine market; fierce competition with 'cheap' gas; and a wave of downward revisions to support mechanisms in an austerity driven economic landscape; the industry continues to be challenged to compete on a price basis directly with heavily subsidized fossil fuel and nuclear energy plants. Having said that, all the fundamental drivers for wind power development still hold, and there is a need around the world for new power generation, which is clean, affordable, indigenous, reliable and quick to install.

1 Exchange rates used in this chapter are from 11-03-2013
2 See http://www.ewea.org/fileadmin/files/library/publications/statistics/Wind_in_power_annual_statistics_2012.pdf
3 http://english.peopledaily.com.cn/90778/8109836.html Accessed on 03-03-13
4 http://mnre.gov.in/mission-and-vision-2/achievements/ Accessed on 03-03-13. The month of January in 2013 saw total wind installations of 131.3 MW
5 http://www.cea.nic.in/reports/monthly/executive_rep/dec12/1-2.pdf Accessed on 03-03-13
6 http://www.rechargenews.com/magazine/article1318231.ece Accessed on 04-03-13
7 DECC (2013) Accessed on 03-03-2013 https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/120641/Press_Notice_Feb_2013.pdf
8 The exact amount would be set based on advice from the independent body set up to advise Government, the Committee on Climate Change.
9 https://www.gov.uk/government/news/energy-trading-creates-opportunities-for-ireland-uk-davey-rabbitte
10 http://www.abc.net.au/rural/news/content/201303/s3702991.htm
11 Beginning 1 July 2015, Australia's carbon pricing scheme will be linked to the EU's Emissions Trading System (ETS) under an interim link that will synchronise carbon prices in the two markets and allow for global permit trading. A full linkage is scheduled to take place no later than January of 2018.
12 http://www.bloomberg.com/news/2013-02-06/australia-wind-energy-cheaper-than-coal-natural-gas-bnef-says.html

MARKET FORECAST FOR 2013-2017

Wind power turbines on a hill in morning © *Porojnicu Stelian.*

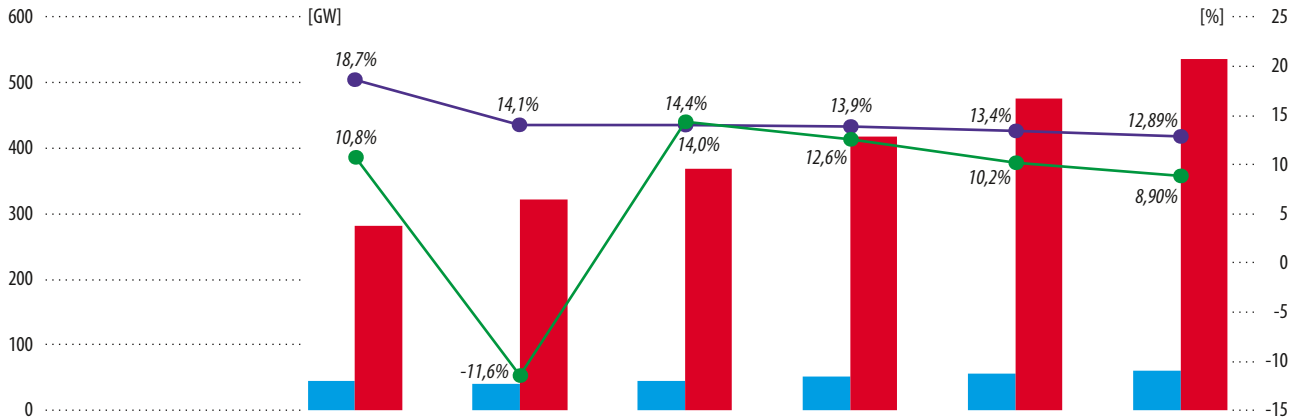
The wind industry continues to diversify geographically, with significant new activity in Latin America, Africa and Asia outside of China and India; but it is still the ups and downs of the major markets which are the main determinants of global market growth. Continued uncertainty over the short term development of the global economy with all its regional and national variations, and its effect on electricity demand growth are major variables to contend with when looking at the wind industry's development over the next five years, and although we continue to watch closely the development of national and regional carbon markets, given the state of the global climate negotiations, climate policy and carbon markets are unlikely to have a significant effect on global development in the next five years.

As ever, policy at the national level is the most significant factor driving the market. The Production Tax Credit (PTC) in the United States was extended on 1 January 2013 for one year, with the critical proviso that it will cover projects which have broken ground during 2013, not only those which are connected to the grid. But what happens after 2014? While it seems clear that the current wave of policy uncertainty sweeping through many European markets is going to have an effect on 2013, and perhaps 2014, what next? What about the post 2020 target discussion in Europe? How long will China's consolidation phase last before the market returns to significant growth? Will India's 'policy gap' be rectified in a timely enough fashion to bolster the 2014 market?

These are some of the many questions that need to be considered when looking at the industry's near term future. In addition, one has to expect the downward pressure on turbine prices because of sluggish markets and manufacturing overcapacity to continue. How long before we return to a reasonable balance between supply and demand, and at what cost to the manufacturing supply chain?

The 2012 market saw the US return to the top of the league table. Installing an incredible 8.4 GW in the fourth quarter in anticipation of the expiration of the PTC, the US installed 13,124 MW, eking out China, which at 12,960 MW had its lowest level of installations since 2008. Combined with an exceptionally strong year in Europe, the market was much more reasonably balanced between the three major regions (Asia, North America and Europe) than at any point in the last several years, and while Asia was still the leading region, it did not enjoy the dominance that characterized the 2010 and 2011 markets.

Looking back at last year's annual market update, we were pretty close with our 2012 forecast, missing our projection by just over 1 GW. But for 2013, we are now looking at a much



	2012	2013	2014	2015	2016	2017
Cumulative [GW]	282.6	322.4	367.7	418.7	474.9	536.13
Cumulative capacity growth rate [%]	18.70	14.10	14.00	13.90	13.40	12.89
Annual installed capacity ([GW]	44.8	39.6	45.3	51	56.2	61.2
Annual installed capacity growth rate [%]	10.80	-11.60	14.40	12.60	10.20	8.90

Source: GWEC

more significant drop in the market than we foresaw a year ago, primarily as a result of a major drop in US installations, a slower than expected recovery of the Chinese and Indian markets, and a bit of a slowdown in Europe. We forecast that annual installations for 2013 will drop by more than 11% to just under 40 GW; and then recover sharply in 2014 to slightly exceed the 2012 market and average just over 11% annual market growth from 2014-2017. The average annual market growth rate for the entire 2013-2017 period will be almost 7%, ending up with an annual market in 2017 of 61 GW.

In cumulative terms, this means an average growth rate over the period of about 13.7%, well below the decadal average, although the larger numbers involved mean that maintaining growth rates in excess of 20% is challenging without some sort of global policy imperative to drive the market. We project that by the end of 2017 we will see total cumulative installed capacity passing 500 GW to end up at about 536 GW. This puts us right on track with the Moderate Scenario from last year's long term projections in the *Global Wind Energy Outlook 2012*, and leaves us to ponder what is required to get us back on the Advanced Scenario track.

Regional Distribution

While new markets in Africa, Latin America and non-China/India Asia are evolving rapidly, their numbers do not have a major impact on global picture over the next five years, with the exception of the burgeoning market in Brazil, which is expected to rack up some impressive numbers over the period. South Africa could surprise us; Pakistan already has; and the new push for a renewable industry in Saudi Arabia could yield some substantial results towards the end of the period, but that is very much a wild card at this stage. But the new markets in East Africa, East and Southeast Asia and North Africa will only start to impact the picture substantially towards the end of the decade; and it's not clear whether there are going to be other major markets in Latin America – from where we sit now, it looks more like a proliferation of smaller ones, at least for now.

Asia will certainly continue to be the world's largest market, and the potential for growth in China remains astronomical. The Chinese government has called for an 18 GW market in 2013. From where we stand today that seems unlikely, although there will be significant recovery from the 2012. But the industry is still recovering from some of the excesses of its explosive growth phase over the last 8 years, and the time taken to sort out grid, quality control and health and safety issues will be time well spent.

India's inexplicable policy gap, where both accelerated depreciation *and* the generation based incentive (GBI) were allowed to lapse at the end of the 2012 fiscal year at the end of last March seems likely to be partly restored, as the GBI is set to be reinstated during the fiscal year beginning on 1 April 2013. That will probably not be reflected much in installations during calendar year 2013, as installations tend to be back loaded into the fourth quarter in India as in so many other markets. Therefore we are expecting the Indian market to continue to lag in 2013, but to get back on track in 2014 and beyond.

Scroby Sands Offshore, Caister, Norfolk, UK © *AnglianArt*

Japan's efforts at this stage are focused on offshore, although METI has now outlined a process of electricity reform which will undo some of the knots which are tying up the expansion of the Japanese renewable industry which the public demands. But this process will take some years, and we expect a low level of installations over most of the period, although with some exciting developments offshore.

South Korea has a similar focus on offshore, and will no doubt build at least 1 GW offshore during the period. The government has set very ambitious 2020 and 2030 targets, but it remains to be seen how successful they can be with a focus on offshore while the onshore industry languishes in red tape and NIMBYism.

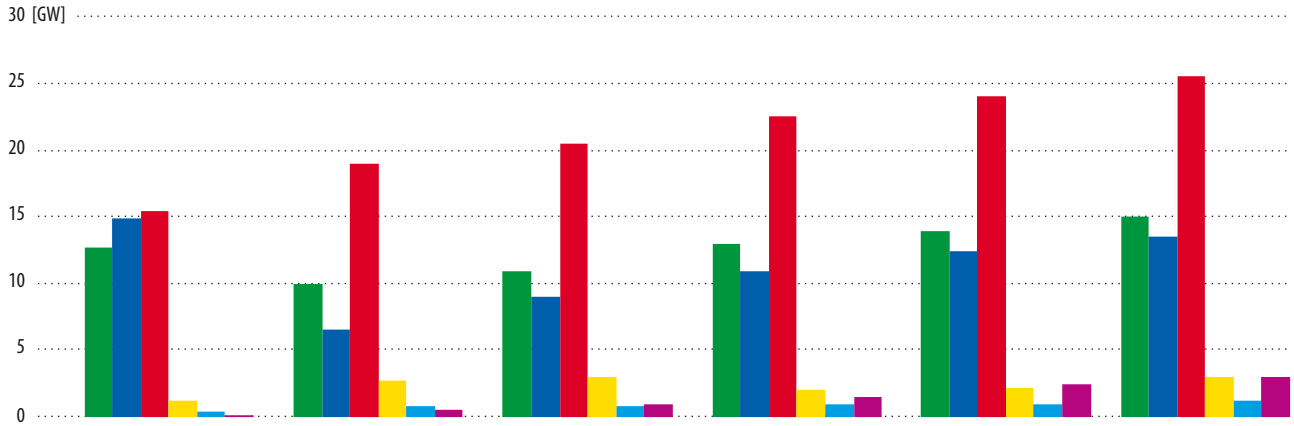
Mongolia, Thailand and the Philippines will all see new installations in 2013, and these markets will slowly build over the forecast period; but the real surprise in this region is Pakistan, with more than 40 projects totaling 2,700 MW under development. Watch this space.

At any rate, Asia will remain the largest market by far, installing about 112 GW over the five year period, ending up in at the end of 2017 with more than 200 GW of total capacity.

Europe had an exceptional year in 2012, exceeding all expectations by installing 12.74 GW, bringing total capacity to nearly 110 GW. In 2013 and 2014, however, the effects of the recent spate of policy disruptions in various markets will begin to take its toll, and it is expected that both years will see levels of installations below that of 2012. However, new markets in the east and strong development in a number of second tier markets will take up the slack created by weaknesses in some traditionally strong southern European markets, and the EU is expected to get back on track by 2015, and continue to grow towards achieving the 2020 targets laid out in European law for the remainder of the period.

Offshore installations in Europe passed the 1 GW mark for the first time in 2012, accounting for about 10% of total installations in the EU in 2012, and this trend is expected to

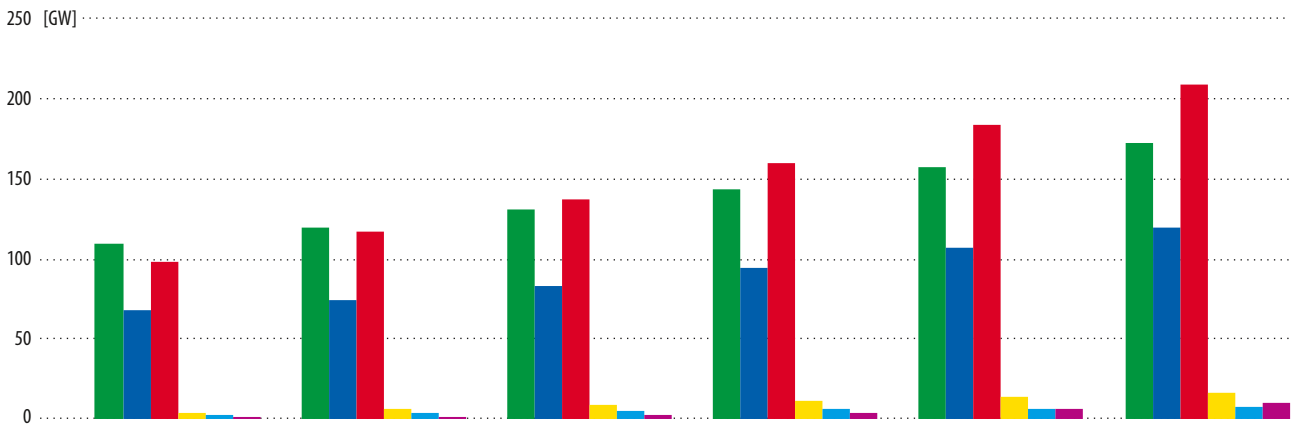
Annual Market Forecast by Region 2012-2017



	2012	2013	2014	2015	2016	2017
Europe	12.7	10	11	13	14	15
North America	14.9	6.5	9	11	12.5	13.5
Asia	15.5	19	20.5	22.5	24	25.5
Latin America	1.2	2.8	3	2	2.2	3
Pacific	0.4	0.8	0.8	1	1	1.2
Middle East and Africa	0.1	0.5	1	1.5	2.5	3

Source: GWEC

Cumulative Market Forecast by Region 2012-2017



	2012	2013	2014	2015	2016	2017
Europe	109.8	119.8	130.8	143.8	157.78	172.78
North America	67.6	74.1	83.1	94.1	106.6	120.12
Asia	97.6	116.6	137.1	159.6	183.6	209.07
Latin America	3.5	6.3	9.3	11.3	13.5	16.51
Pacific	3.2	4	4.8	5.8	6.8	8.02
Middle East and Africa	1.1	1.6	2.6	4.1	6.6	9.63

Source: GWEC

intensify during the next five years. Offshore installations should account for 3 GW or more per year by 2017. Overall installations over the next five years will be about 63 GW, bringing the cumulative total to more than 170 GW by the end of 2017.

In **North America**, the big question is, of course, what will happen to the US market. After record installations in 2012, the '13th hour' reauthorization of the Production Tax Credit on 1 January 2013 means that while the prospects for 2014 are somewhat brighter, 2013 is going to see installations drop to probably less than one third of 2012 levels. After 2014 is anyone's guess, but the increasing competitiveness of wind energy and the gradual recovery of the US economy mean that demand for clean, renewable power will no doubt start to grow again in earnest.

In Mexico, the industry had its best year ever in 2012, and everything is looking up for the establishment of a third significant market in North America of 1 to 1.5 GW per year. While some uncertainty remains in relation to the new government's policies, early indications are quite positive, and we are expecting robust growth throughout the period.

Canada had another strong year in 2012, and we expect a market in the vicinity of 1.5 GW for 2013 and in that same range for the next few years, as Canada seems well on track towards the industry target of 12,000 MW by 2016.

Overall, we expect installations of just over 52 GW in North America over the coming five years, ending the period with a cumulative total of about 120 GW.

Wind energy in **Latin America** continues to be dominated by the dramatic growth of the Brazilian market, and we don't expect that to change fundamentally over the next five years. Brazil installed more than 1 GW in 2012, and will probably install more than 2 GW in each of the next two years, although chronic delays with grid infrastructure means that the pace might be slowed somewhat and backloaded towards the end of the period.

While installations will continue in smaller Central American and Caribbean markets as well as Chile, Peru, Venezuela, Uruguay and Argentina, we expect Brazil to account for the bulk of installations in the period out to 2017, which we expect to be about 13 GW, bringing total installations in the region to about 16.5 GW at the end of 2017.

2012 was another quiet year in **Africa and the Middle East**, with just over 100 MW installed in the region. However, there is a lot of activity, especially in the burgeoning South Africa market, which will see hundreds of MW installed annually in 2013 and for the rest of the forecast period and beyond. New projects are under construction in Ethiopia, Kenya, Morocco and Jordan as well, and it is hoped that the situation in Egypt will stabilize so that the ambitious plans for 7,000 MW of wind power by 2020 can be realized.

Current plans call for the South African market to reach at least 400 MW per year during the course of the forecast period, and that number could increase substantially, and the ambitious plans of the Saudi government may begin to bear fruit during the next five years. Overall, we expect more than 8 GW of new capacity to be installed in the region during the next five years, bringing total capacity close to 10 GW.

The Zafarana wind farm in Egypt saves the country 332,000 tons of fuel a year, and reduces annual carbon emissions by approximately 834,000 tons
© New & Renewable Energy Authority, NREA, Egypt

The main market in the **Pacific** region will continue to be Australia, and new carbon legislation combined with the Renewable Energy Target should see installations continue to grow beyond the 358 MW which were installed in 2012. The country has a healthy 19 GW pipeline, of which a quarter or

more should become operational within the coming period. The recent *Pacific Energy Summit* in Auckland, New Zealand bodes well for wind and solar in the Pacific Islands in the coming years, although the markets and hence the numbers are small. Host country New Zealand has one 60 MW project under construction at the moment, but flat demand means that it is unclear how much of the 1,500 MW or so of consented projects will in fact be built out over the next few five years. Overall installations during the next five years are expected to be just under 5 GW, bringing the region's total installations to just over 8 GW by the end of 2017.

AUSTRALIA

Woolnorth, Tasmania © *Clean Energy Council*

Wind energy continues to increase its share of Australia's clean energy mix following another year of growth in 2012, with a healthy outlook for the next few years. Wind power now supplies over 7,700 GWh of electricity each year; or 3.4% of Australia's overall electricity demand.

Australia's 20% by 2020 Renewable Energy Target (RET) continues to provide the greatest incentive for the development of wind energy in Australia and has driven installed wind capacity from approximately 71 MW in 2001 to 2,584 MW at the end of 2012. Since 1 July 2012 the RET is complemented by Australia's carbon price mechanism which aims to reduce emissions in the stationary energy sector.

At the end of 2012 Australia had 1,397 operating turbines across 62 wind farms, totaling an installed wind capacity of 2,584 MW. There was almost AUD 1 billion (EUR .78bn / USD 1.03bn) of new investment in wind power in Australia in 2012.

Main market developments in 2012

Five new projects were commissioned in 2012, adding 358 MW of wind capacity to the Australian electricity grid; an increase of 50% on the 2011 market.

New wind farms in 2012

Owner	Location	State	Installed Capacity
UBS IIF/ REST	The Collgar	Western Australia	205.4 MW
AGL	Oaklands Hill	Victoria	67.2 MW
AGL	Hallett 5 (Bluff Wind Farm)	South Australia	52.5 MW
Goldwind Australia	Morton's Lane	Victoria	19.5 MW
Verve Energy	Albany 2 (Grasmere)	Western Australia	13.8 MW

Projects in the pipeline

Another eleven projects, totaling 1,627 MW, are currently under construction and expected to be completed within the next three years in the states of Victoria, South Australia, Tasmania, New South Wales and Western Australia. Almost 19 GW of additional wind projects are currently going through approval processes or have been publicly announced.

There are wind projects spread across most states in Australia, with the exception of the sparsely populated Northern Territory; and there is just one small wind farm in Queensland. South Australia remains the state with the highest wind power capacity, accounting for 47% of the national total. South Australia produces more than 20% of its electricity from wind power.

Installed wind capacity in Australia by state

State	Installed Capacity (MW)
South Australia	1,205
Victoria	519
Western Australia	423
New South Wales	282
Tasmania	143
Queensland	12
Total	2,584

Bloomberg New Energy Finance estimated that there was AUD 935.3 million (EUR 736.7mn / USD 960.4mn) of new financial investment in Australian wind power in the 2012 calendar year.

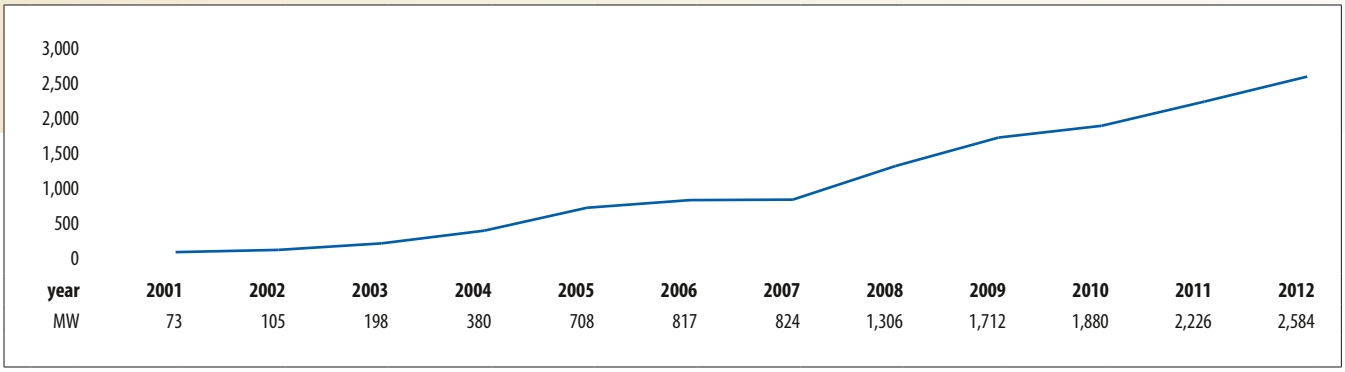
The policy environment

The Australian Government's Renewable Energy Target (RET) is designed to deliver 20 per cent of Australia's electricity supply from renewable sources by 2020, or more than 45,000 GWh of renewable energy.

An independent study released in 2012, *Benefits of the Renewable Energy Target to Australia's Energy Markets and Economy*, found that the RET had delivered AUD 18.5 billion (EUR 14.4bn / USD 18.8bn) of investment in renewable energy since 2001[1]. This investment has driven an increase in total renewable energy capacity from around 7,540 MW in 2000 to around 13,340 MW in 2012 and reduced carbon emissions by a total of 22.5 Mt. The study also found that between 2012 and 2020 the RET is expected to deliver an additional AUD 18.7 billion (EUR 14.5bn / USD 19bn) of investment in renewables – much of this in wind energy.

Wind energy has accounted for approximately 38% of all renewable capacity installed since 2000, and has attracted

Total installed capacity



year	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
MW	73	105	198	380	708	817	824	1,306	1,712	1,880	2,226	2,584

Source: GWEC

over AUD 5 billion (EUR 3.9bn / USD 5.1bn) in investment since 2001[2]. It is expected that new investment in wind energy will be largely driven by the RET until 2020, after which the carbon pricing scheme will likely act as the major incentive for investment.

The RET was the subject of a comprehensive review in 2012 by the independent Climate Change Authority, which resisted calls from some parties to reduce the scheme's target in order to save on the costs of moving away from fossil-fuelled energy generation.

Australia's new carbon price mechanism, designed to reduce emissions from the stationary energy sector, commenced operating on 1 July 2012. The mechanism involves a fixed carbon price of AUD 23 (EUR 17.9 / USD 23.4) per tonne of carbon dioxide equivalent emissions for three years, after which there will be a transition to an emissions trading scheme from July 2015. 50% of the income raised is being spent on assisting households to adjust to the impacts of the carbon price and the rest of the funds will be used to accelerate the deployment of clean energy sources.

