GWEC
GLOBAL WIND ENERGY COUNCIL

Global Wind Report

Annual market update 2011

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Foreword

The bumpy road ahead continues. We have seen both strong growth and serious setbacks in 2011, although the 40.5 GW of new installations represents a 6% increase in the annual market and more than 20% cumulative growth. The distribution of that growth reveals that for the second year running, the majority of new installations were outside the OECD, and that trend now seems firmly established.

The aftershocks of the credit crisis, the continuing Eurozone crisis, and regulatory and political turmoil in the traditional markets in Europe and North America continue to hamper the industry. Our special focus chapter on the role of public finance takes a look at the increasing role that public finance institutions are playing in filling the gaps left by debt-burdened OECD governments and continued constraints in the availability of commercial finance.

But it's not all tough news: Canada had an exceptional year and the Romanian, Polish and Turkish markets all registered strong growth. India is now the largest growth market in volume terms, and that seems set to continue, at least for another few years. First Brazil and now Mexico are starting to put some large numbers on the board, and the future of industry in that part of the world seems bright. The wind market is set to take off in South Africa, and the near-universal rejection of nuclear power in Japan after the triple tragedy on 11 March 2011 gives hope for a new beginning for our industry in the Land of the Rising Sun.

After nearly a decade of double and triple digit growth, the Chinese market has finally stabilised. Rationalising manufacturing oversupply through cut-throat price competition in China's domestic market will be the order of the day for several years to come, and the next round of growth will have to wait for new planning regulations to set in, and to allow for grid infrastructure to catch up with the size of the market.

Europe as a whole was stable with new strength in the German market offset by weakening in Spain. The EU countries remain on track to meet their 2020 targets, although offshore growth has not yet fulfilled expectations.

The single greatest factor affecting the global market in 2012 will be the debate on the future of the US Production Tax Credit. Wrapped up in the politics of a presidential election year, anything could still happen. We watch, and wait, and wish our US colleagues the best as they battle on in the trenches on Capitol Hill. Everything is still in play.

Finally, although the Durban climate talks last December yielded some positive momentum, we are no closer to a global price on carbon than we were twelve months ago. The EU's flagship Emissions Trading System is in the doldrums through an oversupply of freely allocated credits, although there are moves afoot to rectify it. Australia's landmark carbon legislation will help the industry in the long term, and we will be watching the pilot emission trading schemes under development in China and Korea.

This is the seventh 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 75 countries, with 21 countries having more than 1000 MW installed. The data and analysis for the country profiles in this report have been collected through GWEC's member associations and companies around the world, as well as from governments and independent analysts. We thank our contributors and look forward to continuing our close cooperation for future editions.

March 2012

Steve Sawyer
Secretary General
Global Wind Energy Council

Klaus Rave
Chairman
Global Wind Energy Council

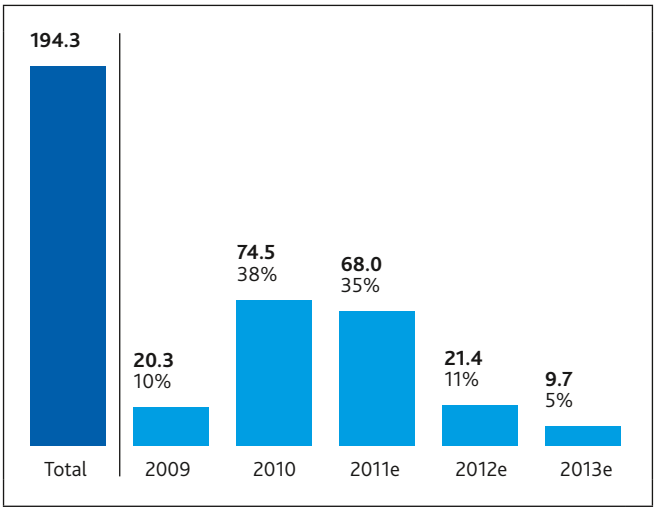
The Role of Public Finance in Wind Power Development

Post-2008 financing for wind projects

Beginning in the third quarter of 2008, flows of equity and debt investment in the global markets have been disrupted by one of the longest running financial and economic crises since the 1930s, which has been worsened by the budget crisis in the Eurozone. The macro-economic and institutional monetary health indices have not recovered since then across much of the OECD. The tougher financing environment and tightened cash flows have disrupted the rising stream of investments in wind energy projects.

In the immediate aftermath of the banking crisis in late 2008, the International Energy Agency, in its note to the G8 Energy Ministers in May of 2009[1], urged those governments to act on economic, energy security and environmental goals. A key recommendation in that briefing note was for those governments to consider increasing their support towards a '*clean energy new deal'* and to increase financial investment in clean energy by a factor of four with a view towards the long term energy future. Approximately 5% of the combined national stimulus packages announced by mid- 2009 was earmarked towards clean energy and energy efficiency spending.

Global Stimulus Spending on Clean Energy, $ billions



Note: Last year's report estimated a total of $ 177 billion was allocated to renewable energy. The $ 194 billion figure is updated to reflect exchange rate effects and additional allocations made between the launch of the second report and year-end 2010.

Source: Bloomberg New Energy Finance

The pace and structure of renewable energy project finance has been reshaped by a combination of forces, including the financial crisis, global economic recession, and changes in national legislation; and they are likely to continue to affect renewable energy finances in the short term.

The large amount of balance sheet financing that the industry has seen recently from utilities has reached its limits, and their debt financing capacity is restrained. Project finance has largely been restricted to mature markets with stable support frameworks. It has limited application in offshore projects[2] and is still difficult to get in emerging markets.

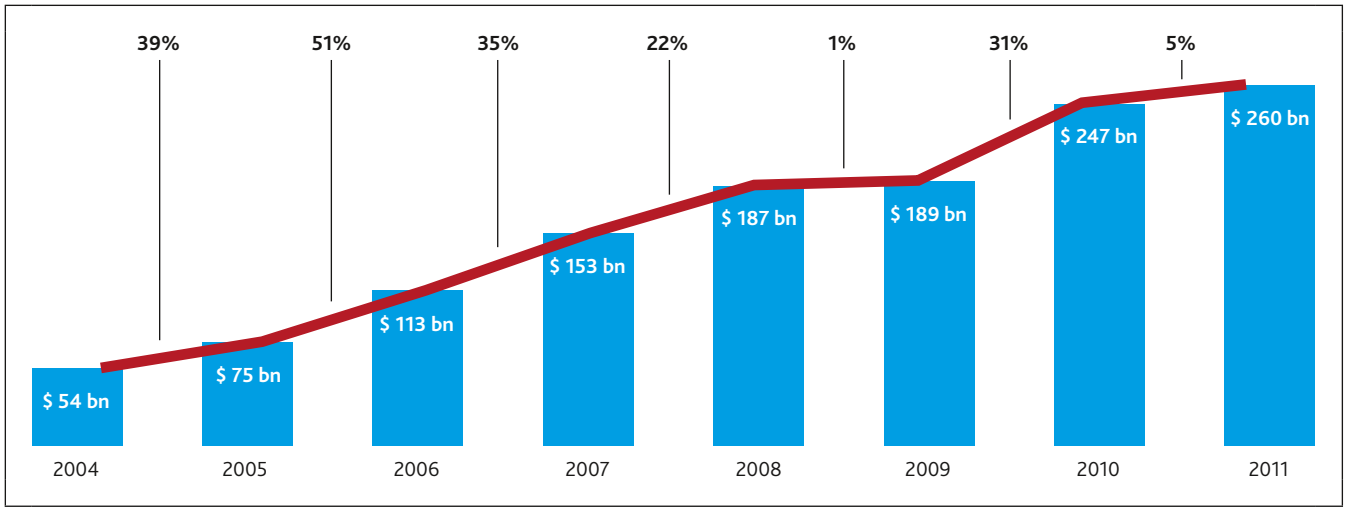
Financing and Investment Trends [2008-2011]