Outlook for 2013 and beyond

While the wind industry was quieter in the first half of 2012 due to investor uncertainty surrounding the RET, carbon price and other policy developments, the market gained momentum in the second half of the year. Wind energy is still the fastest growing large scale renewable energy source for electricity generation in Australia, and a report prepared by Bloomberg New Energy Finance for the Clean Energy council predicts that an additional 2 GW of wind power will be built by 2015.

An independent report released by the Clean Energy Council in June 2012 found that wind farms deliver substantial economic benefits to local communities through new jobs and investment. The *Benefits of Wind Energy In Australia*[3] found that for every 50 MW of capacity, a wind farm creates up to 48 jobs during construction, pays host farmers AUD250,000 (EUR 194.4 / USD 254.7) per year, is constructed by workers who spend up to AUD 1.2 million (EUR 0.93mn / USD 1.2mn) locally and contributes up to AUD 80,000 (EUR 62.2 / USD 81.5) annually to community projects.

In the past year, the Australian wind industry has been working extensively to ensure communities are engaged and informed about the economic benefits wind projects can bring to the community. In January 2012 the Commonwealth Scientific and Industrial Research Organisation (CSIRO) released a report called *Exploring community acceptance of rural wind farms in Australia: a snapshot*[4]. The CSIRO found there is strong community support for the development of wind farms, including support from rural residents.

A recent independent survey carried out for the Clean Energy Council by the QDos social and market research firm found that 77 % of people surveyed across Victoria, NSW and South Australia (including regional areas containing wind farms) said they supported the development of wind farms. In 2012, the Clean Energy Council published its *Community Engagement Guidelines for the Australian Wind Industry*[5], which is a best practice approach to community engagement.

With the right policy mix, a transmission system able to absorb further wind penetration without significant augmentation, and an increasing demand for low emission energy, the wind industry will remain a major contributor to decarbonisation of Australia's energy mix.

With input from the Clean Energy Council, Australia

1 SKM, 2012, Benefits of the Renewable Energy Target to Australia's Energy Markets and Economy, http://www.cleanenergycouncil.org.au/policyadvocacy/Renewable-Energy-Target.html
2 SKM, 2012, Benefits of the Renewable Energy Target to Australia's Energy Markets and Economy, http://www.cleanenergycouncil.org.au/policyadvocacy/Renewable-Energy-Target.html
3 Available at: http://www.cleanenergycouncil.org.au/cec/misc/gwd
4 Available at: http://www.csiro.au/Organisation-Structure/Flagships/Energy-Transformed-Flagship/Exploring-community-acceptance-of-rural-wind-farms-in-Australia.aspx
5 Available at: http://www.cleanenergycouncil.org.au/technologies/wind/comm-engage-guidelines.html

BRAZIL

Investments/ installed wind capacity in the Brazilian wind market in January 2013

Year	Installed Capacity (MW)	U.S. $ (million)*
2010	325.6	558.63
2011	498.0	855.61
2012	1,124.0	1,928.43
2013	2,770.1	4,752.62
2014	2,256.3	3,871.10
2015	28.8	49.41
2016	861.3	1,477.72
2017	281.8	483.48

*2013/Jan

Source: ABEEólica

Bons Ventos Wind Farm, Ceará © *ABEEólica*

Most of Brazil's rich wind resources, estimated at more than 350GW, are located in the north-eastern and southern parts of the country, as are most of its burgeoning industry and new jobs.

Main market developments in 2012

At the end of 2012, Brazil had 2.5 GW of installed wind capacity, enough to power four million households and accounting for 2% of national electricity consumption. In 2012 alone 40 new wind farms came online, adding more than 1 GW of new capacity to the Brazilian electricity grid and creating 15,000 new jobs. This represents an investment of USD 3.43 billion (€2.63 billion), which is expected to increase to USD 24.50 billion (€18.8 billion) by 2020.

The wind power industry and its supply chain are becoming firmly established in Brazil, and eleven international manufacturers have opened facilities in the country. Since the first wind-only auction in 2009, rising industrial investment has strengthened the manufacturing base which is now capable of producing more than 2 GW of wind power equipment per year and supplying the domestic market alone with 1,000 turbines, 1,000 towers and 3,000 blades. This creates about fifteen new job/years per MW installed in the year of manufacture/ installation, and it is estimated that 280,000 direct and indirect new jobs will be created in the wind sector by the end of 2020.

Technological progress which is linked to the height of the wind turbines (50 to 100 meters) has strongly contributed to the increased competitiveness of the Brazilian wind industry. The diameter of the blades and rotors are specific to Brazilian wind conditions and provide the domestic wind industry with a unique competitive advantage.

The Brazilian wind market

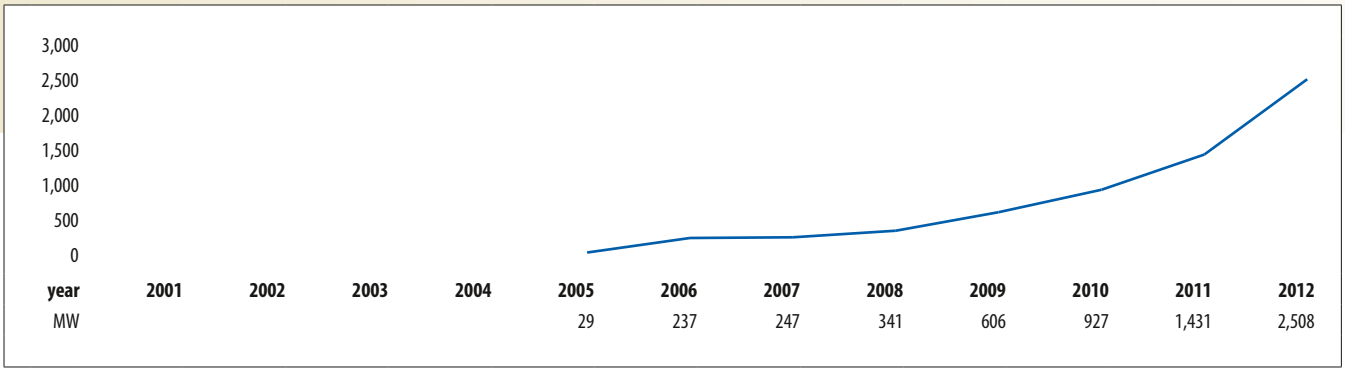
In the near future, wind power production capacity and turbine manufacturing are likely to exceed national demand in Brazil, providing an excellent opportunity for the country to become an export hub.

The Brazilian government's Decennial Energy Plan (PDE 2021) sets a goal of 16 GW of installed wind capacity to be reached by 2021, accounting for 9 % of national electricity consumption.

Recent developments in the Brazilian wind power sector can be explained by a number of important structural factors, in particular by the technological progress achieved by the industry. In addition to the rich wind resources in the country, regular competitive auctions in the regulated market and beneficial financing policies have put Brazil in an excellent position to be the regional leader in wind energy generation and development.

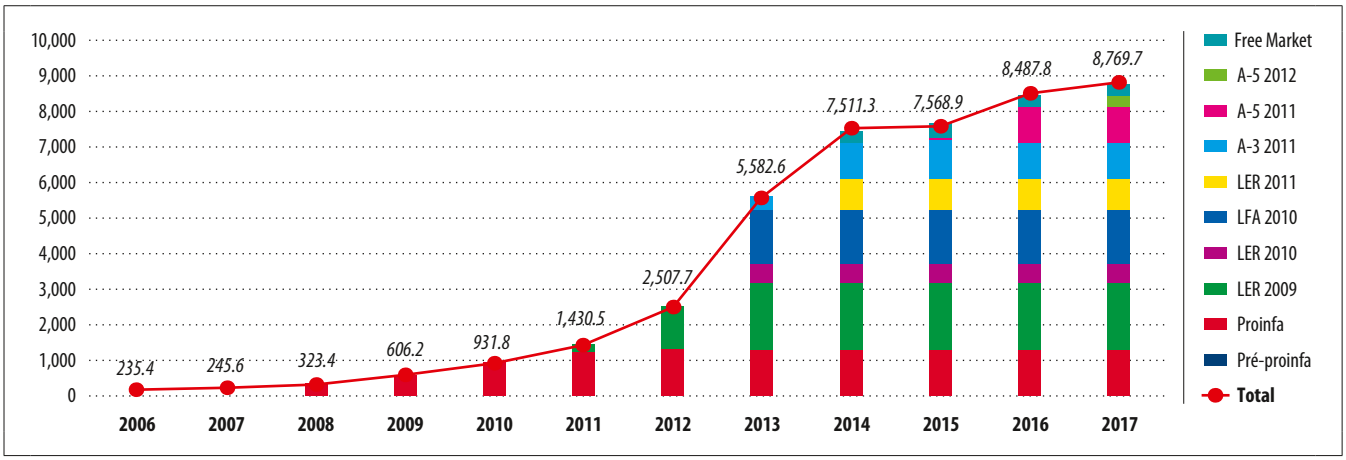
However, some significant challenges facing the wind energy sector still remain. In 2012 the main difficulties were related to: lack of sufficient transmission and distribution lines; revision of rules of the accreditation of manufacturers according to the financing program of machinery and equipment (Finame) provided by the National Development Bank (BNDES), requiring ever higher levels of local content; and repeated postponements of the auctions.

Total installed capacity



Source: GWEC

Installed capacity through 2012, and contracted through 2017 through individual wind auctions



Source: Aneel/CCEE, 2012.

New policy developments in 2012

At the end of 2011, a public hearing was held in order to set requirements for wind farms, such as permitting procedures and minimum distance between projects, in order to qualify to participate in auctions. Other aspects such as regulations for wind measurements and defining rules for best turbine distance were also covered. Proposals for amendments to the current law are still pending with the government, and the discussion will continue in 2013.

As Brazil's economic growth continues, and electricity demand increases by 6 GW[1] annually, there is a growing need for further investment in renewables. Development of Brazil's more than 350 GW of potential wind resources and other renewable energy sources contributes to Brazil's energy security and diversity of supply, creating new industries and jobs.

New rules for financing policies were introduced by the BNDES regarding accreditation of wind turbines for funding, and created a program for progressive nationalization and industrialization, from 2012 until 2015.

For the wind auctions to be held in 2013 the projects are expected to come online between 2016 and 2018.

New Brazilian Network for Wind Energy Innovation

The "Brazilian Network for Wind Energy Innovation", an innovation and research centre for exchanging knowledge and best practice, will soon open its doors. The centre will provide an online platform to enhance collaboration between different stakeholders including wind developers, companies, universities and research institutes. The new organisation also aims to enable the transfer of technology know-how by establishing a research network; a Wind Power Research and Technology Center; and a wind turbine test field.

Outlook for 2013 and beyond

The prospects for the Brazilian wind market for 2013 look promising: Brazil is likely to reach the 5 GW milestone and to move from the current 16th position to become the 10th biggest wind power market in the world. Brazil's GDP is expected to increase by about 4% in 2013, and the increase in electrical demand should keep the Brazilian wind market on track with the annual 2 GW target[2], helping to ensure the consolidation and sustained development of the wind industry.

With input from the Brazilian Wind Energy Association (ABEEólica)

1 www.epe.gov.br/PDEE/20120924_1.pdf
2 Set by the Brazilian Wind Energy Association, ABEEólica

CANADA

In 2012, wind energy grew by nearly 20% in Canada, driving over CAD2 billion (EUR 1.49 / USD 1.95 billion) in investment and creating 10,500 person-years of employment (CanWEA, 2012). The industry in Canada installed 936 MW in 2012, bringing total installed capacity to 6,200 MW by the end of the year.

Wind energy projects were built and commissioned in British Columbia, Alberta, Ontario, Manitoba, Northwest Territories, Quebec and Nova Scotia. Ontario is the provincial leader with over 2,000 MW of installed wind energy capacity, while Quebec wind farms made up about 46% of total installations in Canada in 2012.

There were many firsts for wind energy in Canada in 2012. The 9.2 MW Diavik Wind Farm has not only put the Northwest Territories on Canada's wind map, it has also opened the door to a new potential market in a growing mining sector looking to tap into the economic and environmental advantages wind energy brings. The 4 MW M'Chigeeng Mother Earth Renewable Energy Project in Ontario is the first wind farm 100% owned by a First Nations community in Canada. These milestones highlight the diversity of the wind energy industry in Canada and its ability to deliver real economic and environmental benefits at a local level.

The progress Canada's wind energy sector made in 2012 provides a strong foundation for the future. As the provinces begin to lay out plans for what their future electricity supply mix will look like, they will want low-cost generation with strong economic development potential and minimal environmental impacts. There is no doubt that in this context, wind energy is a strong competitor.

Installed capacity by province

Source: CanWEA

North Cape Wind Farm, Prince Edward Island, Canada © *CanWEA*

New market and policy developments in 2012

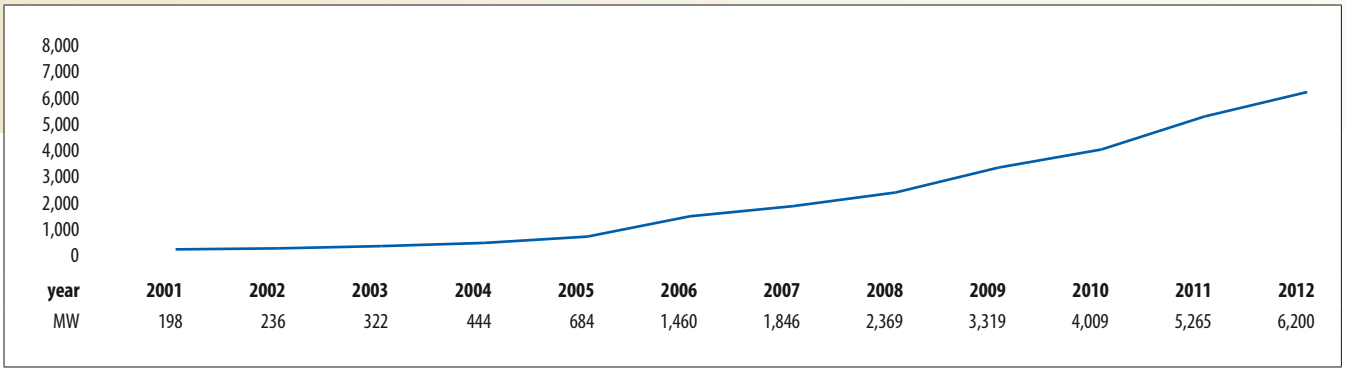
The Ontario Government's Long Term Energy Plan (LTEP) envisions that by 2018 there will be over 7,000 MW of wind energy in the province. In 2012, the government made a commitment to procure all the energy required to meet that aggressive target by 2015 and to examine in 2013 the potential for additional renewable energy procurements. A new price of CAD 0.115 (EUR 0.09 / USD 0.112) per kWh for wind energy was also established as part of Ontario's feed-in tariff program.

The Quebec government is expected to announce a fourth call for tenders for 700 MW of new projects. In issuing this new call for tenders, the province would reaffirm its commitment to renewable energy by seeking to attain the 4,000 MW objective set in its 2006-2015 energy strategy. Furthermore, Quebec's newly elected government is expected to begin consultations on a new post-2015 energy strategy this spring.

Nova Scotia has moved to enshrine its goal of 40% renewable energy by 2020 in regulation and awarded 100 MW of wind energy contracts to help meet its interim target of 25% by 2015. The province has also implemented feed-in tariffs for small and community wind projects.

In British Columbia, wind energy can help power a burgeoning liquefied natural gas (LNG) sector without the price and environmental risks that come with an increased reliance on fossil fuels. There are at least five LNG ports proposed that will require enormous amounts of electricity to compress and cool the gas for shipment. The province is wrestling with the question of where that electricity will come from. The answer

Total installed capacity



year	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
MW	198	236	322	444	684	1,460	1,846	2,369	3,319	4,009	5,265	6,200

Source: GWEC

to this will have a big impact on the market for wind energy in the province. BC Hydro is expected to deliver its 20-year integrated resource plan in August 2013.

CanWEA is also in the process of developing a strategic WindVision for Alberta to take advantage of a "once-in-a-decade opportunity" to lay a long-term foundation for wind energy development in the province. The Alberta Electric System Operator's (AESO) latest long-term forecast predicts electricity demand will increase an average of 3.2% a year for the next 20 years and wind energy can play an important role in filling that gap. The provincial government is planning to launch consultations in 2013 on an alternative and renewable energy policy framework, and the Alberta WindVision will form the industry's input into the process.

Obstacles to wind energy development

One area where policy clarity is still required is in Canada's approach to climate change. Securing a national carbon pricing framework in Canada that recognizes wind energy's environmental attributes in market prices is critical to future wind energy development – particularly at a time when low-priced natural gas is factoring heavily into discussions about future electricity supply. It will be up to the industry to make the case that wind is an economically efficient and sensible investment from an electricity pricing perspective but also the right investment focus for protecting the climate, both today and in the long term.

At the provincial level Ontario saw wind energy linked to issues around electricity pricing and local decision-making, and become a significant political issue in 2012. The "politicization" of wind energy is creating some uncertainty for investors and threatens the significant progress that has been made in making Ontario a North American leader in the development of renewable energy. The industry is working with stakeholders to promote responsible, stable and sustainable wind energy development in the province.

Further, as noted above, many jurisdictions will be taking decisions on the future shape of the electricity mix in Canada over the next 18-24 months. What is uncertain at this time, however, is what role wind energy will ultimately play in these new long-term plans for electricity development that will soon be discussed and debated across the country. The coming months will be crucial to assuring the sustainable growth of the country's wind energy industry beyond 2015. Continued political support and policy stability is crucial to ensure that wind energy continues to deliver clean, safe and affordable power in all provinces.

Outlook for 2013 and Beyond

In a world where there is tremendous competition for wind energy investment, clear long-term policy objectives and stable policy frameworks are critical to making Canada a competitive destination for such investment. The national WindVision 2025, along with the regional WindVision targets proposed for Quebec, British Columbia and soon Alberta, are part of the industry's attempt to kick start a discussion on what Canada's long-term wind energy future could look like.

2013 will be another record year for new wind energy development in Canada with the largest portion of new development taking place in Quebec and Ontario. New contracts were also awarded in 2012 for projects in Saskatchewan, Nova Scotia and Prince Edward Island. With various projects now contracted to be built across Canada, the country will see about 1,500 MW of new wind energy installations in both 2013 and 2014.

Canada is expected to reach 12,000 MW of total installed capacity by 2016 and remains on track to meet CanWEA's WindVision target of supplying 20% of Canada's electricity from wind energy by 2025.

With input from the Canadian Wind Energy Association (CanWEA)

PR CHINA

Top 10 provinces new capacity (MW) in 2012

1	Inner Mongolia	1,119
2	Shandong	1,129
3	Gansu	1,070
4	Yunnan	1,032
5	Shangxi	1,026
6	Xinjiang	990
7	Hebei	909
8	Liao Ning	869
9	Heilongjiang	819
10	Ningxia	690

Wind farm in China © *Fu Junming*

Main market developments in 2012

Since 2011 the Chinese wind market has been in a consolidation phase, and last year installations were down by 26% to 'only' 12.96 GW, a similar level to 2009. Although China still maintains its position as a global wind leader in cumulative terms with a total of 75.32 GW, it ceded it's No. 1 position in the annual market in 2012 to the US (13.1 GW) for the first time since 2008. The Chinese market represented about 27% of the global market in 2012, down from 49.5% in 2010, and 43% in 2011.

Market consolidation and rationalization was necessary after years of rapid double and triple digit growth. Although grid connection issues abated last year, curtailment has become a major issue. Furthermore, access to finance became tighter, and some of the major State owned developers began to face serious financial constraints.

However, despite the slow-down wind energy became the third largest source of electricity in China, for the first time surpassing nuclear power. This change is in accordance with the government's efforts to increase its use of renewable energy as a means to reduce carbon emissions, improve air quality, and cut reliance on fossil fuels. In October 2012, the State Council released its 'White Paper on China's Energy Policy 2012', setting a target of 11.4% of primary energy and 30% of electrical generation capacity from non-fossil fuel sources. By the end of 2012, non-fossil fuel energy sources already accounted for 29.5% of China's electricity generation capacity.

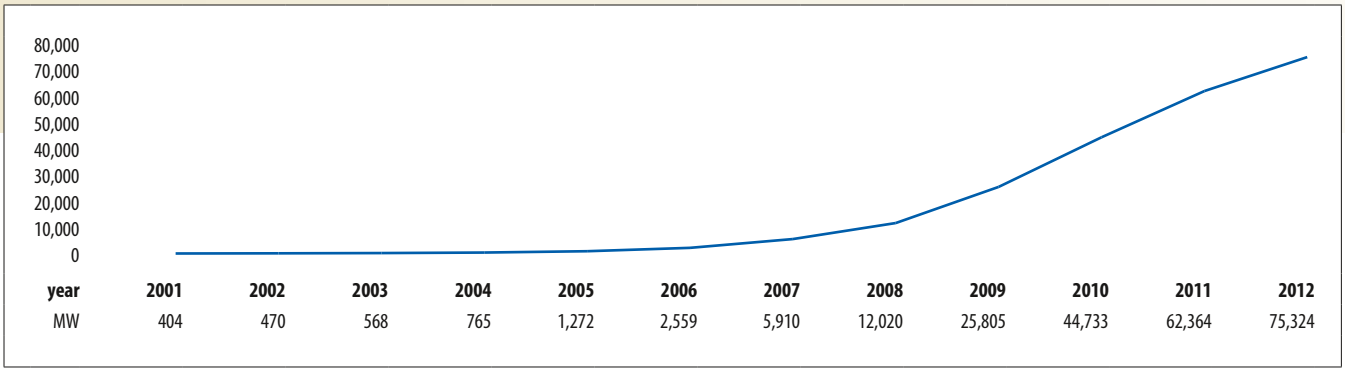
Regional Development

After years of development in the country's north, north eastern and north western areas, where wind resources are abundant but power consumption is relatively low and grids are weak, wind power is now also spreading to other parts of the country. The lower wind speed regions in south western and central west China are accelerating wind energy development, and a welcome diversification of development is beginning to emerge.

Fourteen Chinese provinces have now passed the 1 GW milestone, of which eleven are located in the 'three northern wind regions'. Overall, in 2012, five provinces surpassed 1 GW in new installed capacity, including for the first time a typical lower wind speed area, Yunnan province. However, in some of the historically more prominent wind areas such as Hebei, Liaoning and Heilongjiang, installations dropped below 1 GW.

Also the provinces containing the 'wind bases' slowed down, with Inner Mongolia accounting for only 1,119.4 MW and Gansu for 1,069.8 MW, followed by Hebei (908.8 MW), LiaoNing (869 MW), Hei Longjiang (818.6 MW) and XinJiang (990 MW). The lower levels in these wind rich provinces were mainly caused by insufficient grid infrastructure.

Total installed capacity

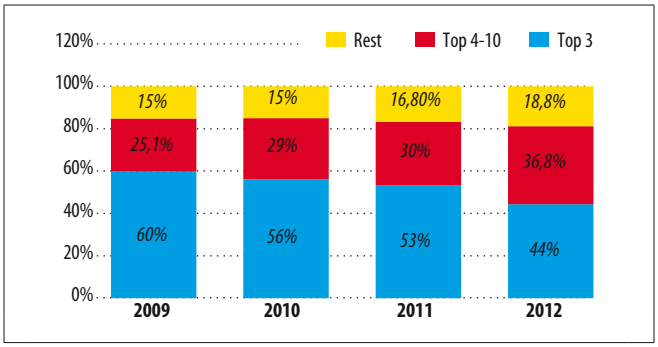


Source: GWEC

Top 10 provinces cumulative capacity (MW) in 2012

1	Inner Mongolia	18,624
2	Hebei	7,979
3	Gansu	6,479
4	Liao Ning	6,118
5	Shandong	5,691
6	Heilongjiang	4,264
7	Jilin	3,997
8	Ningxia	3,566
9	Xinjiang	3,306
10	Shangxi	2,907
11	Jiangsu	2,372
12	Yunnan	1,964

Market share of the top 3 and top 4-10 manufacturers



Top ten manufacturers in Chinese wind market in 2012

	Manufacturer	MW	Share
1	Goldwind	2,521.5	19.5%
2	Guodian United Power	2,029	15.7%
3	Sinovel	1,203	9.3%
4	Mingyang	1,133.5	8.7%
5	XEMC	893	6.9%
6	Shanghai Electric	822	6.3%
7	Envision	544	4.2%
8	Gamesa	493.2	3.8%
9	Dongfang Electric	466.5	3.6%
10	Vestas	414.4	3.2%

The Chinese wind industry

The top three Chinese manufacturers in 2012 were Goldwind (2,521.5 MW), Guodian United Power (2,029 MW), and Sinovel (1,203 MW), accounting for a 44% share of the annual market. A dark horse entering the top ten players was Envision with 544 MW, more than doubling its market share and moving up from 15th in 2011 to 7th place in 2012.