Debt markets continue to be weak, leading to higher borrowing costs for project developers. Europe, in particular, is still struggling to cope with the aftermath of the financial crisis. Confronted with significant national budget deficits, several European countries have either reduced or are looking to stem the support for renewables in the coming year. Reductions in tariff rates are likely to occur in several feed-in tariff markets in 2012, starting with some of the key markets in Europe (Greece, Ireland, Portugal and Spain). Some of these reductions are due to decreased technology costs, but many are austerity driven.

The Eurozone is a special case. On the one hand the EU has its 20-20-20 targets and on the other the budgetary crisis. A troika comprised of the International Monetary Fund, the European Central Bank and the European Commission is watching over the budgets of Greece, Ireland, Portugal and Spain and have in writing advised the Portuguese government to stop funding renewables via its budget. Spain now has a one year moratorium on renewables development. This highlights the political risk involved in a political market.

In the United States, the wind sector continues to suffer from the lack of federal climate or energy legislation, continued piecemeal extension of the Production Tax Credit[3] and competition from new found sources of 'cheap' natural gas. In China, increasing economic imbalances could impact the ability of the Chinese banks to invest in one of the national priority sectors i.e. renewable energy[4]. Despite these difficulties the wind sector saw an annual market growth of 6% in 2011, with cumulative installed capacity growth of more than

Global Total New Investment in Clean Energy 2004-2011 (US$ Bn)



Includes Corporate and Government R&D, and small distributed capacity. Adjusted for re-invested equity. Does not include proceeds from acquisition transactions. *Source: Bloomberg New Energy Finance*

20%. Thus it appears these factors collectively have to date merely slowed the wind sector's progress.

A key factor adding to the growth of the wind energy sector has been the support from public sector investment over the past three years. Several governments provided considerable support for the renewable energy sector as part of their stimulus packages.

Global clean energy investment reached a new record of $260 billion (See figure above) in 2011. This characterizes a key milestone for a sector that enjoyed an average compound annual growth rate of 37% between 2004 and 2008, but then saw growth slowdown in the face of the widespread recession in 2009. The majority of investment in 2011 was the asset financing of utility-scale projects such as wind farms, solar projects and biofuel plants.

Emerging Trends

According to the IEA, $38 trillion of investment is required to meet projected energy demand through to 2035. Of this, the IEA projects that almost two-thirds of incremental energy demand in 2010-2035 will be met by natural gas and renewables [WEO, 2011].

The industry expects to install another 255 GW of wind between now and 2016. Meeting this growth target for the wind industry and the various national targets for renewables will depend upon the availability of rational and fair support mechanisms to be available in the interim. Further, the lack of a global price on carbon only thickens the plot for ensuring a viable return on investments for project developers.

While the value of direct payment mechanisms (such as tax credits, feed-in tariffs, capital subsidies) may be on the decline due to budgetary restrictions, the support from development banks is rising. The lending portfolio of development banks (multilateral, regional and national) is increasingly reflecting larger support for clean energy projects. This support has come through greater involvement of these banks in club-deals[5] and loan syndication[6] activities undertaken for renewable energy projects in the post 2008 economy.