Top ten turbine manufacturers have dominated the Chinese wind market with over 80% of the market share during the past four years, yet their share started slightly decreasing towards the end of this period. Meanwhile, the total share of the top three market players declined dramatically from 60% in 2009 to less than 45% in 2012 and the share of the market players ranking from 4th to 10th on the list increased from 25% of the annual market in 2009 to almost 37% in 2012. This trend shows that the market is becoming more evenly distributed among all players and less dominated by leading companies.

The industry is still suffering from manufacturing overcapacity which is pushing smaller manufacturers out of the market and is driving the industry into cut-throat competition on prices, which is one of the major reasons the market share of international manufacturers continues to decrease, which is not a good thing for the industry in long term. In addition, an evaluation mechanism to assess wind turbine performance during its lifespan would be needed in order to switch focus from installation costs to production costs over the full life-cycle.

The policy framework for wind energy

Project approval process

Since 2011, all new projects must first be included in the project development plan announced by the National Energy Administration (NEA) and undergo approval before starting construction, whereas previously quite a number of projects

had started without the relevant permissions fully in place. This allows the NEA to get a sense of the total volume of the projects to be permitted, while previously the local governments had authority to approve small projects, making it impossible to predict overall volume of projects. This means that only projects included in the plan which are then approved will be eligible for the feed-in tariff and grid access. The aim is to avoid lack of coordination between wind farm development and grid expansion, which has hampered the market for the last several years. The first plan in 2011 covered a total project volume of 26.83 GW, a second batch in 2012 of 25.28 GW and a third one for 2013 an additional volume of 28.72 GW. This guarantees a project pipeline of over 80 GW from 2011 to 2014.

Renewable Energy Portfolio Standard (RPS) under debate

At the end of 2012, the National Energy Agency published a proposal for a Renewable Energy Portfolio Standard, calling for four levels of RPS/RE penetration rate for different provinces, depending on the quality of their wind and solar resource. The responsibility for meeting the RPS would fall on the shoulders of the provincial government and the local grid companies (subsidiaries of the national grid company). How this proposal develops will be a key factor to watch in the Chinese market this year.

Obstacles to wind energy development

Grid continues to be the greatest challenge

The grid remains the most serious challenge facing the wind industry in China. The real bottleneck is the transmission system, and the increasing curtailment of wind production at peak periods due to the grid companies' inability to manage the transmission system effectively. According to the National Energy Administration, about 20 TWh of electricity produced by wind power was lost to curtailment in 2012.

Electricity generated by wind power only accounted for 2% of national electricity consumption, while wind accounted for 5% of the total capacity. This is due to the mismatch between the location of wind farms and the large load centers; most of the large wind farms are located in the north where interconnections are weak and the capacity of the grid is low, whereas the load centers are found in the eastern and southern parts of the country. This is why the NEA set a new regulation in the spring of 2012 stating new projects will not be approved in areas with over 20% grid curtailment; the main reason for the slower development in the 'wind base' provinces.

Grassland © *Fu Junming*

Lack of finance becoming a major bottleneck

Back in 2009, when the effects of the financial crisis started to hit the wind industry in Europe and the US, China was still a 'safe haven' without financial constraints. Since the developers are mostly State Owned Enterprises (SOE), they were sheltered from the financial turmoil, with government backed commercial banks pouring money into infrastructure projects as a part of the government green stimulus plan.

In 2012 this situation changed. Big utilities had suffered from losses from coal fired power plants and were required by the National Asset Management Bureau to control their corporate debt equity ratio. Loans from the commercial banks for new projects started to tighten up.

Meanwhile, feed-in tariff premiums, which were usually paid to wind developers by the end of each fiscal year that electricity was fed into the grid, were halted. Wind projects had become too huge in numbers for the payment mechanism to support such a large volume of development. The premium accounts for 51-59% of the feed-in tariff, thus having a considerable impact on the cash flow of project owners and consequently on the entire supply chain.

At the end of 2012, a new mechanism for payments was put in place by the National Development and Reform Commission to cover both old and new projects for the years to come.

Slow progress on offshore wind

China installed 127 MW of offshore wind in 2012, of which 113 MW was in inter-tidal projects (projects in shallow water, unique to China) and the remaining 14 MW were near shore demonstration projects. The majority (67%) of the Chinese offshore projects are inter-tidal projects, accounting for a total of 261 MW. In 2012, China maintained its position in offshore wind development with a total of 389.6 MW, ranking third in the world after the UK and Denmark.

Given the ambitious national targets of 5,000 MW by 2015 and 30 GW by 2020, China's offshore development is still at modest level. The main bottleneck is caused by lack of coordination between different government agencies relevant to marine development. Currently, only small scale demonstration projects are under way to test the water for the 'real' offshore development.

Outlook for 2013 and beyond

The Chinese market is set to recover substantially in 2013 – the target of 18 GW set by the government has given a boost to the wind industry. In addition, the new feed-in tariff premium payment mechanism is up and running, giving positive signals to the entire supply chain. Also, the National Asset Management Bureau gave a total of 6 billion RMB to the five big utilities at the end of 2012 and this is set to continue for the next three years, which is likely to have a positive impact on the wind sector. Meanwhile, discussions about the possibilities for electricity market reform started when China's new leadership took office at the beginning of 2013. All this shows recovery signals to the wind industry, and annual installation rate is expected to be in the range of at least 14 to 15 GW for the next few years.

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

DENMARK

Main market developments in 2012

2012 wind power installations in Denmark amounted to 170 MW onshore and 50 MW offshore for a total of 217 MW. By the end of 2012, Denmark had installed a total of 4,162 MW of wind capacity: 922 MW offshore and 3,237 MW onshore.

The most significant offshore development in 2012 saw the first 14 out of 111 turbines get grid connected for a total of 50 MW at the Anholt wind farm. The Anholt wind farm will be finished during 2013 with grid connection of the remaining turbines for a total of 400 MW. The wind farm will become Denmark's largest offshore wind farm and will supply power corresponding to the annual consumption of 400,000 households, or approximately 4% of Denmark's total power consumption[1].

According to the Danish Transmission System Operator (TSO) Energinet.dk, the share of wind power in the country's total electricity demand in 2011 was 28.3%, by far the largest share of any country in the world. Wind power accounted for 9,765 GWh of electricity generation in 2011, raising its share of net generation to 29.4%[2]. By the end of 2012, wind energy covered more than 30% of Denmark's electricity consumption. Denmark is thus still well on its way toward the target of 50% wind energy in 2020, and remains the country with the highest share of wind energy in its electricity system globally[3].

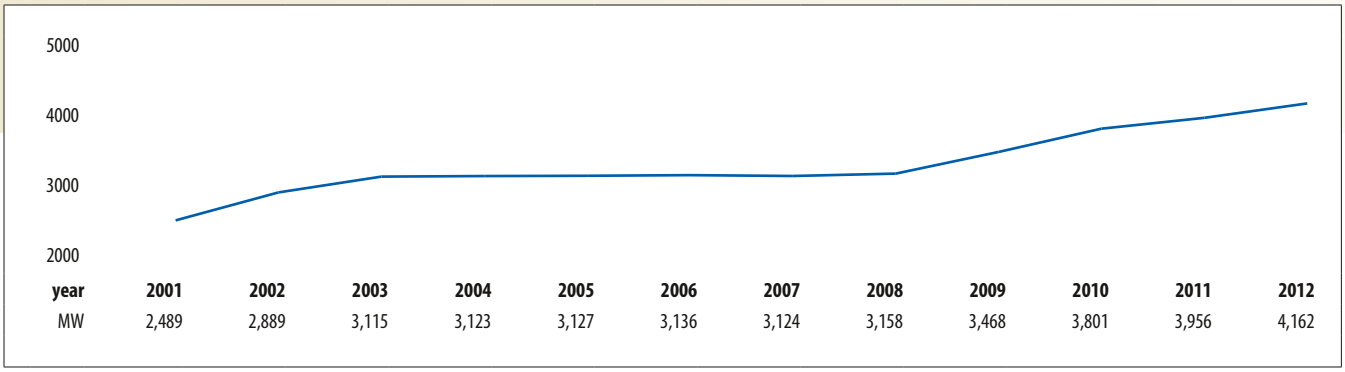
50% wind power by 2020, 100% renewables by 2035

In March 2012, after several months of intense negotiations with the opposition, a broad energy agreement was reached for the period up to 2020. The new government formally set a target of 50% wind power in electricity consumption by 2020 as part of its long-term strategy to achieve a 100% renewable energy target in the electricity and heat sector by 2035, and in all sectors by 2050 (Danish Energy Agency (DEA), 2012)[4].

According to this agreement in 2020 wind energy would cover 50% of traditional electricity consumption. To meet the 50% by 2020 target, approximately 2 GW of new wind energy installations are anticipated by 2020.

Wind In Mind, Denmark © *Wedigo Ferchland / GWEC*

Total installed capacity



year	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
MW	2,489	2,889	3,115	3,123	3,127	3,136	3,124	3,158	3,468	3,801	3,956	4,162

Source: GWEC

Besides the 1 GW of new offshore capacity at Horns Rev III and Kreigers Flak, there are plans to install an additional 500 MW in near-shore waters. New planning tools will encourage an increase in net onshore capacity of 500 MW. This will reflect 1,800 MW new onshore capacity, which will partly substitute for approximately 1,300 MW of old turbines.

Funding for expanding the renewable energy supply to the electricity grids will be financed through a Public Service Obligation (PSO) scheme via the Energy Bill (DEA, 2012). In the first half of 2013 the possibility of further reduction in surcharge (price-adder) for onshore wind where the full surcharge is not required will be discussed.

Denmark is far ahead of comparable markets in terms of domestic R&D and especially testing. In keeping with its historical leadership and excellent technical capabilities in the wind sector, in 2012 Denmark opened the world's largest testing center (Østerild), where 7x250 meter high turbines can be tested.

Tariff levels for onshore and offshore wind

Onshore wind gets DKK 0.25 (EUR 0.03 / 0.04 USD) per kWh for the first 22,000 full load hours. This system will change from 1st of January 2014 to include a DKK 0.58 (EUR 0.08 / USD 0.10) ceiling, with a 1:1 subsidy deduction, if the power price exceeds DKK 0.58 (EUR 0.08 / USD 0.10) per kWh. From 2014 onwards the amount of full load hours will depend on both the capacity of the generator and the swept rotor area - giving a relatively higher weight to the rotor area than the size of the generator.

Offshore tariff and development in Denmark continues to be driven by a tendering system, with the Government pre-screening, evaluating and selecting sites for the tender. The winner of a tender is the one with the lowest bid for a feed-in-tariff for the first 50,000 full load hours per MW of installed capacity. The system has proven very effective in the Danish context, delivering offshore wind at considerably lower prices than most other markets in Europe.

Outlook for 2013 and beyond

For Denmark 2013 will be a stellar year in terms of new capacity addition in comparison to the last ten years. The Danish wind market will see the remaining 350 MW of the offshore wind farm at Anholt go online accompanied by the usual 150-200 MW onshore.

The latest energy agreement (March, 2012) includes significant offshore wind expansion in the form of tendering for a total of 1,000 MW of offshore wind up to 2020. This includes 600 MW at Kriegers Flak and 400MW at Horns Rev. Horns Rev III is likely to be grid connected by 1st of January 2016 and Kreigers Flak should be grid connected by 1st of July 2017 at the earliest.

Denmark's target under the EU-mandated National Renewable Energy Action Plan will increase the share of renewable energy sources in the country's final energy demand from 17% in 2005 to 30% in 2020. Denmark seems well on track to meeting or exceeding these targets, although some challenges may arise, due to supply chain, grid or offshore infrastructure bottlenecks created by major offshore installations in neighbouring countries during the period, including Norway, Sweden, Germany and Finland.

With input from the Danish Wind Industry Association (DWIA)

1 http://www.dongenergy.com/anholt/EN/Projectbackground/Pages/default.aspx Accessed on 4-2-2013
2 http://energinet.dk/EN/KLIMA-OG-MILJOE/Sider/Environmental-key-figures-for-electricity.aspx Accessed on 4-2-2013
3 Danish Wind Industry Association (2013) http://www.windpower.org/en/news/news.html#727 Accessed on 7-3-2013
4 On 22 March 2012, a historical agreement was reached whereby Denmark will have more than 35% renewable energy in final energy consumption by 2020. This is a key step towards the long-term goal for a green economy with 100% renewable energy in energy and transport sectors. This Energy Framework was supported by all major political parties in Denmark (barring one).

EUROPEAN UNION

Austria © *Klaus Rockenbauer / GWEC*

Main market developments in 2012

During 2012, 12,744 MW of wind power was installed across Europe, with European Union countries accounting for 11,895 MW of the total, 23% more than the previous year. Investment in onshore wind farms attracted from €9.4 to €12.5 billion (USD 12.2-16.3 billion), while offshore wind farms accounted for €3.4 to €4.7 billion (USD 4.4-6.1 billion).

Of the 12,744 MW installed in Europe, 10,729 MW were installed onshore and 1,166 MW offshore. The offshore market grew by 35% compared to 2011 and considerable preparatory work was carried out on new offshore projects. It is expected that during 2013 and 2014 about 3.3 GW of new offshore capacity will be grid connected in European waters.

In terms of annual installations, Germany was again the largest market in 2012 adding 2,415 MW of new capacity. The UK was second with 1,897 MW, including 854 MW offshore. The two leading markets were followed by Italy (1,273 MW), Spain (1,122 MW), Romania (923 MW), Poland (880 MW) and Sweden (846 MW).

Among the emerging Central and Eastern European countries, Romania and Poland both installed almost double the previous year's installations and were among the top 10 European markets for the second year running.

The total wind power capacity installed in the EU by the end of 2012 will, in an average wind year, produce 231 TWh of electricity, enough to meet 7% of overall EU electricity consumption (up from 6.3% in 2011).

EU wind power installations in 2012 do not yet reflect the significant negative impact of the wave of market, regulatory and political uncertainty which has swept across Europe since the beginning of 2011. The projects completed during 2012 were generally permitted and financed prior to the destabilisation of legislative frameworks for wind energy. However, the stress felt in many markets across Europe throughout the wind industry value chain is expected to result in a reduced level of installations in 2013, possibly continuing into 2014.

A total of 44.6 GW of new power generating capacity was added to the grid in the EU during 2012. Wind energy accounted for 27% of these new installations, the second largest share after solar PV (16.8 GW, 37%) and ahead of all other technologies, including gas (10.5 GW, 23%) and coal (3.1 GW, 7%). Renewable technologies accounted for 31 GW of new capacity, or 70% of the EU's total new installations. In 2012, for the 5th year running, renewables represented more than 50% of all new capacity added to the grid.

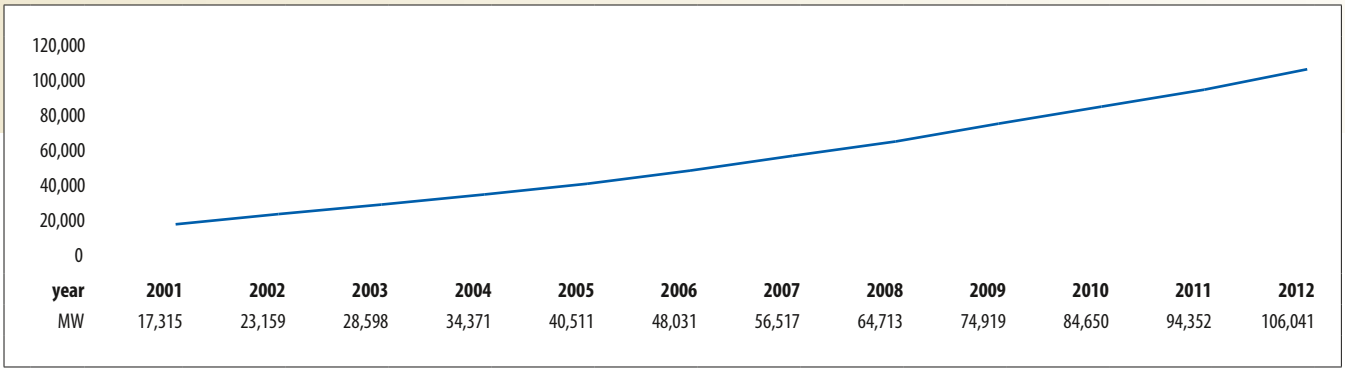
Meanwhile, 5.5 GW of gas, 5.4 GW of coal, 3.2 GW of fuel oil and 1.2 GW of nuclear generating capacity was decommissioned in 2012. Since 2000 a total of 352.6 GW of new power capacity was installed in the EU, of which 28% was wind power, 51% renewables and 91% renewables and gas combined.

Falling slightly behind 2020 targets

In 2010, the 27 EU Member States submitted National Renewable Energy Action Plans (NREAPs) to the European Commission indicating how they intended to reach their binding 2020 renewable energy targets. The NREAPs also include a trajectory showing how each government expected their wind energy capacity to develop year by year.

A comparison of the wind energy figures in the NREAPs with real capacity additions indicates that eighteen Member States are falling behind their targets. Taking all the NREAPs together, the EU is lagging behind by 1.5 GW (-1.5%) of the expected wind energy capacity: In 2012, 106,040 MW of cumulative installed capacity was reached compared to 107,602 MW called for in the NREAPs. The shortfall is most important in offshore installations, where the NREAPs called for 5.8 GW, while the real installations totalled just under 5 GW (-14%).

Total installed capacity



year	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
MW	17,315	23,159	28,598	34,371	40,511	48,031	56,517	64,713	74,919	84,650	94,352	106,041

Source: GWEC

EU offshore

In 2012, 293 new offshore turbines in nine wind farms were fully grid connected totalling 1,166 MW. This brought European cumulative offshore capacity to 4,995 MW, of which 4,993 MW is in the EU Member States, and 2 MW in Norway.

New policy developments

In January 2013, the EU Heads of States agreed on the EU's budget for the next seven years: the "Multi-annual Financial Framework" for 2014-2020, which for the first time ever is decreasing. The European Parliament is still to approve the proposal and therefore negotiations on the details will continue during 2013.

On the positive side, the framework includes an increase in the budget for EU research, called "Horizon 2020". About €7 billion (USD 9.33 billion) is earmarked for energy research, and a further €5 billion (USD 6.5 billion) for energy infrastructure within the "Connecting Europe" facility. Moreover, renewable energy projects can obtain funding under the EU's Cohesion Fund with a focus on regional and economic development.

Outlook for 2013 and beyond

During 2012 the European Commission's Energy Roadmap 2050[1] was widely debated. The Roadmap models pathways aiming at delivering the EU's decarbonisation objective of 85% emissions reduction in the energy sector by 2050. In each scenario, wind energy is the leading electricity generating technology, supplying between 32% and 49% of the EU's total electricity consumption by 2050.

There is currently a debate on the EU's post-2020 legislative framework for climate and energy. It is anticipated that in April 2013 the European Commission will present a proposal for a future 2030 climate and energy package, which may lead to more binding commitments, including a renewables target for 2030.

Moreover, the European Commission has launched a consultation on options for structural reform of the EU emissions trading system (EU-ETS) to address the growing surplus of emission allowances in the system, largely due to over-allocation of free allowances to polluting industries in the first two phases of the ETS, which has been made worse by the economic slowdown across the EU in the past few years.

The proposal could see surplus credits withheld from the market – a move which should push the carbon price up, and providing polluting industries with an incentive to move away from fossil fuels. The economic crisis has had the general effect of reducing carbon emissions, meaning that thousands of carbon permits have been in the market at prices so low they no longer provide an incentive to shift away from carbon-intensive processes.

Under the current terms of the Commission proposal, permits will be "backloaded"[2] – which means that they could be released onto the carbon market again at a future date. However, in order to provide a long-term fix to the ETS and keep the carbon price higher, these permits must eventually be permanently removed[3]. The proposal must still go through a final vote in the European Parliament, currently scheduled for April 2013, where it may well meet strong opposition from MEPs with ties to heavy industry. Earlier this year, the Parliament's industry committee gave a negative opinion on the proposal to withhold carbon permits.

With input from the European Wind Energy Association (EWEA)

1 http://ec.europa.eu/research/horizon2020/index_en.cfm
2 http://ec.europa.eu/energy/energy2020/roadmap/doc/com_2011_8852_en.pdf

GERMANY

© Martin Goltermann

Main market developments

Germany maintained its position as the European leader in wind energy in 2012 with a total of 31,308 MW installed capacity and 23,030 operating wind turbines. 2,415 MW came on line last year, representing 20% annual market growth, and included 432 MW in repowering and 80 MW offshore. 627 MW of onshore turbines were decommissioned in 2012.

Wind energy generated 45 TWh of electricity in 2012, 7.3% of the country's net electricity consumption. In total, 23% of electricity was generated from renewable energy in Germany, with wind being the single largest contributor.

In terms of wind power deployment, Lower Saxony is the leading German federal state with a total of 7,333 MW. Although Lower Saxony (361 MW added in 2012) and Schleswig-Holstein (333 MW) rank as the top two states, southern states such as Rhineland-Palatinate (288 MW) and Bavaria (201 MW) each chalked up significant recent additions.

The policy environment

As a response to the nuclear disaster in Fukushima, in 2011 the German parliament voted in favour of fully phasing out nuclear energy by 2022, greater energy efficiency and an accelerated switch to renewable energy. Following this decision, the German government adopted a package of measures: "The path to the energy of the future - reliable, affordable and environmentally sound"[1]. Moreover, amendments were made to seven laws, including the Renewable Energy Sources Act.

Amendment to the Renewable Energy Sources Act

The amended Renewable Energy Sources Act (EEG)[2], effective on 1 January 2012, continues to provide stable support for onshore wind power and has improved support for offshore wind power. The amended EEG sets Germany's target for renewable energy in final energy consumption at a minimum of 35% by 2020 and 80% by 2050.

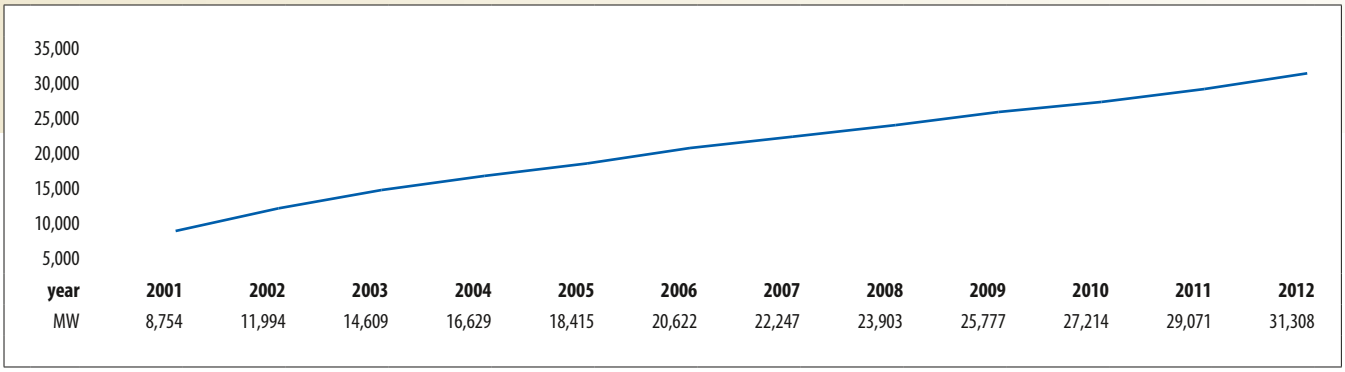
The initial tariff for onshore wind energy, which is paid for at least five years depending on site conditions, was kept at EUR 8.80 cent/kWh (USD 11.39 cent). In addition, a system services bonus for turbines with advanced technological capacities installed before the end of 2014 was set at EUR 0.47 cent/kWh (USD 0.61 cent) and a repowering bonus of EUR 0.49 cent/kWh (USD 0.63 cent) is paid when replacing old turbines with new ones. In 2012, the annual digression rate for new onshore wind turbines was 1.5%.