Since 2007, the development banks have made significant project finance contributions to renewable energy projects across the world. According to BNEF's report from January 2012, there were several development banks and agencies amongst the top asset finance lead arrangers for clean energy projects in 2011[7]. The top slot went to the US Federal Financing Bank[8] ($10.14 billion) followed by the Brazilian Development Bank's (BNDES) lending of $ 4.23 billion[9] to various domestic clean energy projects. The German development bank KfW and the Nordic Investment Bank were tied at the sixth spot in terms of market share (lending $1.89 billion

Table: Development bank financing: 2007-2011*, $m

Institution	2007	2008	2009	2010	2011*	Institution Type**
European Investment Bank	1,128	1,361	2,682	5,409	1,046	Regional MDB
Brazilian Development Bank	1,554	6,206	2,240	3,149	4,229	NDB
KfW Bankengruppe (excluding KfW IPEX Bank)	697	968	1,207	1,525	1,889	NDB
PR China Development Bank	119	417	500	600	n/a	NDB
World Bank Group	207	205	474	748	875	MDB
Asian Development Bank	121	208	612	819	n/a	Regional MDB
European Bank for Reconstruction and Development	47	365	189	482	n/a	Regional MDB
Agence Francaise de Developpement	254	141	245	294	n/a	NDB
Nordic Investment Bank	163	378	235	113	1,889	MDB
Indian Renewable Energy Development Agency	94	68	87	115	n/a	NDB
Inter-American Development Bank	128	662	264	83	n/a	Regional MDB
Overseas Private Investment Corp.	19	0	121	95	n/a	MDB
African Development Bank	0	0	68	108	n/a	Regional MDB
Total	**4,531**	**10,979**	**8,924**	**13,542**	**--**	

**Partial list as on 15-03-2012 : Figures from BNEF table on top 20 asset finance lead arrangers in 2011http://bnef.com/PressReleases/view/182*

***MDB: Multilateral Development Bank ; NDB : National Development Bank*

Note: This table does not cover finance to energy efficiency projects. Development banks made significant contributions to large hydro projects, which are also not included. Finance to supply chain projects like component manufacturing (e.g. turbine manufacturing plants) was also not considered. Some development banks (e.g. Deve lopment Bank of South Africa and the Eurasian Development Bank) are not included due to the relative size of their contributions (i.e. less than $50m).

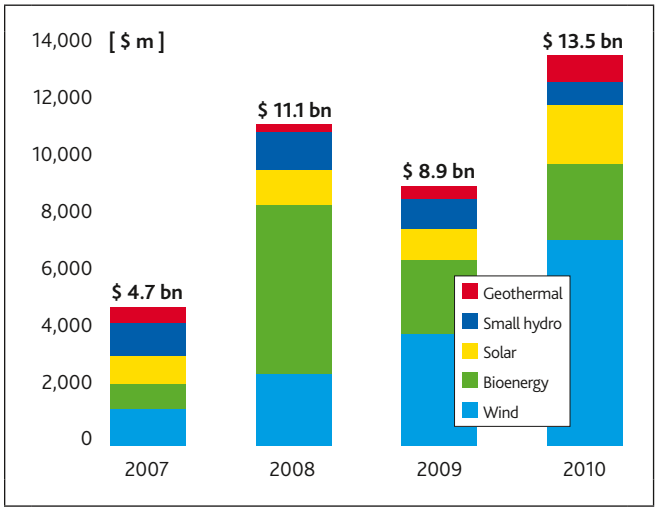
Source: Bloomberg New Energy Finance (April, 2011)

each). Other large development banks with significant investments were the European Investment Bank (lending of $1.05 billion) and the World Bank (lending of $885 million). The role of Chinese banks in the country's domestic wind market as well as the international expansion plans of its wind and solar companies is significant, however a final number is hard to determine.

The main factor that distinguishes development banks from private sector lending institutions is the ability of development banks to take more risk associated with political, economic and locational aspects. Further, since they are not required to pay dividends to private stakeholders, the development banks take higher risks than commercial banks to meet various national or international 'public good' objectives. Additionally, long-term finance from the private sector for more than a ten year maturity period is not available. However, public sector banks on their own cannot fill the gap arising from a lack of syndication activities in the market. They have to restrict themselves to a certain share of the total loan and would not be expected to take the lead. For instance in the EU, due to competition legislation, the public sector banks have to limit their share to less than 50 percent.