According to the German government's energy strategy, offshore wind power will become the second most important renewable energy source. However, due to the risks involved, financing difficulties and grid connection delays, deployment is lagging behind projections. Therefore, offshore wind receives an additional starter bonus of EUR 2 cent/kWh (USD 2.6 cent) included in the initial tariff for offshore wind power which is set at EUR 15 cent/kWh (USD 19.4 cent) and paid for at least twelve years depending on distance to shore and water depth. Moreover, a so-called "optional compression model" was introduced for offshore turbines which come online before the end of 2017. This gives developers the option of an initial tariff of EUR 19 cent/kWh (USD 24.6 cent) for 8 years instead of EUR 15 cent/kWh for 12 years).

The 2012 amendment of the EEG also created the conditions for direct sale of renewable electricity on the spot market with the introduction of a feed-in-premium (Marktprämie). The level of the feed-in-premium per kWh is flexible and calculated as the difference between the monthly average spot market price for electricity and the fixed feed-in tariff. Producers also receive a so called "management premium" amounting to EUR 1.2 cent per kWh (USD 1.6 cent) with a gradual decrease to EUR 0.7 cent per kWh by 2015, designed to finance renewable electricity vendors' new trading infrastructure and the balancing energy which they are now obliged to cover in case production differs from their forecast.

Switching between the fixed feed-in- tariff and the feed-in-premium can be done monthly. By February 2012, more than 18,000 MW of renewable capacity including over 16,500 MW of wind had already opted for the feed-in-premium and this rose in March of 2013 to more than 30,000 MW of renewable capacity including over 24,300 MW of wind.

Total installed capacity



year	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
MW	8,754	11,994	14,609	16,629	18,415	20,622	22,247	23,903	25,777	27,214	29,071	31,308

Source: GWEC

Future Trends – designation of new sites and onshore repowering

For onshore wind farm development, the number of sites commissioned has decreased during recent years. However, a number of federal states have now set new targets for wind energy and started commissioning new sites. In Brandenburg, a 50% increase in designated sites was announced with a target to reach wind capacity of 7,500 MW by 2020 and Schleswig-Holstein has targeted 9,000 MW of installed capacity by 2020. Lower Saxony plans to be 100% renewable by 2021, of which 10,000 MW will come from onshore wind. All of the targets cannot be met in parallel due to grid and system restraints but they show the large potential for onshore wind energy in Germany.

Repowering can and will play a stronger role in Germany in the future, with the potential to double the amount of capacity and to triple the energy yield with significantly fewer turbines deployed.

Obstacles to wind power development

In many regions, height restrictions inhibit the installation of larger, modern turbines, which with hub heights above 120 meters and optimised ratio between rotor diameter and generator at very good sites can reach capacity factors of 35% (3,000 full load hours) in mainland Germany and up to 45 % in coastal and mountainous areas. Federal and State governments have started rethinking their framework conditions to allow for continuous onshore development and have entered into discussions with local and regional planning authorities.

Another challenge for expanding renewable energy is system optimisation and speedy grid expansion. It will also be important to improve grid transport capacity in Germany through soft measures such as temperature monitoring, high temperature conductors, load flow management and other smart grid options. There is an on-going discussion of this important topic and the first projects for improved renewable electricity integration at the regional level have been implemented, with so-called feed-in grids[3].

Offshore wind development

Offshore wind energy in Germany grew to 280.30 MW in 2012, and a further 2,700 MW are under construction. Most German offshore wind farms are 20-60 km from the coastline in 20-40 meters depth. To date, 29 projects have been licensed, bringing overall capacity to 9,000 - 10,500 MW depending on turbine sizes.

The costs for connecting offshore wind farms to the mainland grid have been assumed by transmission system operators. Three connections (400 MW HVDC light lines) have already been completed. However, difficulties in securing sufficient finance to install offshore cables in a timely fashion could cause delays to current and future offshore projects.

Outlook for 2013 and beyond

The domestic market has been very stable for the past few years in Germany and further growth depends upon the removal of key administrative barriers. These are primarily political issues, yet both national and federal state level targets for renewable electricity require a growing contribution from wind energy in Germany.

In 2013, the German wind industry expects new installations of about 2,700 to 2,900 MW of onshore and about 300-600 MW of offshore wind. Offshore projects are expected to gain larger shares of the market over the coming years; but the main impetus for growth will continue to be in new onshore installations and repowering.

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

1 http://www.bmu.de/en/uebrige-seiten/the-path-to-the-energy-of-the-future-reliable-affordable-and-environmentally-sound/
2 www.erneuerbare-energien.de/fileadmin/ee-import/files/english/pdf/application/pdf/eeg_2012_en_bf.pdf
3 Feed-in grids connect various (renewable) generation units directly to the high-voltage network (220 kV or 380 kV), thereby bypassing the distribution network.

GLOBAL OFFSHORE

Thornton bank, Ostend, Belgium © *EWEA*

The state of play of the global offshore market

Twenty-two years have passed since the world's first offshore wind farm was built in Denmark, Vindeby (5 MW). Today, 5,415 MW of offshore wind power has been installed globally, representing about 2% of total installed wind power capacity. More than 90% of it is installed off northern Europe, in the North, Baltic and Irish Seas, and the English Channel; and most of the rest is in a number of demonstration projects off China's east coast. However, there is also great interest elsewhere: Japan, Korea, the United States, Canada, Taiwan and India have shown enthusiasm for developing offshore wind in their waters. According to the more ambitious projections, a total of 80 GW could be installed by 2020 worldwide, with three quarters of this in Europe.

In 2012, 1,296 MW of new offshore capacity was added, a 33% increase from the 2011 market. The majority (90%) of the installations were in Europe, led by the UK (854 MW) and followed by Belgium (185 MW), Germany (80 MW) and Denmark (46.8 MW). Most of the rest was in inter-tidal and near shore demonstration projects in China (127 MW), in one project located in Jeju Island in Korea, and Japan's floating turbine near Goto Island off Nagasaki with a capacity of 100 kW.

Global offshore wind power in the end of 2012

	2012 (MW)	Cumulative (MW)
UK	854	2,947.9
Denmark	46.8	921
China	127	389.6
Belgium	185	379.5
Germany	80	280.3
Netherland	0	246.8
Sweden	0	163.7
Finland	0	26.3
Japan	0.1	25.3
Ireland	0	25.2
Korea	3	5
Norway	0	2.3
Portugal	0	2
Total	1,296	5,415

Offshore wind has a number of advantages, such as higher wind speeds and less turbulence than on land and fewer environmental constraints. Offshore is particularly suitable for large scale development near major demand centers represented by the major port cities of the world, avoiding the need for long transmission lines to get the power to demand centers, as is so often the case onshore.

Although offshore development has passed the 5 GW mark, it still is lagging behind expectations. Actual installations in the EU member states in 2012 were 14% lower than the 5.8 GW target set in the National Renewable Energy Action Plans (NREAPs) for the end of 2012. The Chinese target of 5 GW by 2015 seems increasingly unlikely to be met.

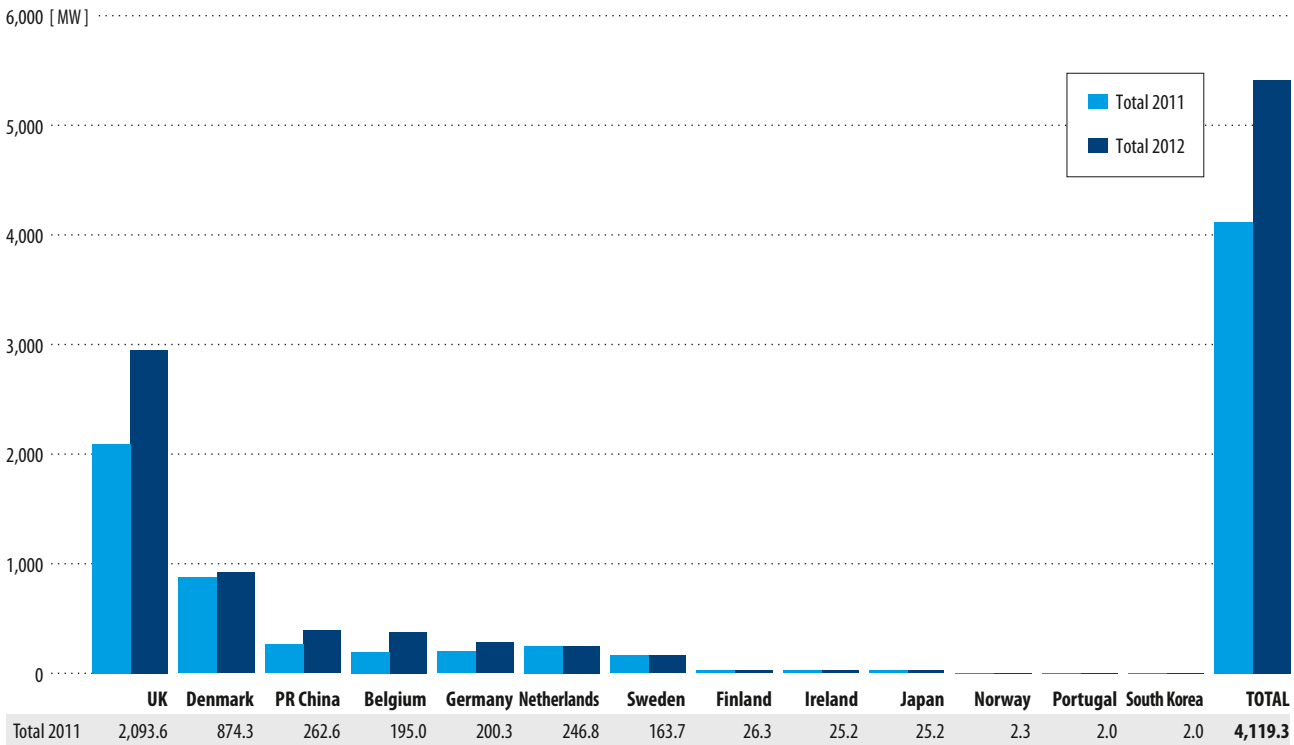
The major challenge for offshore wind development today is to continue to bring down costs. Selection of sites in deeper waters, further from shore, with more difficult bottom conditions and higher waves, have all contributed to driving the costs up faster than the improvements in the technology has been able to drive them down. However, technology cost reductions continue to be achieved, and this is one of the main reasons for confidence regarding offshore wind. It is expected that the cost of energy from offshore wind will come down substantially as the mass roll-out of the next generation of offshore wind turbines begins to take place.

EU offshore wind energy sector posts solid 2012

1,166 MW of new offshore wind power capacity were connected to the electricity grid during 2012 in Europe, bringing the total to 4,995 MW. Over 73% of all new capacity was installed in the UK (854 MW), followed by Belgium (185 MW or 16%), Germany (80 MW, 7%) and Denmark (46.8 MW, 4%). Of the total 1,166 MW installed in European waters, 80% were located in the North Sea, 16% in the Atlantic Ocean and the remaining 4% in the Baltic Sea.

The turbines installed in 2012 represent investments of around 4 billion euros. Offshore prospects for 2013 and 2014 are positive with 14 projects under construction, due to increase

Global Cumulative Offshore Installed Capacity in 2012



	UK	Denmark	PR China	Belgium	Germany	Netherlands	Sweden	Finland	Ireland	Japan	Norway	Portugal	South Korea	TOTAL
Total 2011	2,093.6	874.3	262.6	195.0	200.3	246.8	163.7	26.3	25.2	25.2	2.3	2.0	2.0	**4,119.3**
New 2012	854.2	46.8	127.0	184.5	80.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	3.0	**1,295.6**
Total 2012	2,947.9	921.1	389.6	379.5	280.3	246.8	163.7	26.3	25.2	25.3	2.3	2.0	5.0	**5,415.0**

Source: GWEC

installed capacity by a further 3.3 GW, and bring total offshore capacity in Europe to 8.3 GW.

Offshore industry development in Europe

Despite the majority of European offshore wind farms being still owned by utilities (70%), the developers of offshore projects are becoming more diversified. DONG remained the biggest developer in the European offshore sector representing 19% of total installations in 2012. DONG, Statoil (12%), Statkraft (12%), RWE (9%), SSE (8%), E.ON (6%), Vattenfall (3%), Nuhma (3%), Centrica (2%), and EDF (1%) installed more than 70% of the capacity that came online during 2012.

UK leads the way

The UK is the world leader in offshore wind, with 2,948 MW. The UK government's Renewable Energy Road map, which was updated in December 2012, indicates that offshore wind could contribute up to 18 GW by 2020.

New development & grid roadmap in Germany

Offshore wind energy in Germany grew to 280.3 MW in 2012, and a further 2.7 GW are under construction. Most German offshore wind projects are 20-60 km from the coastline in waters 20-40 meters deep. To date, 29 projects have been licensed by the national maritime authority and the federal states, bringing the overall capacity to 9,000 - 10,500 MW depending on turbine sizes.

Belgium and Denmark moving on strongly

Belgium, despite its very small offshore area continues to hold third place in Europe in terms of installations. Denmark's ambitious target to increase the penetration of wind energy in its electricity mix to 50% by 2020 depends to a great extent on new offshore projects.

Slow progress in China

China installed 127 MW of offshore wind in 2012, of which 113 MW was in inter-tidal projects (projects in the shallow inter-tidal zone which dries out at low tide, unique to China) and the remaining 14 MW were near shore demonstration projects. The majority (67%) of the Chinese offshore projects are inter-tidal projects, accounting for a total of 261 MW. In 2012, China maintained its 3rd position in offshore wind development with a total of 389.6 MW, after the UK and Denmark.

Offshore wind farm in Baltic Sea off Copenhagen, Denmark © Tony Moran

2012 New offshore wind projects and manufacturers in China

	Unit		Turbine Size (MW)	Project size (MW)	Project type
ShanDong Binhai 1st Phase	United Power	1	3	3	Near shore
Shan Dong Weifang Demonstration	United Power	1	6	6	Near shore
FuJian Fuqing Offshore Demonstration Project	XEMC	1	5	5	Near shore
Jiangsu Rudong Longyuan 150MW Intertidal	CSIC	2	5	10	Intertidal
Jiangsu Rudong Longyuan 150MW Intertidal	Goldwind	20	2.5	50	Intertidal
Jiangsu Rudong Longyuan 150MW Intertidal second phase	Goldwind	20	2.5	50	Intertidal
Jiangsu Xiangshui Intertidal Project	Goldwind	1	3	3	Intertidal
	Total	46	27	127	

China has ambitious national targets of 5,000 MW offshore by 2015 and 30 GW by 2020, although progress has been slow. The main bottleneck is caused by lack of coordination between different government agencies relevant to marine development. Currently, only small scale demonstration projects are under way to test the waters for the 'real' offshore development.

3 GW by 2030 plan in Taiwan

The Taiwanese government has set a target of 600 MW of offshore wind capacity by 2020 and 3 GW by 2030. To reach this goal, the Bureau of Energy launched a support scheme for offshore wind projects in July 2012, covering 50% of the capital costs of two pilot offshore turbines and up to TWD 250 million (EUR 6.5mn / USD 8.4mn) for the development of a large wind farm of 100-200 MW capacity.

As of January 2013, three projects had been awarded the grant: the 100.8 MW Fuhai offshore wind farm, which is expected to be finalised by the end of 2016; a 108 MW project off the coast Miaoli county by Formosa Wind Power; and another 108-150 MW wind farm owned by Taiwan Power. In the meantime, a feed-in tariff for offshore wind has been set at TWD 5.56 per kWh (EUR 0.151 / USD 0.186), which is twice the level of the onshore wind tariff. The FIT is valid for twenty years.

Focus on offshore in Japan

Japan is an island country with a very large EEZ and excellent offshore resources, and following the Fukushima disaster in 2011, a strong appetite for renewable energy. The Ministry of Environment (MOE) estimates Japan's theoretical offshore potential at 1,573 GW.

Offshore projects in Japan at the end of 2012

Project Name	Location	Project Owner	Time of installation	Turbine manufacturers	Project size (MW)	Turbine size	Unit of turbines (MW)	Foundation	Type of Project
Setana	Hokkaido	Hokkaido local government	2004	Vestas	1.2	600 kW	2	Dolphin	Near shore
Sakata	Akita	Private investor	2003	Vestas	10	2 MW	5	Dolphin	Near shore
Kamisu	Ibaraki	Private investor	2010	Fuji Heavy Industries (FHI)	14	2 MW	7	Monopile	Near shore
Kabashima	Nagasaki	MOE	2012	Fuji Heavy Industries(FHI)	0.1	100 kW	1	Spar type floating	Offshore

Currently, Japan has four on-going offshore wind projects at four sites totalling 25.3 MW, including both founded and floating types of turbines. The only new installation in 2012 was the floating turbine demonstration project off Goto Island, near Nagasaki, with a capacity of 100 kW.

Due to the lack of historical data, the feed-in-tariff FIT for offshore wind is not fixed; it will take 2 to 3 years in order to get enough of a track record to set the price, which are re-estimated annually by the Ministry for Economy, Trade and Industry (METI). Most of the projects are owned by government agencies testing the water for offshore development, both in terms the economics of the projects, and for testing different foundation and turbine technologies.

METI's floating offshore project, the 16 MW Fukushima project, is located offshore from where the nuclear accident happened two years ago, triggering an energy revolution in Japan. The project may be expanded to up to 1,000 MW if the technology proves to be successful. Another project testing the floating foundation concept is the 2.1 MW Goto Island project, with 0.1 MW already installed in 2012.

The floating turbine technology is still in its early stages of development. However, given the water depths along the Japanese coast (more than 200 meters depth close to the shore) floating technology is an attractive option as bottom mounted turbines are not practical.

Offshore projects in the pipeline in Japan

Project (Conductor)	Operation	Location	Wind turbine model	Foundation / type of floater
Demonstration of Offshore Wind Power Generation by NEDO	Jan. 2013	Chiba (Chioshi)	MHI 2.4MW	Gravity foundation
	Spring 2013	Fukuoka	JSW 2MW	Gravity & hybrid-jacket foundation
Floating Offshore Wind Turbine Demonstration Project by MOE	Aug. 2012	Kabashima Goto island in Nagasaki	FHI 100kW	Spar type floater
	2013		Hitachi 2MW	Spar type floater
Floating Offshore Wind Farm Demonstration Project (Farewinds, by METI)	2013	Fukushima	Hitachi 2MW	Spar type floater
	2014		MHI 7MW	Semi-sub type floater
	2015		MHI 7MW	Advanced spar type floater

MHI: Mitsubishi Heavy Industries, Ltd. JSW: Japan Steel Works, Ltd.
FHI: Fuji Heavy Industries, Ltd. FHI's wind turbine division merged by Hitachi Co. in July 2012

South Korea announcing ambitious offshore targets

South Korea's offshore wind installations, totalling 5 MW, are all located in Jeju Island in a project developed by the Korean Institute of Energy Research. The project consists of one 2 MW STX direct drive turbine installed in 2011 and another 3 MW Doosan turbine, which was installed in July 2012.

The South Korean government set a target for offshore wind power of 2.5 GW in 2010. The plan was modified at the end of 2012 to include a new time line for 100 MW to be operational by 2013, 900 MW by 2016 and 1.5 GW by 2019. According to the plan a total of USD 8.2 billon (EUR 6.4 bn) will be invested in offshore wind sector in the next nine years. Most of the projects under the 2.5 GW plan will follow the private-public partnership (PPP) model, in which the Korea Electric Power Corporation (KEPco), 51% owned by the government, will be the leading developer, together with Korean turbine manufacturers such as Doosan Heavy Industries, Samsung, Hyundai, and Daewoo. Parallel to this, there is another 4.5 GW of offshore projects being planned by local governments. Jeju Island has some of the most ambitious plans with a target of 380 MW by 2016 and 2 GW by 2030.

The government's ambition in offshore wind development is driven by a goal of generating 11% of the country's total primary energy supply from renewable sources by 2030; and many large and well known Korean companies have entered the offshore market, including Doosan, Daewoo, Hyundai and Samsung. These corporate giants have also expressed strong interest in overseas markets in Europe and North America.

INDIA

© Vestas India

Wind power grew in India last year, though at a slower pace than in 2011, adding 2,336 MW of new capacity. Total installed capacity reached 18.4 GW by the end of December 2012. Wind energy accounted for about 70% of total renewable energy capacity in the country by the end of 2012.

By 2012 grid-connected renewables provided more than 12.5% (26.7 GW) of India's overall power generation capacity (~211 GW). India's 11th five-year Plan (2007-2012) ended in March 2012 and the total wind installations during the plan period were over 10.2 GW, surpassing the plan-period target of 9 GW. A capacity addition of 30 GW of grid connected renewable power is proposed under the 12th five-year plan (2012-2017), of which 15 GW is envisioned to come from wind power alone.

India's Centre for Wind Energy Technology (C-WET) revised the official wind potential figure to 102 GW at 80m hub height (validation pending). The earlier estimate was 49 GW at 50m hub height, assuming 2% potential land availability.

Main market developments in 2012

The drastic reduction in the rate of accelerated depreciation (AD) benefit from 80% to 15% effective from April 2012 had a significant impact on wind installations. Traditionally balance sheet financiers have driven wind power development in India. The drop in AD rates had a significant impact on the amount of financing available from this segment to the wind sector in 2012. In effect, the total depreciation benefit available in the first year consists of 15% normal depreciation and 20% additional depreciation that is available for all power sector projects.

The Generation based Incentive (GBI of INR 500/MWh or EUR 7 /MWh[1]) initially valid up to 31 March 2012, also lapsed for the remainder of 2012. This was a double whammy for the wind sector in India.

The Renewable Energy Certificate (REC) scheme, introduced in early 2011, witnessed a rapid increase in REC volumes. REC Registry as of mid-February 2013 issued over 4,869,000 non-solar RECs. Wind power made up 56% of the registered generation capacity. The market clearance price for non-solar RECs ranges between INR 1,500 to 3,300 (~ EUR 22 to EUR 47) per certificate. However, due to poor enforcement and monitoring of the Renewable Purchase Obligation (RPO) by the States, the demand for RECs seems to be declining and a majority of RECs are now selling at the floor price.

In the past year the regulators have failed to penalize relevant organisations for non-compliance with their respective RPOs. However, the 12th Plan considers the possibility of improving RPO enforcement by introducing an amendment to the Electricity Act of 2003 to make it a mandatory obligation.

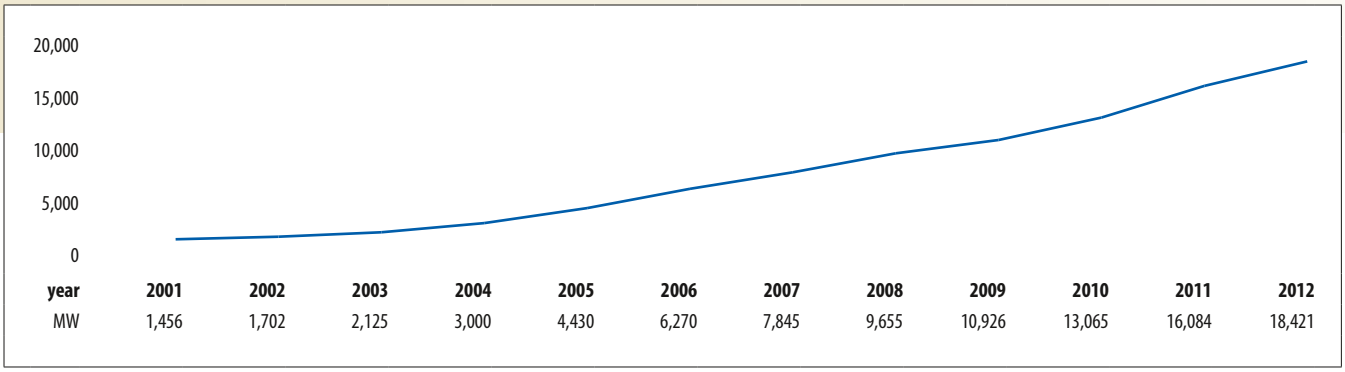
Independent power producers are now playing a larger role in the Indian market. With an installed capacity of 310 MW, Mytrah Energy Limited is on course to installing 1 GW capacity in the near future. Tata Power has initiated talks with IDFC Private Equity Fund owned Green Infra Limited to merge renewable assets of both the companies and are planning to add 150-200 MW of wind energy capacity every year for the foreseeable future. Ming Yang is collaborating with Global Wind Power (promoted by Reliance ADA group), and will install 2.5 GW of new capacity over the next three years with financing support from China Development Bank.

India has now become a major manufacturing hub. By the end of 2012, nineteen manufacturers had a consolidated annual production capacity of over 9.5 GW.

Policy framework for wind energy

State Electricity Regulatory Commissions (SERCs) from 13 states have issued wind-specific preferential FITs. SERCs from 25 states have also specified statewide Renewable Purchase Obligations (RPOs). Some of the states like Tamil Nadu, Gujarat, Kerala, and Andhra Pradesh have revised the tariff for wind power. The Gujarat Electricity Regulatory Commission revised the wind tariff in August 2012 from INR 3.56 to INR 4.23 per unit and revised it downward to INR 4.15 per unit in January 2013 due to an upward revision in the capacity factor expected from projects in the state.

Total installed capacity



year	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
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

Source: GWEC

Progress towards an offshore wind policy

The Ministry of New and Renewable Energy (MNRE) has set up an offshore wind energy steering committee, involving several major stakeholders including relevant national and state government departments and agencies. This committee will draft a road map for offshore wind power development in India. The MNRE is likely to issue an offshore wind policy in the near future.

Challenges for wind energy development

The Central Electricity Regulatory Commission recently allowed projects with capacities of over 50 MW to connect directly to the central transmission network subject to scheduling requirements[2]. However this provision is not being implemented uniformly across the states.

The plan to link India's southern (regional) grid with the national grid during FY 2013-14 will facilitate transmission of renewable energy and will help to strengthen the REC market. According to a recent Power Grid Corporation (PGCIL) study, building a 'green energy corridor' in India would cost approximately INR 420 billion (~ EUR 6 billion). If this proposal gets implemented it would help create much-needed transmission infrastructure.

In India, the majority of financing for wind projects to date has been balance sheet financing. The advent of IPPs in the wind sector is helping to establish project financing as an acceptable norm. However due to high borrowing costs the ability of the industry to expand at a faster pace is significantly affected.

Most of the wind power generators have PPAs with state utilities based on the tariff decided by the respective state regulators. Wind power generators are supplying power to the utilities; however, in some states like Tamil Nadu the wind farm operators have faced delays in getting payments. Sometimes, this delay is up to 12-16 months. The poor financial health of state utilities impacts future investment decisions and often results in investment flowing to other sectors.

Outlook for 2013 and beyond

The approved budgetary outlay for MNRE's programmes for the 12th plan is over INR 330 billion (~ EUR 4.7 billion), which is almost 3 times the budgetary outlay during the last plan period (2007-2012). This is likely to help the Ministry to strengthen its support for renewable energy generation by improving existing policy initiatives, and supporting new measures that have been identified to accelerate the pace of deployment of renewable energy generation in the country. It is likely that the government will approve a long-term target for the industry under a National Wind Power Mission, along the lines of the Solar Mission.

In February 2013 India's Finance Minister in his Annual Budget speech allowed for the reintroduction of the GBI and allocated INR 8 billion (~ EUR 118 million) to the Ministry of New and Renewable Energy for this purpose. He also made an announcement regarding transfer of low interest funds from the National Clean Energy Fund to the Indian Renewable Energy Development Agency (IREDA) for financing wind projects over the next five years. This will offer some respite and help ease the high costs of borrowing for wind farm developers in India.

For 2013, the Indian wind market is unlikely to see the exceptional growth it witnessed in 2011 and may struggle to meet 2012 levels. With the forthcoming reintroduction of the GBI, we foresee the prospect of rising investments in the wind sector in 2013, and a full recovery by 2014. The GBI will add to the attractiveness of the Indian wind market to both foreign and domestic investors; but the industry needs more clarity on how the scheme will be rolled out.

With input from the World Institute for Sustainable Energy (WISE)

1 Exchange rate EUR 1 = INR 69.97 as on 15-March-2013
2 Report on Green Energy Corridors: Transmission Plan for Envisaged Renewable Capacity. Volume 1, PGCIL, July 2012. http://apps.powergridindia.com/PGCIL_NEW/home.aspx

JAPAN

Japan in need of fossil-fuel free electricity

Despite the overwhelming public support for a switch away from nuclear power towards renewables, progress is slow in Japan. While an attractive feed-in tariff (FIT) was put in place in July 2012, there are continuing difficulties in getting grid connections, and a new requirement for a three year Environmental Impact Assessment (EIA) has added both delay and cost to wind projects since October 2012. The decision on the EIA law was made by the Ministry for Environment (MOE) prior to the Fukushima accident and therefore, the Japanese Wind Power Association has requested that the regulation be revisited, but such a process takes time.

The new Japanese government, led by the Liberal Democratic Party (LDP), is proceeding with electricity market reform in the country. The Fukushima accident has not only affected public opinion towards the government's energy policy but has also had a severe impact on Japan's economy and trade. Four nuclear plants in Fukushima were destroyed and the remaining 50 plants were forced to shut down. As of February 2013, 48 out of 50 nuclear power plants were still shut down. Japan has suffered from power shortages which have been compensated for by increased use of fossil power plants. Fossil-fuel free electricity is becoming ever more attractive in Japan, forcing the Japanese government to maintain its pro-renewables policy, in particular in relation to offshore wind development and grid extensions.

Main market developments in 2012

At the end of 2012, 2,614 MW of wind capacity had been installed in Japan consisting of 1,887 operating wind turbines supplying about 4,500 GWh annually. This represents about 0.5 % of the total power supply in Japan. The Environmental Impact Assessment law will keep installations at a low level until at least 2014.

New feed-in tariff

Japan's new feed-in tariff law went into effect in July 2012 with a price of 23.1 JPY/kWh (EUR 0.19 / USD 0.25) for large wind power installations and 57.75 JPY/kWh (€0.47 / USD 0.62) for smaller ones. Despite the attractive tariff, solar power received most of the investment in 2012, due to the advantage of higher price, easier regulation and grid access.

100 kW floating offshore wind turbine in Kabashima in Nagasaki Prefecture
© MOE

FIT prices in Japan in 2012 (2013**)

Type of Renewables		Price with tax* (JPY/kWh)	Price (JPY/kWh)	Purchase Period (years)
Wind	20kW	23.1	22.0	20
	>20kW	57.75	55.0	20
Solar (Photovoltaics)	10kW	42.0 (37.8)	40.0 (36.0)	20
	>10kW (house)	42.0 (38.0)	42.0 (38.0)	10

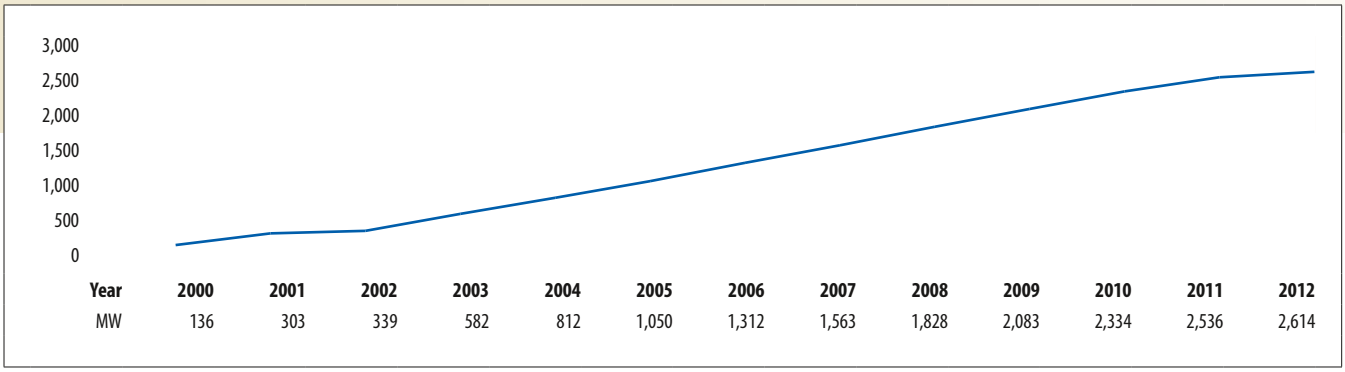
** 5% of general consumption tax is applied for companies.*
*** Solar prices for 2013 are expected to be reduced by10% from 2012 levels; prices for wind are expected to remain at 2012 level.*

These tariffs are estimated with the objective of providing a 6%-8% IRR for projects based on the Japanese domestic experience. Due to the lack of historical data, the FIT for offshore wind is not fixed; it will take 2 to 3 years in order to get enough of a track record to set the price. The FIT prices are re-estimated annually by the Ministry for Economy, Trade and Industry (METI). The price for solar is expected to decrease to 37-38 JPY/kWh and price for wind to remain at current level in 2013, and the investment in renewable energy will gradually shift from solar to wind power.

Japan invests 43 billion JPY for wind power in 2013

The Japanese government has earmarked a JPY 43.4 billion budget for wind power for the 2013 fiscal year. Offshore wind power will receive 17.1 billion JPY, while JPY 25 billion are earmarked for grid extension.

Total installed capacity



Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
MW	136	303	339	582	812	1,050	1,312	1,563	1,828	2,083	2,334	2,536	2,614

Source: GWEC

Japanese government's budget allocation for wind power for 2013 fiscal year

Item	Budget	Source
Floating Offshore Wind Farm Demonstration Project	9.5 bn JPY	METI
Demonstration of Offshore Wind Power Generation	4.0 bn JPY	NEDO
Advanced Wind Turbine Technology Development	2.0 bn JPY	NEDO
Floating Offshore Wind Turbine Demonstration Project	1.6 bn JPY	MOE
Environmental Assessment Model Project for Wind Power	1.3 bn JPY	MOE
Grid extension subsidies for wind power	25.0 bn JPY	METI
Total	**43.4 bn JPY**	

New grid extension on the way

The best wind power resources in Japan are located in the remote rural regions of the north such as Hokkaido and Tohoku with small populations, low electricity demand and few grid lines connecting them to large demand centers. To expand wind power potential and enable electricity to be transported more effectively, the Ministry for Economy, Trade and Industry (METI) has decided to support the improvement of local grid extensions. Half of the costs will be covered by an official fund. The first step will be taken in 2013 with a 25 billion JPY budget dedicated to upgrading the grid in the Hokkaido region. Extension work in the Tohoku region is expected to start in 2014 with a view to finalizing the regional grid upgrade within the next ten years.

Grid extension and offshore wind sites in Japan

Source: JWPA/JWEA

Cost estimation for the grid extension in the Hokkaido and Tohoku regions

Area	Future potential	Grid acceptance potential now	Installed capacity	Grid Cost
Hokkaido (Northern area)	3,935 GW	0.28 GW	0.16 GW	290 bn JPY
Tohoku (Aomori and Akita)	2,220 GW	1.94 GW	0.83 GW	20 bn JPY
Total	**6,155 GW**	**2.22 GW**	**0.99 GW**	**310 bn JPY**

Focus on developing offshore wind power

About 73% of Japan is mountainous with about 128 million people living on the relatively narrow plain areas, mostly near the coast. While decreasing social acceptance places limits on Japanese onshore wind power development, Japan has a marine industry with strong technical capabilities and the world's 6th largest marine Exclusive Economic Zone. For these reasons, offshore wind is regarded as an attractive option in Japan.

Currently, Japan has four on-going offshore wind projects at four sites totalling 25.3 MW, including both founded and floating types of turbines. Offshore wind power development is expected to significantly contribute to the domestic energy supply, creating a new industry in Japan. This comes as a necessary development for the recovery of the Tohoku region after the disaster, and gives a symbolic meaning for the floating offshore demonstration project located off Fukushima.

Outlook for 2013 and beyond

After the Fukushima accident, Japan has started slowly moving towards transformation of the energy system which would allow more reliance on wind power and other renewables. However, removing many existing barriers is still likely to take a long time. Offshore wind development, particularly floating turbines, gives some promising prospects for the future. The government aims at installing 5-6 GW of offshore wind capacity by 2030.

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

MEXICO

CentralEoloeléctrica La Venta wind farm, Oaxaca © *Mexican Wind Energy Association (AMDEE)*

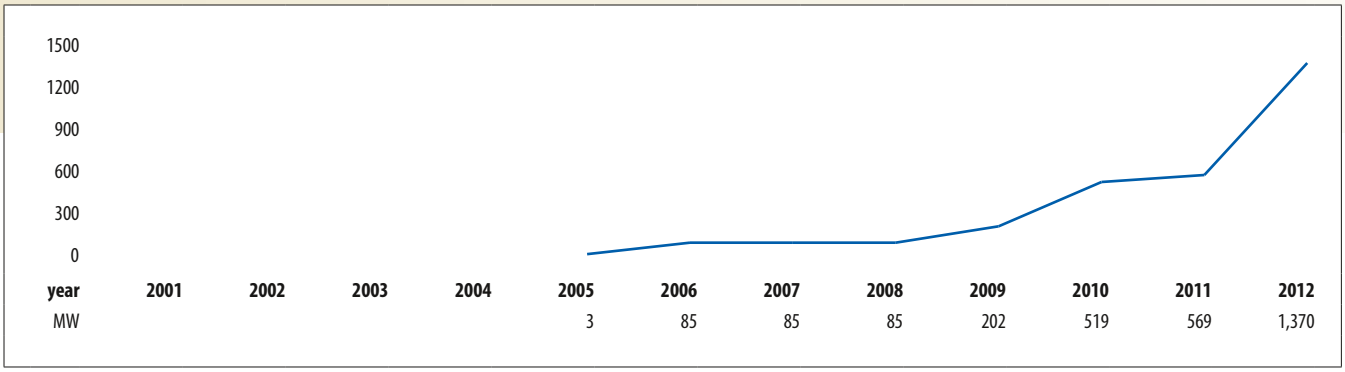
Wind power potential in Mexico

Mexico more than doubled its wind power capacity by adding 801 MW to the country's electricity grid in 2012, bringing total wind capacity up to 1,370 MW.

In the new government's National Energy Strategy for 2013-2027, the target for wind energy is set at 20 GW over the next eight years, and identifies potential of more than 50 GW. However, the Mexican Wind Energy Association (AMDEE) calls for a more conservative target of 12 GW by 2020, which would still amount to enormous growth for the sector.

Although most new wind installations in 2012 were in the region of the Isthmus of Tehuantepec in the southern state of Oaxaca, there are already plans to harness the huge potential in other states in the northern and central part of the country, closer to major urban and industrial load centers. This is due to recent technological developments resulting in more reliable and efficient turbines with higher hub heights and larger rotors which can yield high capacity factors, often above 40%, even in areas not blessed with the tremendous wind resources of Oaxaca.

Total installed capacity



Source: GWEC

The policy framework for wind development

There are no major expectations for a change in the support system for renewables in Mexico with the recent change of government. However, Mexico's new president Peña Nieto has announced a programme of energy reform, which would include increased measures for making the system more efficient and outlining a more important role for renewable energy.

The private sector can participate in the electricity business either through self-generation for particular entities or individuals, through generation by Independent Power Producers (IPP), or for export to other countries. Currently, 85% of the wind capacity in Mexico is developed under the self-generation scheme, where power consumers produce electricity for their own use, which is delivered to the CFE (Comisión Federal de Electricidad - the national utility) interconnection point and then transported to the consumer. The balance of existing generation is owned by the CFE. In the coming years, this balance is expected to reduce somewhat for self-generation, with the rest reserved for IPPs and CFE. Under the self-supply model, a developer and a group of off-takers create a generation corporation that supplies the off-takers' annual electricity requirements. A direct electricity sale from privately owned generators to the grid for sale to private customers in a spot market is not allowed in Mexico.

Some important incentives for private projects under the self-supply scheme for renewable energy in Mexico include: 100% depreciation in the first year of operation; a virtual energy bank, allowing the producer to generate the maximum possible when wind is available, and if not consumed immediately by the off-taker, electricity can be virtually 'stored' for up to 12 months; and a preferential reduced wheeling charge.

A series of recent regulatory changes have strengthened the policy environment for renewables in Mexico. This has created a more supportive and enabling business environment, and spurred growth in the private power generation sector.

Main market developments in 2012

In 2012, Mexico passed the 1 GW milestone of wind power capacity. Five wind farms with 509 MW of capacity came online under the IPP for CFE in the state of Oaxaca. Importantly, in addition to the existing 10 MW wind farm in Baja California, a 29 MW project in the State of Chiapas was finalised and construction work started in wind farms in Nuevo Leon and Jalisco states, showing that wind development in Mexico is no longer exclusively concentrated in the Oaxaca region.

The Mexican wind energy market has been dominated by four main turbine manufacturers: Acciona (40.5%), Gamesa (39.1%), Vestas (9.6%) and Clipper 10.8%). However, GE has finalised its first wind project in northern Mexico, Siemens has a project under construction, and other major players are now becoming active in the Mexican market.

Outlook for 2013 and beyond

The Mexican Wind Energy Association AMDEE has set a target of 12 GW of wind capacity by 2020, which would represent 15% of total power generation capacity in the country. Although the legal and regulatory framework for wind power development currently in place is adequate, the industry still faces obstacles and some significant improvements are needed. Expanding and reinforcing the grid and fully developing the small producer scheme are key areas for development. In addition, speeding-up and simplifying the permitting procedures is also essential.

The projects currently under advanced stages of development mean that by the end of 2015 the Mexican wind industry will have installed a further 3,500 MW.

With input from the Mexican Wind Energy Association (AMDEE)

PAKISTAN

© AEDB, Pakistan (2012)

2012 was an important year for wind energy in Pakistan, with total installed capacity reaching 56 MW. Commercially exploitable wind energy potential in Pakistan is estimated at over 346 GW[1]. With the exception of large hydro projects, wind is the fastest developing renewable energy source in the country today.

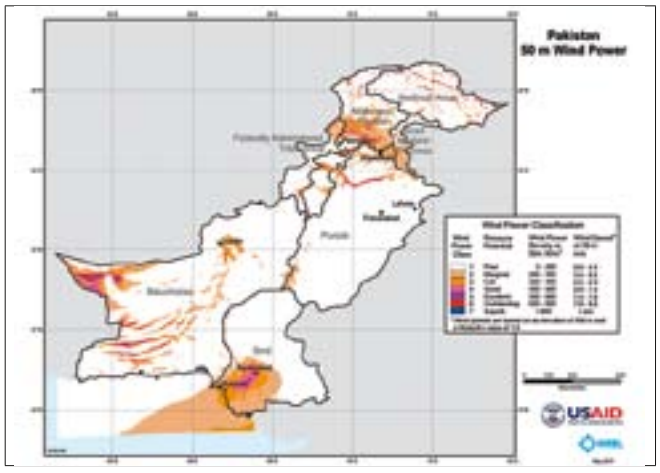
Pakistan's wind resource

In 2005-06 the National Renewable Energy Laboratory (NREL, US) undertook the first resource assessment for wind potential in Pakistan. This assessment led to Pakistan's first wind map being published, which indicated that there is excellent wind power potential in south-eastern Pakistan, the northern Indus valley, south-western Pakistan, central Pakistan and elevated mountain summits and ridge crests especially across northern Pakistan.

Among these, south-eastern Pakistan is considered to have excellent wind resources and the infrastructure for setting up of wind projects, particularly the Jhampir, Gharo and Keti Bandar wind corridor which extends 60 kms along the coastline and spreads more than 170 kms inland.

The south-eastern coastal wind corridor alone has a wind power potential of almost 60 GW[2], and this is where commercial wind project development is taking place at the moment. Although the south-western parts of Pakistan have a better wind resource, almost all of the new projects are located in the south-east, close to the national electricity grid with the electricity distribution company offering interconnection opportunities at 132 kVA.

Wind Power Density (W/m^2) at 50-m Above Ground Level



Source: NREL

Policy Environment

The government of Pakistan is taking aggressive steps to harness the country's wind resource. Currently, 42 wind energy projects with a total capacity of around 2,700 MW are in various stages of the project development process. By early 2013, projects with a total capacity of 850 MW had already been allocated land for construction purposes.

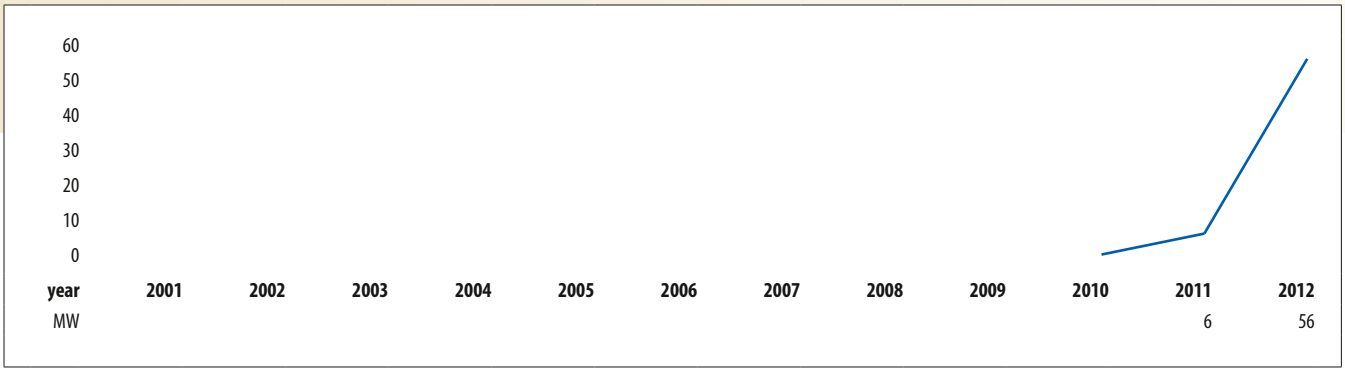
The laws applicable to IPPs in the country guarantee a 15% return on equity (RoE) through the tariff. To promote renewable energy, the government is offering 17% RoE for renewable energy projects.

Currently tariffs are being offered to investors which are designed to achieve the RoE outlined above and based on an assumption of financing available at LIBOR plus 4.5%. A debt-equity ratio has to be maintained in a range of 70/30 – 80/20. Several wind power projects have applied for project specific tariffs based on the standard tariff determination procedures of Pakistan. The initial projects have approved tariffs in the range of USD 12–14 cent/kWh (EUR ~ 9-11 cent/kWh) based on foreign financing.

To reduce the project development lead-time and costs for investors, the government of Pakistan offered a feed-in tariff for wind power projects of USD 14.7 cent /kWh (EUR ~ 11 cent/kWh) in October 2011. This tariff was valid until December 2012. A new upfront tariff for wind power is expected to be announced in the first quarter of 2013 with several investors opting for a pre-determined tariff rather that going through lengthy tariff negotiations.

In addition to the tariffs, the Government of Pakistan, as per the Renewable Energy Policy law of 2006, is offering investors a number of incentives such as waivers for income tax, sales tax, withholding tax and custom duties; repatriation of equity in US dollars; and priority grid access as well as 100% power purchase and evacuation guarantees.