Major beneficiaries from this increased lending by development banks are the mature clean energy technologies like wind, solar and biomass. Wind has been the single largest beneficiary of these investments to date, receiving $7.2 billion in 2010 alone (BNEF, 2011). In 2011, wind projects made up more than 28% of the $260 billion investment in clean energy projects. A significant portion of this investment was from public sector institutions.

Development bank project finance by sector: 2007-2010



Source: Bloomberg New Energy Finance

Many of the wind projects in South East Asia, Africa and Latin America have benefitted from public funding support in 2011. For example during 2011, several of GWEC's member companies were engaged in a number of projects in Africa, Latin America and Asia-Pacific in cooperation with different public funding institutes clearing the way for wind projects in countries that haven't been able to utilize this energy option before.

Outlook for 2012-2016

Wind energy stands to benefit from its role as both a source of energy security and a key to solving the problem of climate change in the coming decade. These attributes are likely to keep clean energy solutions in the priority list of development banks' strategy for energy access, climate and green growth.

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Development banks increasingly drive wind investment in emerging markets

by **Sean Whittaker**
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The renewable energy business is experiencing phenomenal worldwide growth driven by declining costs of generation, growing electricity demand and mounting environmental concerns, particularly over climate change. The year 2010 marked an important milestone in the global wind energy industry as it was the first year that more new wind capacity was added in emerging markets than in "traditional" OECD countries. Emerging economies - some of whom were barely on the global wind map only six years ago - have now surged to the forefront in terms of new installed wind capacity. Most observers expect that this trend will continue, with projections indicating that by 2030 half of the world's installed wind capacity will be in emerging markets including Brazil, China, India, Mexico, Morocco, South Africa and Turkey. In the midst of this transformation, a parallel trend has emerged: national and multilateral development banks are playing an increasingly important role in driving wind energy investment in these emerging markets.

According to Bloomberg New Energy Finance (BNEF), global investment in clean energy reached a new record of US$260bn in 2011, almost five times the total of US$54 bn in 2004. The percentage of this investment moving to emerging economies and developing countries has risen dramatically in this time, from 19 percent in 2004 to 46 percent in 2011. Looking at the wind energy sector alone, BNEF expects that annual investment in onshore wind will grow from US$65bn in 2010 to US$137bn per year in 2030 with a significant portion of this taking place in emerging markets.

But who is going to finance this growth? A variety of factors including the Basel III agreement's provisioning requirements; the ongoing Eurozone crisis and the aftermath of the global financial downturn have driven many commercial banks away from emerging markets (the so- called "flight to quality"). In many of these markets, public financial institutions have stepped into the gap and are providing increasing levels of financing for wind and other renewable energy projects.

According to BNEF, development bank financing of renewable energy projects rose from US$4.5bn in 2007 to US$13.5bn in 2010, led by multilateral development banks (MDBs) such as the European Investment Bank, Asian Development Bank and the World Bank Group (of which the International Finance Corporation is a part) as well as national development banks (NDBs) such as KfW Bankengruppe (Germany) and BNDES (Brazil). Over the same time period, the annual investment by these institutions specifically in wind has increased dramatically from US$1.3bn to US$7.2bn.

The International Finance Corporation's (IFC) renewable energy portfolio attests to this trend. In the last two fiscal years more than half of all IFC's downstream power sector investments have been in renewable energy. Wind now represents 25% of IFC's power portfolio, with more than US$511 million of investment in 15 wind projects representing nearly 3 GW of total capacity. This has had an important catalyzing effect on private investment. For example in Mexico, collaboration between the World Bank, IFC and the Inter-American Development Bank has mobilized project financing for more than 300 MW of wind projects and helped to catalyze subsequent investment by commercial banks alongside the private sector. Total installed capacity in Mexico is now expected to exceed 1 GW by April 2012. Similarly, IFC is expanding its upstream investments in the wind supply chain, seeking to catalyze private sector investment in the production of turbine components in markets that can act as regional manufacturing hubs.