Total installed capacity



Source: GWEC

Details of Projects (commissioned, planned and pipeline)

Capacity	Developer/Owner	Location
Projects constructed and supplying electricity to the national grid:		
49.5 MW	FFC Energy Ltd.	Jhampir, Sindh
56 MW	Zorlu Enerji Pakistan Ltd.	Jhampir, Sindh
Note: First 6 MW came online in 2011; remaining 50 MW came online in February 2013.		
Projects under construction:		
50 MW	Foundation Wind Power I (Pvt.) Ltd.	Khuttikun, Gharo, Sindh
50 MW	Foundation Wind Power II (Pvt.) Ltd.	Khuttikun, Gharo, Sindh
50 MW	Three Gorges First Wind Farm Pakistan (Pvt.) Ltd.	Jhampir, Sindh
Note: Additional wind power projects of almost 1,000 MW are in the pipeline		

Capacity	Developer/Owner	Location
Projects expected to achieve financial closure by December 2013:		
50 MW	Yunus Energy (Pvt.) Ltd	Jhampir, Sindh
50 MW	Tenaga Generai Ltd.	Khuttikun, Gharo, Sindh
50 MW	Sapphire Wind Power (Pvt.) Ltd.	Jhampir, Sindh
50 MW	Metro Wind Power Co Ltd.	Jhampir, Sindh
50 MW	Gul Ahmed Wind Power Ltd.	Jhampir, Sindh
50 MW	Master Wind Energy (Pvt.) Ltd.	Jhampir, Sindh
50 MW	Sachal Engineering Works (Pvt.) Ltd.	Jhampir, Sindh
50 MW	Dawood Power (Pvt.) Ltd.	Bhambore, Gharo, Sindh
50 MW	Zephyr Power (Pvt.) Ltd.	Gharo, Sindh
50 MW	Hawa Energy (Pvt.) Ltd.	Jhampir, Sindh
2*50 MW	Wind Eagle (Pvt.) Ltd.	Jhampir, Sindh

Recent Market Developments

Currently, the total installed capacity in Pakistan is 106 MW, 56 MW of which was grid-connected by the end of 2012. This consists of two power projects of 49.5 MW and 56.4 MW respectively. The 49.5 MW wind power project is owned by the country's largest fertilizer (urea) manufacturer and started supplying electricity to the grid by late 2012. The construction of 56.4 MW plant owned by a Turkish energy investment- company was completed in early 2013. The successful completion of these two projects created interest from several local and foreign investors for developing wind power projects in Pakistan.

In terms of the technology being deployed, the installed projects as well as several planned wind projects are utilising proven turbines from Nordex and Vestas, with some projects with Chinese investors bringing in turbines manufactured in China. Local EPC companies are also providing services to wind power developers and the towers for 25 out of 33 wind turbines for the 49.5 MW project were manufactured by a Pakistani firm.

Outlook for 2013 and beyond

Some barriers to wind power development exist in the form of a less than ideal security situation in the country (though the south-eastern corridor is located in a relatively safe and easily accessible area) resulting in difficulty for project developers in achieving financial closure.

High interest rates and Pakistan's low credit rating leads to the perception of higher financial risk, further adding to the complexities in projects achieving financial closure. The global economic conditions have also had an impact on the wind sector in Pakistan. The Turkish wind power project (56.4 MW) should have been completed in 2010 but due to the project financier becoming unable to finance the project, the developers installed the first 6 MW in 2011 against their equity portion and had to achieve financial close for the remaining capacity through other sources.

Grid-interconnection is currently not a barrier to wind power, but it is essential that the national grid operators invest in the grid to allow for the integration of larger volumes of wind power without affecting overall grid stability.

Despite these challenges, wind power is expected to take off in the coming years. Several projects are already in advanced stages of project development with some of them expected to come online in 2013.

With input from GIZ Program Office, Islamabad, Pakistan and the Alternative Energy Development Board, Govt. of Pakistan

1 Alternative Energy Development Board, Government of Pakistan http://www.aedb.org/Main.htm
2 http://www.aedb.org/respot.htm

ROMANIA

Fântânele wind farm © *CEZ*

Romania has tremendous wind resources, and the industry has grown dramatically in the past three years. However, wind power only accounts for about 5 % of national electricity production today. Romania continues to be powered predominantly by fossil fuels, which accounted for 50% of generation in 2012, followed by large hydropower at 25%, and nuclear at 20%. The share of hydro was lower than usual due to a dry year in 2012.

Romania's 1,941 MW of operating wind farms are mainly (90%) located in Dobrogea on the Black Sea coast, which boasts average wind speeds of 7.2 m/s at 100m altitude. The region is flat and sparsely populated, making it ideal for wind power development. Two other regions with significant potential are Banat and Moldavia, and both are expected to host significant wind development in the near future (see map).

MW by region

Source: NREL

Main market developments in 2012

Romania was the leader among Europe's emerging markets in 2012, installing 923 MW of new capacity, nearly double the 520 MW installed in 2011, for a cumulative capacity of 1,905 MW at the end of last year. The country has a significant development pipeline, and ranks 10th within the European Union wind markets.

Czech utility CEZ dominates the market, having completed the 600 MW Fântânele Cogealac project, which is the largest onshore wind farm in Europe. The two other main developers are Enel Green Power with 498 MW, followed by EDP, with 285 MW.

Four large wind turbine manufacturers dominated the market with an 85% share in 2012, namely Vestas, GE, Nordex and Enercon.

In July 2012, a new law on electricity and gas markets (the Romanian Energy Act 2012) came into force in Romania. This new Act constrains power producers to sell power only to the wholesale market directly, and places an outright ban on power purchase agreements (PPAs) and bilateral contracts. This creates a significant barrier for project finance since commercial banks are unlikely to provide financing without a PPA or some other long term contract.

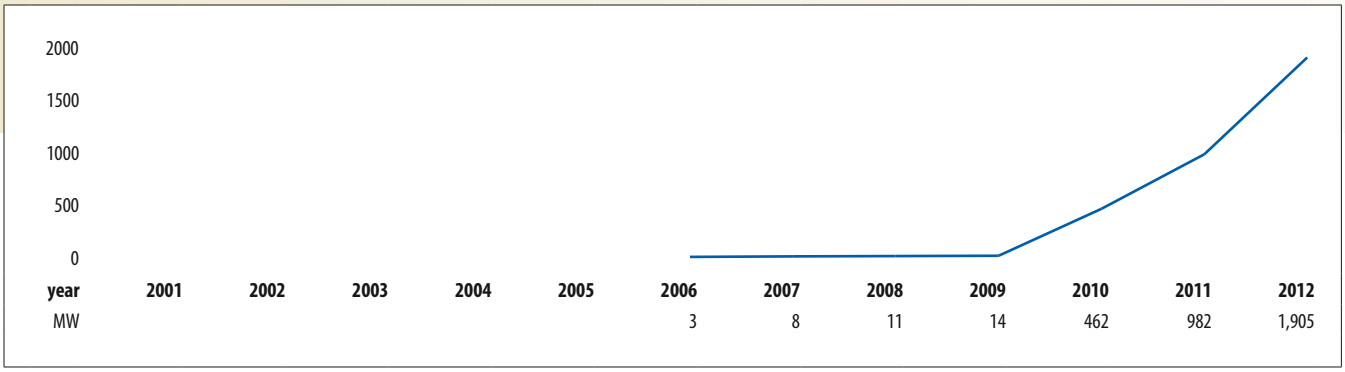
The policy framework

The renewable energy law adopted in November 2008 was a major step forward for wind development in Romania, introducing a green certificate (GC) scheme for renewable electricity for a period of 15 years, as well as loan guarantees and tax exemptions for renewable energy investments.

In 2011, the renewable energy law was amended in a positive fashion. The most important points of the amended law are:

- Wind energy producers receive two green certificates per MWh up to 2017. From 2018 this is reduced to one certificate. Wind farms receive certificates for 15 years.
- The value of the green certificates, initially set between EUR 27-55 (USD 35-71.3), will be adjusted annually using the inflation index of the Eurozone, both for the cap and the floor. In 2012 the cap is EUR 57.67 (USD 74.77).
- The penalties for suppliers for each non-produced certificate increased from EUR 110 (USD 143) to EUR 115.34 (USD 149.5) in 2012.

Total installed capacity



Source: GWEC

Before official adoption of the law, the energy regulator drafted secondary legislation and the renewable energy law had to wait for the European Commission's approval, resulting in long delays and uncertainty in the market. Finally, on 13 July 2011, the European Commission finalized its review and approved the Romanian E-RES promotion scheme. The implementation of the RES scheme started on 1 November 2011.

The following are some of the key revisions to Law 220/2008 following the EC's review:

- Introduction of the overcompensation concept – if the internal rate of return (IRR) of a RES technology exceeds the IRR published by the national regulator for that specific technology, the number of green certificates may be reduced. For wind, the maximum allowable IRR is 11.99%.
- Wind farms larger than 125 MW must individually notify the EC in order to qualify under the scheme. There is the possibility that the Commission will decide that the two green certificates/MWh in the case of these big producers is too high and that it could distort the market. This review process could lead to delays as long as a year, and cause great uncertainty for financing institutions, public or private.

In July 2012, some further amendments to the law were introduced, including:

- Guaranteed access to grid and priority dispatch;
- Projects that came online before 2013 and received European funding will benefit from the entire support scheme (2 GCs/MWh);
- Projects over 125 MW will receive 2 green certificates/MWh for a period up to 24 months during which they need to notify the European Commission;
- Green certificate trading takes place quarterly instead of annually, increasing market liquidity;
- Revision of the support mechanisms has been postponed to 2015 creating more uncertainty within the market.

All of these changes have to be approved by the Commission. There is some indication that earning green certificates at the same time as receiving EU support is not likely to be accepted.

Outlook for 2013 and beyond

The prospects for the wind sector in Romania for 2013 don't look very promising. Banning PPAs has already cut the forecast for 2013 in half from 1,500 MW of new capacity to 750 MW.

However, the biggest concern at the moment is a new amendment to the renewables law announced by the Prime Minister as a result of vigorous lobbying by the coal and metallurgical industries, which would reduce the cap of the GCs. This change has had a dramatic impact on the wind industry: the market is frozen, banks do not provide financing, and transactions for wind power have been put on hold; and above all, the market for green certificates is dead as the traders are expecting a significant decrease in their value. The only wind farms under construction are the ones where works started prior to the government's announcement in 2012.

This development is also no doubt confusing to the European Commission: the Romanian government has submitted an official application for approval for amendments to the law which was approved by the parliament in 2012, and meanwhile the same government is preparing dramatic changes to the law.

The wind industry, trying to maintain the status quo, is deeply frustrated by the situation. The final result is still pending, and any change will be subject to a new approval by the European Commission. Therefore, it's likely that the current law will be applied until 2014.

Due to rich onshore wind resources, offshore wind is not a priority in Romania, although it is expected that measurements will start at sites in the Black Sea in 2014.

With input from the Romanian Wind Energy Association (RWEA)

SOUTH AFRICA

Coega IDZ (industrial development zone), South Africa
© Electrawinds Africa and Indian Ocean Islands

Wind power in South Africa has moved from the planning to the execution phase, and is becoming one of the most vibrant new wind markets globally.

South Africa is blessed with excellent wind resources. After taking a decade to install the first 10 MW of wind power, the industry in South Africa is currently developing between 3,000 MW and 5,000 MW of wind power, of which 636 MW is under construction and a further 562 MW approaching financial close. In addition, there is a long term energy blueprint giving wind a significant allocation, about 9,000 MW of new capacity in the period up to 2030

South Africa's energy mix and wind power development

South Africa has the world's seventh largest coal reserves, so it is no surprise that more than 90% of South Africa's electricity comes from coal fired power stations. The bulk of it is produced by para-statal company Eskom, with in excess of 34,000 MW of coal fired capacity; South African municipalities own another 2,400 MW, and an additional 860 MW is privately held. Non-coal electricity generated by Eskom include: one nuclear power station at Koeberg (1,930 MW); two gas turbine facilities (342 MW); six conventional hydroelectric plants (600 MW); and two hydroelectric pumped storage stations (1,400 MW). Eskom's three previously mothballed coal-fired facilities (3,800 MW) at Camden, Grootvlei and Komati have been refurbished.

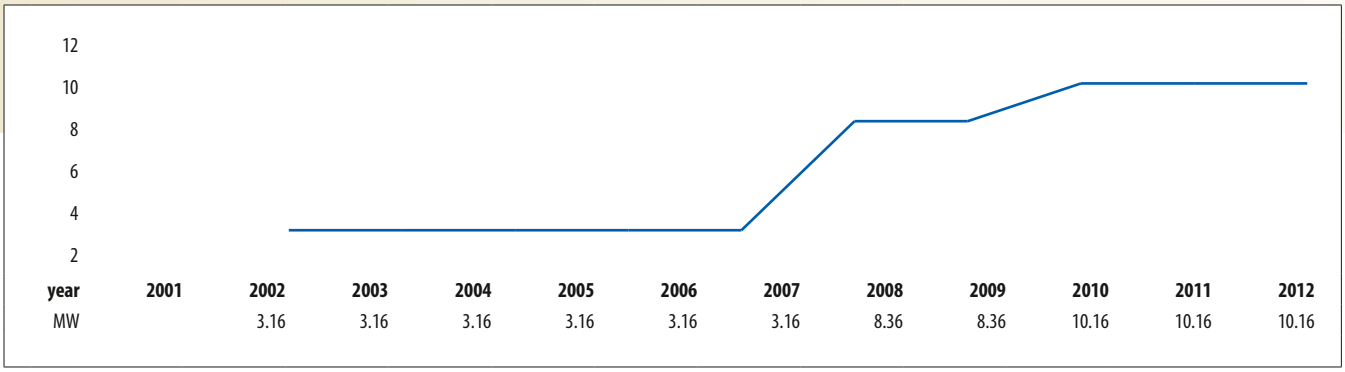
Distribution of electricity has been traditionally done by Eskom and this is still the case. South Africa's National Energy Regulator (NERSA), oversees electricity matters in the country, including the pricing and the licensing of electricity generation, transmission and distribution.

Reserve margins are razor thin, and South Africa has recently been plagued by blackouts and rolling brownouts during peak periods. The need for rapid capacity additions, as well as the government's policy to stop the growth in greenhouse gas emissions by the middle of next decade bodes well for wind power development.

South Africa's electricity price has traditionally been one of the lowest in the world, and despite some increases it is still low. Eskom is selling electricity at an average price of about ZAR 63 cent/kWh (EUR 5.24 / USD 6.78 cent). New coal based power is likely to cost about ZAR 0,97/kWh (EUR 0.08 / USD 0.1). There have been steep increases in the electricity price recently but there is pressure from consumers and industry to moderate this to avoid social and economic disruption.

Wind Power in South Africa is currently sold competitively at around ZAR 0,90/kWh (EUR 0.075 / 0.1 USD). The PPA counterpart to wind developers is almost invariably Eskom, backed by the SA government.

Total installed capacity



year	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
MW		3.16	3.16	3.16	3.16	3.16	3.16	8.36	8.36	10.16	10.16	10.16

Source: GWEC

Main market developments in 2012

The progress in 2012 was still focused on finalising the procurement and regulatory framework. The installed capacity did not increase in 2012, but the first round of projects under the Renewable Energy Independent Power Producer Programme (REIPPPF) reached financial close and construction work started in several large wind farms of up to 138 MW in size.

In terms of the 634 MW of projects awarded so far, the top three players in the market are:

1. African Clean Energy Developments (ACED)
2. Rainmaker Energy South Africa
3. Mainstream Renewable Power Jeffreys Bay Pty Limited

It is projected that the second procurement round will see capacity rise to about 1,000 MW installed by the end of 2014, with quick further growth to follow. The South African Energy Minister Dipuo Peters[1] also confirmed that the REIPPP will be extended into a rolling procurement programme, with an additional allocation of 1,470 MW for onshore wind projects to be developed by 2020.

Many of the large international manufacturers were involved in the first round. Those involved in projects that were announced include: Nordex, Siemens, Sinovel, Suzlon and Vestas.

The tender process places strong emphasis on local content requirements with an aim to ensure that local communities benefit economically from renewable energy facilities.

Many of the large international developers and utilities are active in the South African market. They are collectively represented by the South African Wind Energy Association (SAWEA) – see www.sawea.org.za

Obstacles to wind energy development

There are still some remaining obstacles to the wind industry, including:

- There are logistical challenges associated with the very rapid ramp up of the industry that is foreseen;
- The Integrated Resource Plan[2] (IRP - energy master plan until 2030) is reviewed every two years. Until that is settled there will be uncertainty as to whether the present regime will continue in substantially the same form. It is, however, highly likely to do so;
- Increasing thresholds for localisation will create challenges for developers, beginning with the third procurement round, due later in 2013;
- The position around grid integration and the costs thereof is not completely settled as yet;
- Adverse economic conditions may create popular sentiment for cheap electricity regardless of its environmental impacts;
- The costs involved in tendering into the procurement programme are high and create a challenge for smaller players.

Outlook for 2013 and beyond

The industry in South Africa is in a very rapid growth phase. While some set-backs are likely, it seems quite certain that South Africa is moving towards a large wind industry with in excess of 5,000 MW installed within 15 years, and possibly much sooner. The IPR calls for a total of 8,400 MW by 2030 and with the early signs of market development across southern Africa, South Africa could very well evolve into the hub for manufacturing and development that the industry has been looking forward to for many years.

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

1 www.energy.gov.za/IPP/Minister%20Remarks%20-%20IPP%20W1%20Announcement%20-%2029Oct2012.pdf
2 www.energy.gov.za/files/irp_frame.html

SOUTH KOREA

Main market developments in 2012

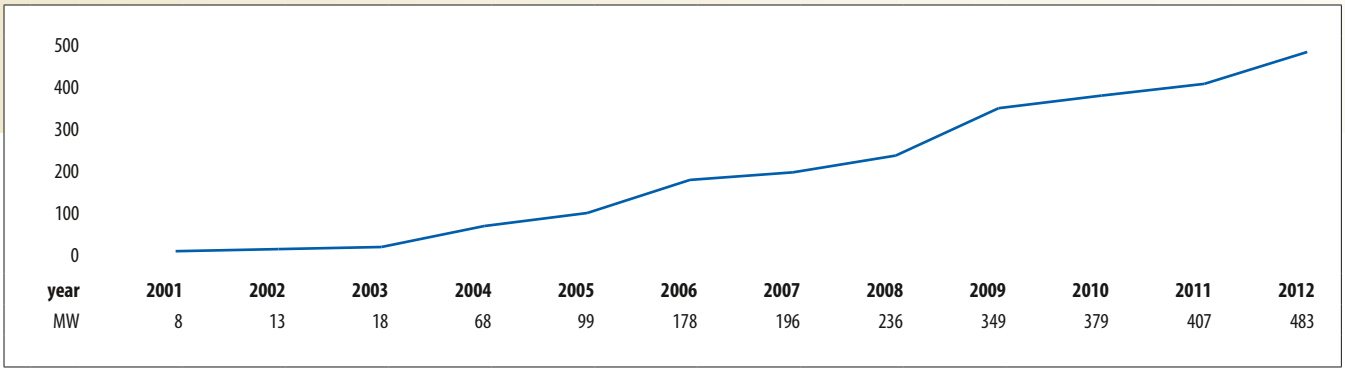
While wind energy development in South Korea is still in its infancy, the South Korean government has continued to invest in its green growth strategy, both financially and in terms of policy development. In 2012, wind capacity in South Korea grew by 76 MW bringing total installed capacity to 483 MW. The Korean wind power industry has set ambitious targets for the future aiming at reaching 23 GW of wind power by 2030, of which 20 GW will be offshore and 3 GW onshore.

The policy framework

On 1 January 2012, the new Renewable Portfolio Standard (RPS) scheme came into effect, replacing the old feed-in tariff regime. According to the new RPS scheme the tariff for power generated by renewable energy sources is based on the system marginal price supplemented by Renewable Energy Certificates (RECs), which aims to compensate for the higher capital cost for renewable energy. Onshore wind project operators will earn one REC per KWh produced, and offshore projects will earn two RECs. The current price for a REC is set at 40 won (EUR 2.6 cents / USD 3.5 cents), and have a lifespan of 20 years, helping to

18 MW Taebaek wind farm in Kangwon Province. Hyundai 2MW x 4WTG's & Hyosung 2 MW x 5 WTG's, commissioned in May 2012 © *KWEIA*

Total installed capacity



year	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
MW	8	13	18	68	99	178	196	236	349	379	407	483

Source: GWEC

create long-term investor certainty. The main power utilities and IPPs in the country will be responsible for acquiring the required RECs in accordance with the standard, or pay a penalty equivalent to the prevailing market price of one REC. The RPS starts at 2% in 2012, gradually increasing to 10% by 2020.

The South Korean government has set a target for the RPS at an ambitious level which would mean 15,660 MW of wind power capacity by 2022. However, the Korean Wind Energy Industry Association has set a more modest goal of 13.5 GW by 2025. Moreover, the government is also aiming at improving the regulatory framework by simplifying the permitting processes, increasing possibilities for tax exemptions and providing easier access to the power grid, for both onshore and offshore wind farms.

The South Korean wind energy market

The Korean wind market has failed to take off partly due to the low feed-in tariff, and partly due to public opposition. Recently, however, companies have come to realise the business opportunities in the wind industry and this has begun to attract increased levels of investment in the sector. Several Korean manufacturers have been successful in launching new products, and several wind farms have now been commissioned using domestic turbines. Korean manufacturers are also very interested in entering the global marketplace.

- Hyundai Heavy Industry produces 1.65 MW, 2 MW and 2.5 MW turbines for onshore and 5.5 MW turbines for offshore use;
- Samsung Heavy Industry is developing 2.5 MW turbines for onshore and 7 MW for offshore applications;
- Daewoo Shipbuilding and Marine Engineering produces 2 MW and 3 MW turbines for offshore, and 7 MW for offshore use;
- STX is developing 2 MW turbines for onshore (will be completed by the end of 2013) and 7 MW turbines for offshore use.

The Korean wind industry is progressing steadily, has a strong market potential and is investing heavily in R & D and technology development. Korea is also home to the largest shipbuilding companies in the world, who have a keen interest in the global offshore market, where their ocean engineering expertise can be put to good use.

The wind turbine component industry is also flourishing, with companies supplying towers, blades, main shafts, generators, transformers, gearboxes, nacelle control systems and cables. The small wind turbine manufacturing sector is also growing and set to provide equipment to small and island grid systems.

Offshore wind power in Korea

The Korean government has an impressive strategy for offshore wind development, and is looking to attract investments worth USD 8.2 billion (EUR 5.8 billion) for developing offshore wind farms with a total capacity of 2.5 GW over the next nine years. The aim is to set up a private-public partnership (PPP) to install about 500 turbines off the country's West coast. Under this PPP, 100 MW of wind projects should be operational by 2013, a further 900 MW by 2016 and the final 1.5 GW by 2019. In addition, local governments are promoting another 4.5 GW of offshore wind projects across the country.

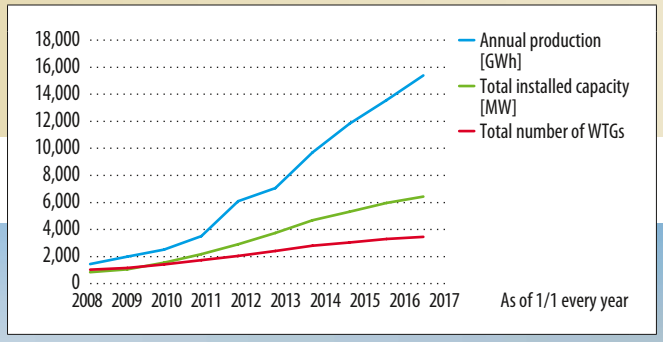
Outlook for 2013 and beyond

The Korean wind power industry has set a target of 23 GW to be met by 2030, which would, with production of around 50 TWh, provide about 10% of the country's total energy demand.

With input from the Korean Wind Energy Industry Association (KWEIA)

SWEDEN

Wind power development and projections up to 2017



Dragaliden Wind Farm, Norrbotten, Sweden © *Svevind*

Wind power in Sweden has grown rapidly in recent years, increasing more than tenfold since the introduction of the Green Certificate system in 2003. During the previous three years wind capacity has grown by 240%. This is mainly due to the rich wind resources and beneficial market framework for onshore wind energy in Sweden.

Main market and policy developments in 2012

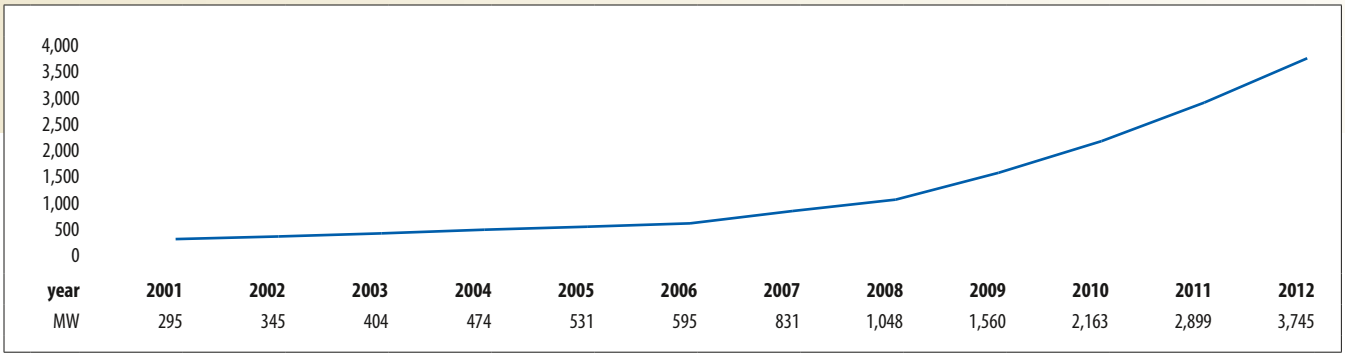
Until now Swedish wind development has not suffered from the financial crisis. In 2012, 846 MW of new onshore wind power was installed in Sweden bringing the total capacity to 3,745 MW, of which 163,4 MW is offshore, accounting for about 5% of the country's total electricity consumption. The average size of new turbines installed in 2012 was 2.3 MW with an average expected capacity factor of about 30%. The soon to be commissioned Jädraås wind farm will be the largest Swedish onshore farm with 200 MW of capacity spread over 66 turbines.

In November 2011, Sweden was divided into four separate bidding areas by the Swedish Transmission System Operator (Svenska Kraftnät). This division identified the areas where the national electricity grid needs to be expanded, and provided a clear indication of areas where increased electricity production is required in order to better meet consumption, thereby reducing the need for transporting electricity over long distances.

While in northern Sweden (SE1 and SE2 bidding areas) there is a surplus of electricity production, in southern Sweden (SE4 bidding area) the circumstances are reversed; consequently, there are transmission bottlenecks from time to time. For electricity consumers, the introduction of bidding areas means that the price of electricity may vary in different areas. Occasionally electricity may be more expensive in southern Sweden than in the north, a difference of a few Swedish öre per kWh. For most of the year, the price of electricity is similar in all four areas. As investments are made in the electricity grid and new electricity production begins in the areas that currently experience high demand but have a low supply, the differences in electricity prices between the areas will diminish.

Currently, most of the wind farms in Sweden are located in the SE3 bidding area, where the power consumption is also the highest. However, there is currently a concentration of project activity in the northern part of the country, where larger wind farms are feasible. In the next 4 to 5 years it is expected that most of the installed wind capacity will be produced within the SE2 bidding area.

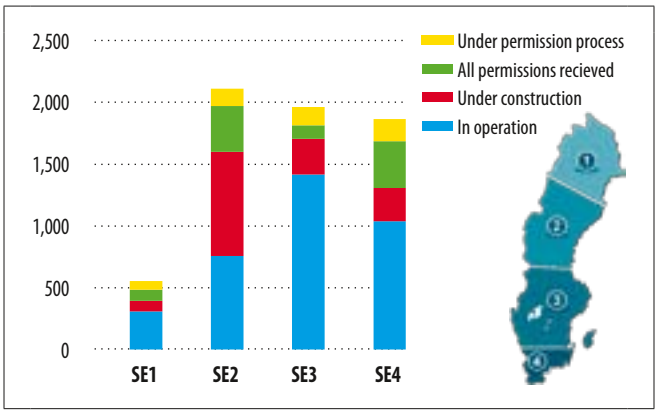
Total installed capacity



year	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
MW	295	345	404	474	531	595	831	1,048	1,560	2,163	2,899	3,745

Source: GWEC

Expected capacity (MW) per price area 1th of January 2017



The Electricity Certificate System

Since 1 January 2012 Sweden has had a joint Electricity Certificate System with Norway with a target of increasing electricity production from renewable energy sources by 26,4 TWh annually until 2020. The joint market will permit trading in both Swedish and Norwegian certificates, and a generator can receive certificates for renewable electricity production in either country.

A surplus of certificates occurs if their supply exceeds demand. In general this happens if the development of renewable energy has been faster and electricity demand is lower than expected at the time the quotas were set. When this happens the development of renewable energy decreases until the price of the certificate reaches again a level that makes investing in renewable energy profitable (in theory).

In the summer of 2012, the price for a certificate reached very low levels. This has not yet slowed down investment, however, despite the low price of both electricity and the green certificates. One explanation might be that building wind power in Sweden has become much cheaper recently.

Currently, the price of certificates is beginning to increase slightly. This is mainly because Norway is falling behind their estimated trajectory and because the 2013 quota doesn't fully compensate the loss of around 10 TWh of bio-fuel production leaving the system as of the 1st of January. It is expected that the price for green certificates will remain at a similar level until 2015.

Obstacles to wind energy development

Grid - Grid operators are obliged to connect wind power plants and reinforce their grid if it is necessary. The most problematic issue regarding grid connection is the so-called threshold effect, which occurs if a 'large' grid reinforcement is required. In that case the operator of the new plant to be connected must bear the entire costs of the 'large' grid investment. There is proposed solution for this situation which has been put forth by the TSO, yet it is currently awaiting government approval.

The high penetration of wind power in the northern part of Sweden will further increase the load on already congested transmission corridors, particularly between price areas 2 and 3. The Swedish TSO has, however, already decided to start reinforcing these sections.

Offshore wind power - Due to lack of a sufficient support system for offshore wind power in Sweden, new development is currently difficult. Only some near shore wind projects can be developed within the current support system. Therefore, the introduction of an additional support regime for offshore wind power is necessary if it is to grow substantially in Sweden.

Outlook for 2013 and beyond

Sweden is set to continue its rapid wind development with a target of reaching 15-20 TWh production by 2020, compared to 7.1 TWh in 2012. Due to its relatively low production costs, rich wind resource, well developed infrastructure and low legal and political risks, Sweden has an opportunity to help other EU countries reach their renewable energy targets under the cooperation mechanism established by the renewables directive. If the cooperation mechanism is used substantially, then wind energy production in Sweden could reach as much as 30 TWh by 2020.

With input from the
Swedish Wind Energy Association, Svensk Vindenergi

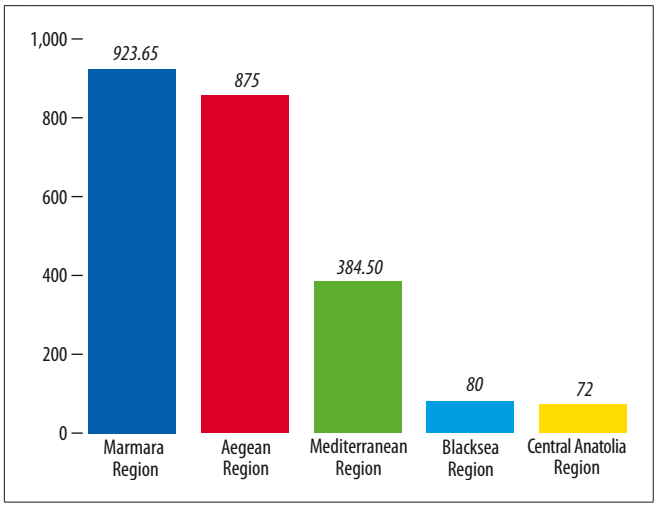
TURKEY

Recent market developments

Turkey added 506 MW of new wind power in 2012 for a total capacity of 2,312 MW. Turkey's installed capacity has grown by 500 MW per year since 2010 and the national transmission company expects annual installations to reach 1,000 MW per year from 2013 onwards. With a very large pipeline of projects, the Turkish Wind Energy Association estimates that with the current regulatory framework about 10.5 GW will be reached within the next 10 years, but it could be as high as 20 GW with the right modifications to that framework. Regardless, the country's vast wind resources are likely to attract significant investment in the coming years.

Turkey's best wind resources are located particularly in the Çanakkale, Izmir, Balikesir, Hatay and Istanbul provinces. As of the end of 2012, the Marmara region has the highest installed wind capacity with a total of 923.65 MW, followed by Aegean region with 857 MW and the Mediterranean region with 384.50 MW.

MW by region



Source: NREL

Main wind farms in Turkey in 2012

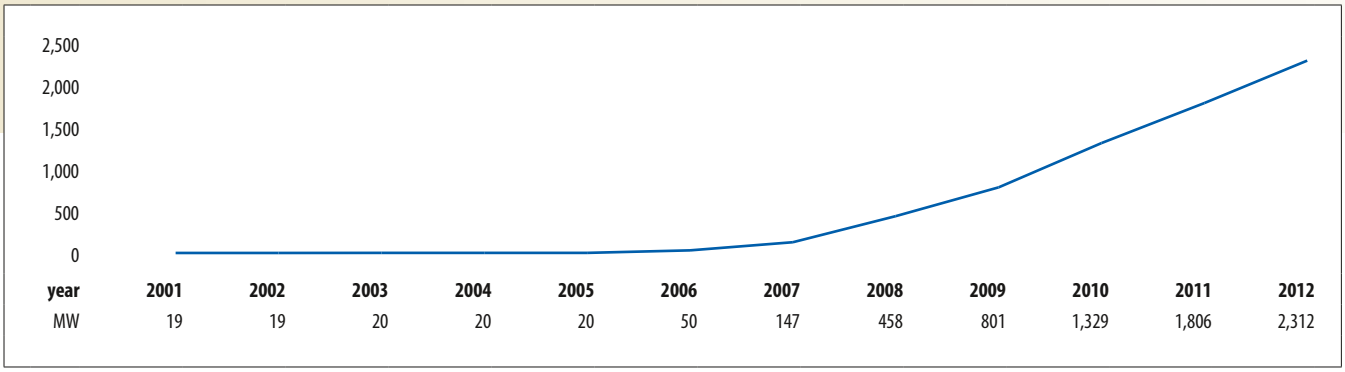
Company Name	Project Name	Installed Capacity (MW)	Location
Al-Yel Elektrik Üretim A.Ş	Geycek RES	150	Kırşehir
Kangal Elektrik Enerji Üretim ve Ticaret A.Ş	Kangal RES	128	Sivas
Tatlıpınar Enerji Üğretim A.Ş.	Tatlıpınar RES	125	Balıkesir
Evrencik Rüzgâr Enerjisinden Elektrik Üretim Ltd. Şti	Evrencik RES	120	Kırklareli
Lodos Karaburun Elektrik Üretim A.S	Karaburun RES	120	İzmir
Sonses Enerji Yatırım Üretim Ve Tic. A.Ş	Zonguldak RES	120	Zongul-dak
Yuva Enerji Yatırım Üretim Ve Ticaret A.Ş	Yuvacik RES	120	Kocaeli
Akış Enerji Yatırım Üretim ve Tic. A.Ş	Söke RES	104	Aydin
Bağlar Elektrik Üretim A.Ş	Bağlar RES	100	Konya
Betim Enerji Yatırım Üretim Ve Ticaret Anonim Şirketi'ne	Ömerli RES	100	İstanbul
Denizhan Enerji Yatırım Üretim Ve Ticaret A.Ş	Mahmut Şevket Paşa-2 RES	100	Kocaeli

The Turkish wind market is mostly dominated by local developers. The 604 MW currently under construction is divided between developers as follows: Fina Energy (109 MW), Ayen Energy (I77.7 MW), Borusan (50.60 MW), Güriş (50.60 MW), Bilgin Energy (50 MW) and Boydak Holding (47.5 MW). In addition, another 500-600 MW are expected to come online in 2013.

The top three players in the Turkish wind market are Demirer Holding (291.15 MW), Bilgin Energy (245 MW) and Polat Energy (233.95 MW), followed by EnerjiSa (211.90 MW) and Aksa Energy (159.20 MW).

Turkey has one of the fastest growing power markets in the world. Until now Turkey has not suffered from the financial crisis. With very limited oil and gas reserves, Turkey is increasingly turning into renewable energy sources to improve

Total installed capacity



year	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
MW	19	19	20	20	20	50	147	458	801	1,329	1,806	2,312

Source: GWEC

its energy security and curb its dependence on imported fossil fuels. In its strategic energy resources plan Turkey aims at producing 30% of its electricity from renewables by 2023. However, more investments are needed to match the rapidly growing energy demand.

Policy environment

A renewable energy support scheme was introduced in Turkey in 2005 based on feed-in tariffs and additional investment incentives. Following the amendment of the law in 2010, the feed-in tariff was set at USD 7.3 cent/kWh (EUR 5.7 cent) for wind power for a period of ten years, with a bonus for using locally manufactured components of USD 0.6-1.3 cent (EUR 0.5-1 cent) for five years. Wind power producers are also free to sell to the national power pool or engage in bilateral agreements.

In addition to the feed-in tariff, the Turkish government provides other measures to promote wind energy development, notably priority access to grid, facilitation and discounts for obtaining leases and authorization to use state owned land. Also, most restrictions on foreign investment in the Turkish power sector have been lifted.

The electricity market regulation has been revised and will take effect on April 2013. The electricity business is largely in the hands of the state owned Electricity Generation Company EÜAŞ and its affiliates. A transition to a competitive electricity market is needed in order to attract private sector investments to help meet demand growth of an average 6-9% per year, and also to reduce electricity prices.

Outlook for 2013 and beyond

Complicated and slow administrative procedures are the greatest obstacle to wind development in Turkey. Permitting goes through up to 18 different institutions taking up to two years before being finalised. More clarity is needed in the applicability of the local content regulations, and once clarified these should be extended until 2020. Moreover, grid capacity is an area of concern to be able to connect the 11 GW of new wind installations currently planned. The Turkish Wind Energy Association has set a target of reaching 3,300 MW in 2013 and 5,000 MW by 2015. To ensure that these targets are met the transmission system operator has announced investments in grid reinforcements between 2013 and 2020.

With input from the Turkish Wind Power Association (TUREB)

Bandırma Wind Farm, Turkey © *Turkish Wind Energy Association (TUREB)*

UKRAINE

© UWEA

Ukraine is situated in the central part of Eastern Europe, with an area of 603,628 km², making it the second largest contiguous country on the European continent after the Russian Federation. Most of Ukraine's electricity generation comes from nuclear and thermal power plants, and it is heavily dependent on oil and gas imported from Russia. This makes development of renewable energy sources increasingly attractive to Ukraine in order to improve energy security and reduce dependence on imported fossil fuels. By joining the European Energy Community in 2011, the country has agreed to transpose the renewable energy directive and has committed to a binding renewables target of 11% by 2020.

Ukraine has a relatively moderate continental climate with favourable conditions for wind energy. According to the National Academy of Sciences of Ukraine, wind energy potential is estimated at 30 TWh a year and total wind energy capacity could reach 16 GW by 2030. The windiest regions of the country are located along the Black Sea coast, mainly in Crimea and along the Azov Sea coast.

Wind farms commissioned after adoption of green tariff (100% private capital), 2012

Wind farm (WPP)	Region	Installed capacity at the end of 2012 (MW)
Novoazovskaya WPP	Donetsk region	57.5
Dmitrievskaya WPP	Nikolaev region	25.0
Tuzlovskaya WPP	Nikolaev region	12.5
Ostaninskaya WPP	AR Crimea, Leninskiy region	25.0 (to be connected)
Botievskaya WPP	Zaporozhye region	90.0
Novorossiyskaya WPP	Kherson region	3.0
Tarkhankutskaya WPP	AR Crimea, Chernomorskiy region	4.0
Total		**217.0**

Main market developments in 2012

Ukraine installed 150.7 MW of new wind power capacity in 2012, bringing its total up to 301.8 MW, out of which 276.8 MW were connected to the national electricity grid. This represents an annual growth rate of 99% compared to the 151.1 MW of total capacity at the end of 2011. Nearly all new wind capacity added between 2011 and 2012 was financed by private investment. In 2012, wind power generated about 246 000 MWh and supplied 1.24 % of the country's total electricity demand.

Currently, the top three producers of the eighteen operating wind farms in Ukraine are the State owned companies with 84.75 MW; Wind Parks of Ukraine with 95 MW; and Vindkraft Ukraine LLC with 3 MW. Several other wind energy projects were under construction during 2012. DTEK, the largest privately owned energy company in the country is among the new developers which could take a significant share of the wind energy market. Other developers, such as Konkord Group and Eco-Optima have significant consented pipelines. Wind farm ownership is expected to diversify over the next few years.

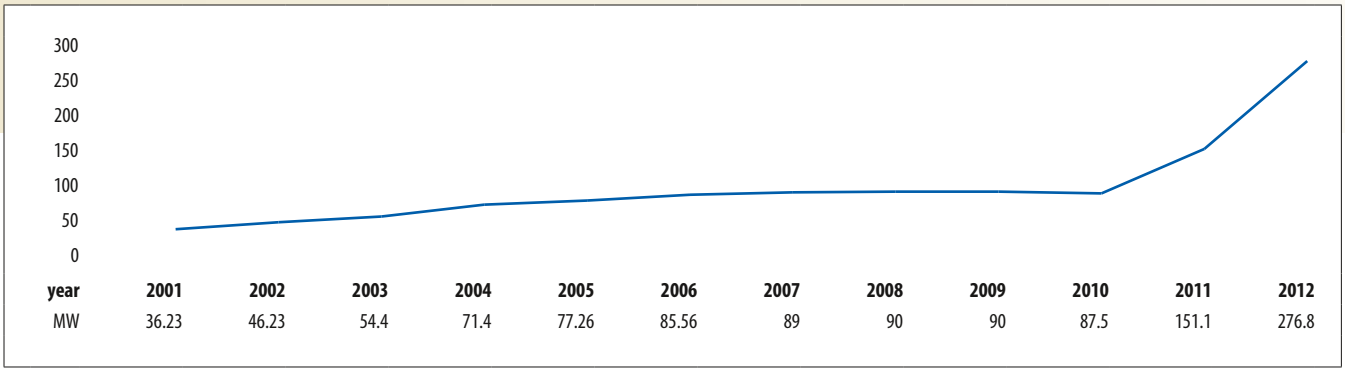
The Ukrainian wind energy market is dominated by domestic manufacturers, producing both small and MW class wind turbines. The Ukrainian company Windenergo produced most of the wind turbines installed in 2011, followed by Fuhrländer, which supplied 25 FL2500 turbines with a unit capacity of 2.5 MW to the Kramatorsk, Donetsk region. Moreover, Vestas delivered a 3 MW turbine to the Novorossiyskiy wind farm in 2011 and in 2012 there were a total of 30 Vestas turbines installed in Ukraine.

Ukrainian electricity market

The Ukrainian energy sector is regulated by the National State Energy Regulation Implementing Commission (NERC). It sets tariffs and issues licenses for electricity generation, transmission and distribution. In 1997, Ukraine launched a Wholesale Electricity Market (WEM) which is operated by state owned company Energorynok. Energorynok is the main operator of the electricity accounting system in Ukraine.

The Ukrainian electricity transmission system is operated by a state owned company Ukrenergo, which is responsible for the high voltage transmission grid, while the electricity distribution networks are managed by 27 distribution companies, which are regional monopolies.

Total installed capacity



year	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
MW	36.23	46.23	54.4	71.4	77.26	85.56	89	90	90	87.5	151.1	276.8

Source: GWEC

The Ukrainian electricity market is based on a single buyer model, Energorynok being the only buyer. However, the government approved a shift of the electricity market to a system based on bilateral contracts in 2002 – this law was passed by the parliament in June 2012.

The policy environment

The electricity generated from renewable energy sources is supported by feed-in tariffs ("green tariffs"), tax incentives and mandatory off-take. The feed-in tariff was introduced in 2009 and is applicable until 1 January 2030. Electricity produced by renewables is purchased by Energorynok and then sold to distributors. Another option is to sell the electricity directly to consumers on the basis of bilateral contracts.

The level of the feed-in tariff is determined by the energy regulator. To address the risk of the devaluation of Ukraine's currency, the "green tariff law" also introduces a fixed minimal feed-in tariff in euros according to the official euro/UAH exchange rate as of 1 January 2009 (1 euro = 1085.546 UAH). Each time the NERC approves the "green" tariff for a company, it must make sure that the "green" tariff is not less than the minimal "green" tariff converted into UAH pursuant to the official euro/UAH exchange rate set by the National Bank of Ukraine at the date of last approval of the basic tariff. According to the acting legislation, the feed-in tariff rate for turbines of more 2 MW will be a minimum of EUR 0.113 per kWh.

The amount of the feed-in tariff varies depending on when the wind farm comes into operation, on the basis of five year periods up to 2030.

Barriers to wind energy development

Local content regulations are one of the main barriers for the development of a modern wind energy sector in Ukraine and remains as a main contradiction between the EU directive and the green tariff law. To qualify for the feed-in tariff, renewable energy producers are obliged to use local raw materials, fixed assets, engineering or services during construction. From 1 January 2012, the share of domestic components in total construction costs had to be at least 15%, rising to 30% in 2013 and to 50% in 2014. This requirement creates a significant barrier for foreign investors to enter the Ukrainian wind energy market.

The urgent need for grid reinforcement is another obstacle to the rapid wind development in Ukraine. A large part of the transmission network has already reached the end of its planned service life, especially in Crimea and along the Azov Sea coast, which are the windiest regions in Ukraine. According to the draft update of the Energy Strategy, 7 GW of renewable capacity can be connected to the grid without threatening its stability.

Outlook for 2013 and beyond

Ukraine is the leader in wind power among the CIS[1] countries, the only one in the CIS community with an established wind industry and functioning feed-in tariff mechanism. However, the successful implementation of wind power projects is largely dependent on the ability of Ukraine to attract foreign investment into the national wind energy sector. The lack of liquidity in the Ukrainian banking system means project finance mainly comes from international finance institutions, such as the European Bank of Reconstruction and Development (EBRD) and the World Bank.

The Ukrainian Wind Energy Association expects an increase of 200 to 250 MW of installed wind capacity in 2013, bringing the total to 500 to 550 MW at the end of 2013 and reaching 900-1,000 MW by the end of 2015 and 3,000 to 4,000 MW by the end of 2020.

With input from the Ukrainian Wind Energy Association, UWEA

1 The Commonwealth of Independent States is a regional organization whose participating countries are former Soviet Republics, formed during the breakup of the Soviet Union.

UNITED KINGDOM

With its extensive natural resource the UK is the world-leader in offshore wind development; but onshore wind development has become increasingly controversial in some parts of the country.

Main market developments in 2012

The total market size for the UK is currently just over 8.4 GW, spread over 397 wind farms and over 4,000 turbines. Thirty-five onshore wind farms and four offshore sites - Greater Gabbard; Ormonde, Sheringham Shoal, and Walney II - came on line last year for an annual market of 1,897 MW. The two biggest onshore sites in the UK are located in Scotland: Clyde (North and Central) with 221 MW and Griffin with 156 MW.

Major manufacturing capacity was added in 2012 in both the onshore and offshore wind sectors. Mabey Bridge's onshore wind tower manufacturing facility became a 24 hour operation, and Wind Towers Ltd announced plans to diversify into offshore tower manufacture.

Following on from 2010 and 2011 announcements regarding the potential for offshore wind turbine manufacturing facilities in the UK, Gamesa signed a Memorandum of Understanding with the Port of Leith and AREVA announced their intention to manufacture in the East of Scotland. Siemens also secured planning permission for a proposed development at Alexandra Dock in Hull. However, it was a mixed picture as Vestas announced that they would not be proceeding with their land option in the Port of Sheerness and Doosan announced that they would not be taking forward plans in Scotland.

There has also been on-going political and policy uncertainty in the UK due to a contentious review of support rates for onshore wind under the Renewables Obligation; and plans to change the support mechanism for low carbon generation, through the Government's Electricity Market Reform programme and the Energy Bill, which sets out support beyond 2017.

As a leader in the offshore wind industry, the UK has the potential for major employment growth in the sector. Currently around 11,000 people work in the UK wind industry with that number expected to rise to 76,000 by 2021. The UK is well positioned to take advantage of its geography and manufacturing base to maintain and expand its position as a world leader within the offshore wind industry.

Burbo Bank, Liverpool Bay, UK © *RenewableUK*

The UK wind industry saw record levels of consent and approvals in 2012 and made steady progress towards the target of 18 GW offshore and 13 GW of onshore wind power by 2020.