Why is this happening? Development banks have a key role to play in mobilizing capital when and where it is needed most. Commercial lenders, faced with global economic uncertainty and investments in unfamiliar markets often look to development banks to share various risks – whether perceived or real. Going forward, this suggests that development banks will continue to play a critical role in accelerating the adoption of wind in emerging markets, assisting these countries in benefitting from the social, economic and environmental benefits that wind can bring. Furthermore, the experience of IFC and other public financial institutions suggests that banks can "Do well by doing good" and that it is a wise investment strategy for any country's public sector to invest in wind and other renewable energy sources in the future.

Kunimiyama wind farm 2MWx15 units (Japan Steel Works)
© Eurus Energy Japan

Nonetheless, with the continuing economic and financial challenges in much of Europe and across much of the G-20 group of countries, the role of development banks is going to be important for the continued growth of the global wind energy sector. With stable and long term regulatory frameworks in place much of the risk from clean energy projects can be mitigated. The fact that with more and more wind being integrated into the conventional energy matrices across much of Europe, Asia and North America, clean energy projects will be perceived as lower risk investments. Even the UK government is setting up a Green Investment Bank to get its plans for offshore wind financed.

Such interventions by public banks are a clear signal of Government support and lead to increased stability of the markets and provide long-term sustainable investments. The urgent need to finance the enlargement and modernisation of the electricity grid is another area for their involvement, hopefully alongside new sources of finance such as pension funds.

Post 2012, both the form and scope of the international carbon market remains unclear. The Clean Development Mechanism had been an ally for the wind sector especially in China and India. It is important that a similar supplementary price support is maintained by national, regional or local carbon pricing schemes.

BNEF's outlook for 2012 includes an expectation of development banks becoming more active in project financing. However, this increase will only partially alleviate any shortfalls in commercial lending as the focus of these banks is fundamentally different. While the development banks have been crucial to adding liquidity to the markets during the financial crisis in 2009-10, BNEF expects most growth in development banks' lending in 2012 to take place in emerging markets where they will be channelling World Bank and other aid money to distributed energy projects, in line with the UN's year of 'sustainable energy for all'.

Basically, the perceived high-risk nature of clean energy investments, particularly in new markets, means that only a limited set of investors (i.e. those with a high-risk appetite) would be willing to invest, thereby limiting the possibility of scaling up deployments. In such an environment the role of public finance institutions in providing services such as loan guarantees, export credit support and risk insurance is critical as a bridging strategy in mature markets and vital for new and emerging markets. Overall, 2012 is very likely to see the trend of rising public sector finance strengthen.

An on-going positive dialogue between project developers, WTG manufacturers, political and regulatory stakeholders and public funding institutes is the way forward to secure a more sustainable energy supply both from a financial and environmental point of view.

With Input from Justin Wu and Anna Czajkowska, Bloomberg New Energy Finance; Henrik Breum, Vestas Wind Systems A/S; Ishwar Hedge, Suzlon Energy Limited.

1 http://www.iea.org/ebc/files/impact.pdf
2 Most offshore projects in Europe are usually financed through club-deals with a limit of Euro 50 to 100 Million per partner.
3 Currently set to expire at the end of 2012
4 http://www.imf.org/external/pubs/ft/survey/so/2011/CAR111411A.htm
5 Club deal means that several banks join forces on equal terms thereby limiting their debt (in most cases between Euro 50 to a 100 Million).
6 Loan Syndication means that one bank takes the lead and invites a few others to join. The reason for the proliferation of such deals is the limited risk taking capacity of banks due to new requirements for equity in the aftermath of the financial crisis. It is relevant only to larger projects but the ill-liquidity of banks has had a serious effect on the offshore market.
7 http://bnef.com/PressReleases/view/182
8 US Department of Treasury's Federal Financing Bank loans are a part of the Department of Energy Loan Guarantee Program under the 2009 Recovery Act. The Recovery Act amended DOE's Title XVII Program by authorizing a new, temporary program designed to stimulate job creation. The Section 1705 program, authorized loan guarantees for commercial renewable energy systems, electric power transmission systems and biofuels projects that commenced construction no later than September 30, 2011. DOE issued 28 loan guarantees between the 1705 program's inception and its end date of September 30, 2011, for a total of $16 bn in loan guarantees. : https://financere.nrel.gov/finance/content/doe-loan-guarantee-program-primer
9 BNDES acted as sole lead arranger in all 27 deals attributed to the organisation. Significant deals include the IMPSA Ceara Wind Auction 2009 Portfolio financing ($519m), the Renova Energia Bahia Wind Farm Portfolio I financing ($477m) [BNEF,2012]