Installed onshore capacity by region in 2012

Region	MW	Region	MW
East Midlands	0.5	South West	66
East of England	26	Yorkshire & Humber	62.9
London	0.1	Northern Ireland	53.1
North East	39.8	Scotland	775.9
North West	9.2	South Wales	9.9
South East	0		
Total			**1,043**

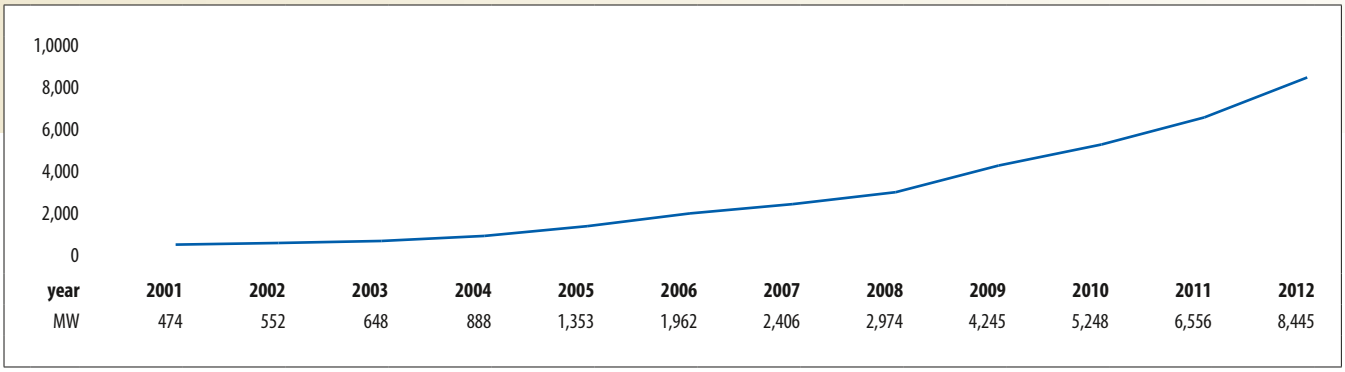
The policy framework

The UK Government is committed to sourcing 15% of its energy from renewables by 2020, as required under the EU Renewables Directive.

Renewable Energy Roadmap update

In December 2012, an update to the Renewable Energy Roadmap[1] was published, showing the progress the UK has made, yet no changes were made to the scenarios for each renewable energy technology. The top-level scenario for wind energy indicates that offshore wind could contribute up to 18 GW and onshore wind up to 13 GW by 2020. An industry-led Offshore Wind Cost Reduction Task Force[2] has set out steps which would support sustainable cost reduction within the industry, and the Crown Estate's cost reduction pathways work set out possible cost reduction trajectories finding that with deployment at scale and industry learning, achieving £100/MWh (EUR 115.3 / USD 150.4) is challenging but could be achievable.

Total installed capacity



year	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
MW	474	552	648	888	1,353	1,962	2,406	2,974	4,245	5,248	6,556	8,445

Source: GWEC

Energy Bill

In November 2012, UK Government published its Energy Bill, which will establish a new support system for all forms of low carbon technologies from 2017 onwards. The Energy Bill contains the framework for the Government's Electricity Market Reform (EMR) programme. This development means moving away from the Renewables Obligation (RO) scheme towards a feed-in tariff with a Contract-for-Difference (CfD).

Support framework for wind energy

The Renewables Obligation

The UK's RO has been the main financial instrument for stimulating growth in renewable energy since 2002, but will be replaced with a Contracts for Difference (CfD) as a result of the EMR. The RO requires power suppliers to derive a specified portion of the electricity they supply to customers from renewable sources. Eligible renewable generators receive Renewables Obligation Certificates (ROCs). According to the latest figures approximately 50% of the total ROCs go to onshore and offshore wind developments.

Current level of ROCs

Following the RO Banding Review of 2011, RO support levels for onshore wind will be cut from 1 ROC to 0.9 ROC from 1st April 2013. A current onshore costs review is on-going with the potential for further ROC reductions. This review is expected to be completed in mid-2013. There are also plans for offshore wind support levels to be brought down from 2 to 1.9 ROCs for new projects coming on line in 2015/6, and to 1.8 ROCs for projects coming on line in 2016/17.

The feed-in tariff for small renewable energy systems

In 2010, the government introduced its long-awaited feed-in tariffs for renewable energy projects up to 5 MW, helping to stimulate a significant increase in domestic and small-scale deployment of renewable energy systems. This has stimulated the installation of more than 17,000 small wind systems across the UK.

The feed-in tariff rates were revised and reduced for wind in December 2012. To have better control over the feed-in tariff budget, the government introduced a capacity-based cost control mechanism, based on which an annual degression between 5% and 20% will apply. The current tariff rates for wind will not change until 1st April 2014

Obstacles to wind energy development

Within the UK there is an increasingly well-organised opposition to wind power that is leading to political and media debate. 2012 saw an escalation in activity from anti-wind groups, particularly around onshore wind. Nevertheless, the opinion polls show that two thirds of the British people are in favour of onshore wind energy with even higher figures for offshore wind. This year consenting levels rose at both the local and national level with record levels for onshore wind.

However, political uncertainty has increased due to the policy upheaval surrounding the Energy Bill, and a drawn out review of the Renewables Obligation for onshore wind. This is likely to have an impact on getting project finance and on investor confidence in manufacturing and the wider supply chain. While delays in planning have been reduced, they are still too long, and issues around aviation remain. Also, the grid needs to be expanded and strengthened to accommodate more renewable energy.

Outlook for 2013 and beyond

In addition to more growth in the wind industry supply chain, 1 GW each of on- and offshore wind power are expected to be added in 2013.

with input from RenewableUK

1 www.gov.uk/government/uploads/system/uploads/attachment_data/file/80246/11-02-13_UK_Renewable_Energy_Roadmap_Update_FINAL_DRAFT.pdf
2 DECC (2012) Cost Reduction Task Force report http://www.decc.gov.uk/en/content/cms/meeting_energy/wind/offshore/owcrtf/owcrtf.aspx

UNITED STATES

USA © *Rainer Grosskopf / GWEC*

A Record Year for Wind Energy Development

The US wind energy industry had its best year ever in 2012, installing 13,124 MW and surging past the 60-gigawatt milestone for total installed wind power capacity.

The record year for new wind power resulted in 28% annual market growth, in line with the five year average for the US wind industry of 29%.

In 2012, more than USD 25 billion (EUR 19.2bn) was invested in new wind projects in the US, pushing the five-year (2008-2012) average annual investment level to roughly USD 18 billion (EUR 13.8bn).

For the first year ever, wind energy was the number one source of new electricity generating capacity in the US, contributing 42% of all the megawatts the power sector installed. In total, more than 170 wind projects came on line, including the first utility-scale projects in Nevada and Puerto Rico.

The US passed both the 50 GW and 60 GW marks last year, in terms of total installed capacity. To put this into perspective, it took the industry 25 years to reach 10 GW of total installed capacity in 2006. Just two years later, in 2008, the industry doubled its capacity, hitting 20 GW, and then it took only one year each to reach the 30 GW and 40 GW levels in 2009 and 2010, respectively.

Today's 60 GW of wind power capacity represents both tens of thousands of jobs and enough electricity to power the equivalent of more than 15 million typical American homes. That's equal to all the households in Colorado, Iowa, Maryland, Michigan, Nevada and Ohio combined. The 60 GW of wind power now deployed can avoid roughly 100 million metric tons of carbon dioxide (CO_2) annually - equivalent to avoiding over 4.6% of total power-sector CO_2 emissions. Installed wind power projects in the US also conserve water by avoiding consumption by thermal power plants, with the existing US wind fleet able to conserve over 35 billion gallons annually.

New capacity added in 31 States in 2012

In 2012, the US wind industry continued to see increased geographic diversity. The number of states with installed utility-size wind turbine installations now sits at 39 plus Puerto Rico, with 31 states adding new capacity during the year.

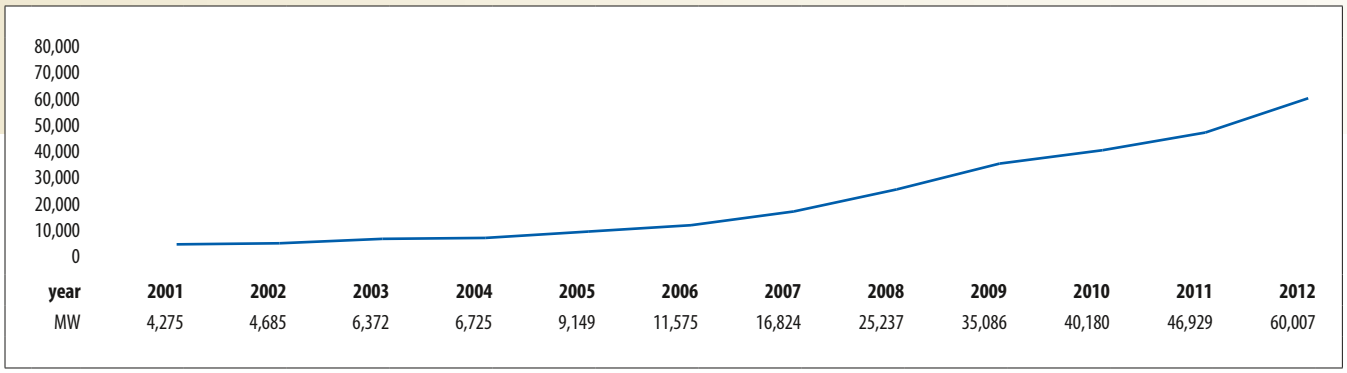
The most active states in 2012 for new wind power were Texas, California, Kansas, Oregon and Oklahoma. Over 1,800 MW of new wind power projects were installed in Texas alone, a 6-fold increase from 2011. Total installations in the state of Texas currently top 12,000 MW.

There were also more than 1,000 MW of new wind capacity installed in California, Kansas, and Oklahoma during 2012. This new capacity pushed California past the 5,000 MW mark and into second place for total wind capacity. Kansas doubled its capacity, and Oklahoma rose to sixth place.

While long-time leading wind states installed the largest number of megawatts, states seeing the largest growth rates in 2012 tell a different story. Nevada and Puerto Rice both installed their first utility-scale wind projects, while New Hampshire, Alaska, Ohio, Rhode Island, Michigan, Vermont, Hawaii and Kansas all doubled their total installed wind capacity. These states have emerged as active wind regions due both to new state policy and to technology improvements, particularly higher hub heights of and larger rotor diameters which capture more energy.

The ownership structure of US wind projects typically involves Independent Power Producers (IPPs) owning projects and signing long-term power purchase agreements (PPAs) with electric utilities, yet there continues to be an interest in the direct ownership of wind projects by the electric utilities. In recent years, approximately 10 to 20% of new wind capacity installed each year has been owned by electric utilities; and

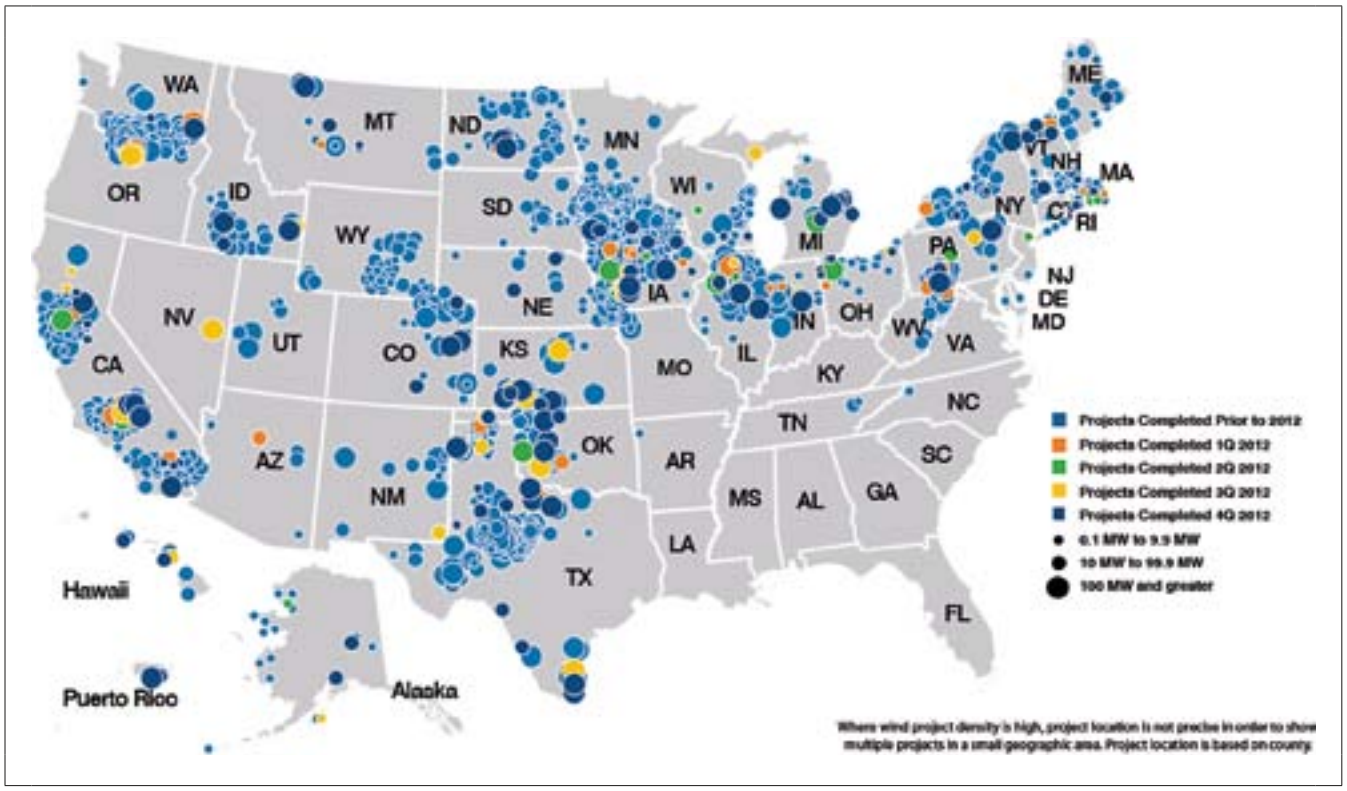
Total installed capacity



year	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
MW	4,275	4,685	6,372	6,725	9,149	11,575	16,824	25,237	35,086	40,180	46,929	60,007

Source: GWEC

Wind project Locations



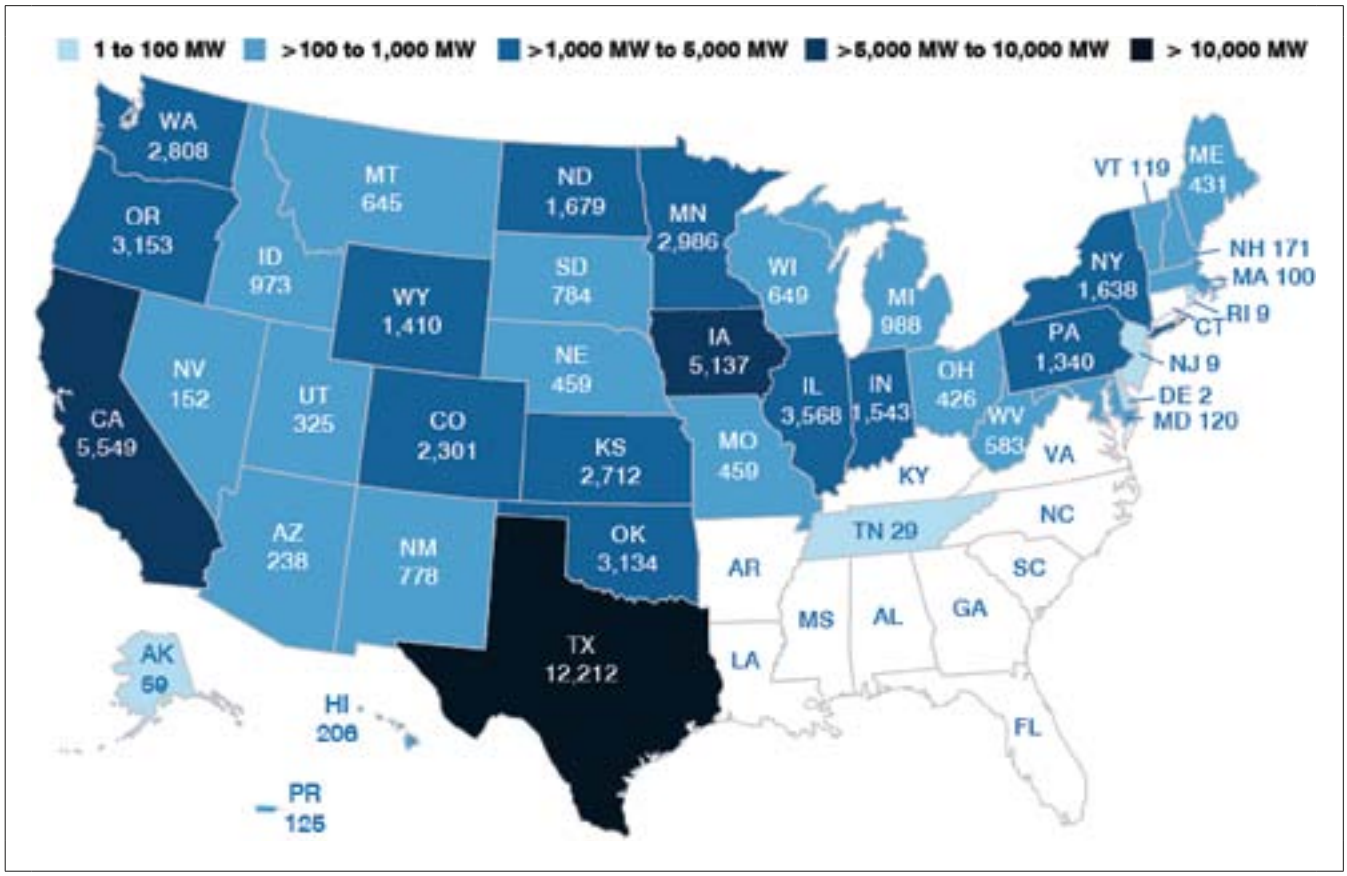
2012 was no different, with 10% of new wind capacity owned by electric utilities.

At the same time, the list of active power off-takers continues to diversify and increase, with more than 65 electric utilities purchasing the output of new wind capacity built during 2012. Non-traditional off-takers such as cities, industrial facilities and other commercial entities also played a role in 2012. Of the 13,124 MW of new installed wind capacity during 2012, 85% of the capacity was installed under long-term agreements (a critical component to successful financing of a wind project in the US), either through a bilateral power purchase agreement with an electric utility or through direct electric utility ownership.

The increasing amount of wind energy on the electric utilities' systems across the US is reflected in the state- and utility-level penetration of wind energy. In 2012, wind energy produced 3.5% of total US electricity supply, but over 20% of the electricity in the states of Iowa and South Dakota. In fact, wind energy produced more than 10% of total electricity supply in nine states across the US during the year. On individual electric utility and regional operating systems, wind energy broke records, include hitting over 56% on Xcel Energy's system in Colorado on one April morning, and reaching 30% one day in December on the Southwest Power Pool operating region (South Central US), and 26%, also in December, on the Electric Reliability Council of Texas (ERCOT) system, which serves most of Texas.

UNITED STATES

US Wind Power Capacity Installations by State



Percent of electric power from wind generation by state

Top 20 States during 2012

Rank	State	Wind % in 2012
1	Iowa	24.50
2	South Dakota	23.90
3	North Dakota	14.70
4	Minnesota	14.30
5	Kansas	11.40
6	Colorado	11.30
7	Idaho	11.30
8	Oklahoma	10.50
9	Oregon	10.00
10	Wyoming	8.80

Rank	State	Wind % in 2012
11	Texas	7.40
12	New Mexico	6.10
13	Maine	5.90
14	Washington	5.80
15	California	4.90
16	Montana	4.50
17	Illinois	3.90
18	Nebraska	3.70
19	Hawaii	3.60
20	Indiana	2.80

Main market developments in 2012

Part of the continued increase in wind energy penetration is due to technology advances in wind turbines increasing their performance. The turbine market saw continued diversification and evolution in 2012, with more than 25 different turbine manufacturers installing over 35 different turbine models ranging from 225 kW to 3.6 MW, with hub heights up to 100 meters and with rotor diameters as large as 117 meters. Overall, turbine size continued its upward trajectory with an installed average of 1.95 MW, compared to 1.77 MW for turbines installed in 2010.

Sailing against the winds of a down economy, lower demand for new power, and continued policy uncertainty, the industry invested roughly USD 25 billion (EUR 19.2bn) in the US in 2012, with much of the investment going toward rural parts of the country. The vast majority of wind projects, over 98%, are installed on private land in the US, with wind project owners

Colorado, US © *Stan Tehee/ GWEC*

leasing land directly from the landowner. The local property tax payments and land lease payments to farmers and ranchers bring significant annual revenue to local communities across the country.

The manufacturing and supply chain sector of the US wind energy industry felt the impacts of the uncertainty surrounding the status of the federal production tax credit (PTC) in 2012, with layoffs, facility closures, and companies exiting the wind industry. Nevertheless, more than 500 manufacturing facilities were active in 2012, supplying wind turbine components and employing tens of thousands of people in the manufacturing sector. The trend of increasing manufacturing capabilities in recent years in the US is reflected in the domestic content of turbines installed in the US, which rose from less than 25% of turbine value prior to 2005 to 67% in 2011.

Outlook for 2013 and beyond

On 1 January, 2013, the key US national policy for wind energy, the production tax credit (PTC) was extended in the high-profile end-of-year legislation to avert the so-called "fiscal cliff." Lawmakers in the US, knowing that the wind energy industry was unable to plan for the coming months as a result of the 11th-hour extension, included all-important language stipulating that wind projects must start construction, rather than be online, by the end of 2013 in order to qualify for the tax credit. Nonetheless, the late passage of the PTC means a dramatic drop in installations for 2013.

With long-term, stable federal policy still eluding the wind energy industry in the US, state targets for renewable energy continue to drive wind installations in many areas of the country. As many as 29 states have renewables requirements, and still more have renewables goals. California leads the way in this area; in 2011, the governor of California signed into law legislation that increases the state's renewable electricity standard from an already strong 20% to an historic 33% by 2020.

Concrete signs that US policymakers understand wind power's value to the nation continued as 2013 got under way. In his State of the Union Address, US President Barack Obama called for a doubling of renewable energy by 2020 as a means of creating good manufacturing and construction jobs, and reducing harmful greenhouse gas emissions.

As the US wind energy industry searches for a stable path forward, wind power is now established as a mainstream energy source. As the number one source for all new generation in the US during 2012, and adding over 36%of all of America's new electric generating capacity between 2008 and 2012, the US wind power industry is well positioned to continue its dramatic growth.

With input from the American Wind Energy Association (AWEA)

ABOUT GWEC

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 70 countries, including manufacturers, developers, component suppliers, research institutes, national wind and renewables associations, electricity providers, finance and insurance companies.

We work at the highest international political level to create a better policy environment for wind power. Our mission is to ensure that wind power establishes itself as the answer to today's energy challenges, providing substantial environmental and economic benefits:

- **Policy development**
  We represent the wind industry's interests in international negotiations to ensure that wind power takes its place as a major energy source (IEA, IRENA, UN, etc).

- **Global outreach**
  We work with local partners to help open up new markets, helping to create the policy environment for wind power to thrive across the world.

- **Information and analysis**
  We provide authoritative information, analysis and data about the status of the industry globally, along with our expectations for the future.

Become a member of GWEC

Position your company as a global leader
Ensure a seat at the table with the industry's leading companies. As the wind industry expands and globalises, it is more important than ever to position your company as a leading international player.

Influence international policy decisions
Our policy team has unrivalled access to information on the leading and emerging wind markets. Keep ahead of policy developments around the world through our members-only newsletter, and be the first to receive GWEC reports, newsletters, press releases. Join our working groups to have a deeper involvement in policy work.

Gain valuable networking opportunities
Meet other leading industry players at our conferences and board meetings. Receive special invitations to speak at our conferences around the globe and priority invitations to industry conferences and workshops.

Establish your company in markets around the world
Link up with the key players in leading and emerging markets through GWEC's policy focused events.

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

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