Role of public finance institutions for scaling-up renewable energy

by **Debashish Majumdar**
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Scaling up the use of Renewable Energy is a key to building a genuinely low-carbon society. Renewable Energy is needed not only for enhancing energy security amid volatile fuel supply & prices, but also towards providing a cleaner form of energy to the masses with significantly reduced greenhouse gas emissions. Easier access to finance will be decisive to achieve speedier and higher levels of deployment of Renewable Energy sources across the globe.

Achieving long-term sustainable development will require substantial investments in environmental technology, new energy systems, environmentally sensitive infrastructure and information technology. The scale of capital flows required is very significant, dictating the need to secure finance from all possible sources, both public and private institutions.

Notwithstanding the existing capital flows to emerging markets, and even in the context of strong national policies supporting Renewable energy technologies, developing countries present a range of risks for private financial institutions, making it difficult for them to invest in this area. The primary risks are unproven technology and comparatively lower rate of capital returns. Private sources of finance further have a tendency to underplay their potential role in funding sustainable development in the belief that such matters are primarily the role of government. Indeed, their view has often tended towards dismissing environmental concerns as being of peripheral importance to their main lending business.

To reduce these risks, the Renewable Energy sector was supported with apt policy enablers in form of tax incentives and generous feed-in tariffs. However, even with these elements in place, it was clearly appreciated that to begin with, commercial banks and private financing community might not be forthcoming to support the sector as their perceived risks outweighed the likely returns expected from such projects. And without any kind of lending support, project development would not have taken place, deterring the financiers for want of initial success stories, creating a kind of vicious circle.

Public sector financing institutions, including national, bilateral and multilateral agencies, were therefore, expected to play a key role to facilitate access of funds to the Renewable Energy sector at competitive terms, till their commercialization for uptake by mainstream banks and private financial institutions. These public finance institutions, like the World Bank, ADB, AfDB, KfW, JICA, EIB etc., developed innovative instruments for these newly created markets in the sustainable development space, with some of them even establishing dedicated verticals to serve the sector. They joined hands with the local governments to support projects by absorbing some of the key risks involved, thereby creating a pool of model investment projects. This arguably worked towards facilitating significant scale-up of private finance into the Renewable Energy market space. These public agencies further acted as conduit for flow of low-cost funds from international donor agencies and specially created carbon funds, given the capital intensive nature of clean energy technologies.

India, with its huge energy requirements and limited resources, has been assiduously working towards harnessing renewable energy resources so as to bridge the demand-supply gap, insulate itself from global energy price volatility, with an overall aim to make a paradigm shift to a low-carbon economy. It embarked upon the path to undertake a comprehensive Renewable Energy development program as early as 1980s, triggered by the oil shocks of 1970s. Wind sector was the initial focus area because of a host of favorable reasons, including established technology and a turnkey business development model.

Learning from international practices, the Government of India created a dedicated public finance institution 'Indian Renewable Energy Development Agency' (IREDA), with an exclusive mandate to provide financial services to the Renewable Energy sector. Funding support from IREDA complemented the government policies to attract the early set of investors in this sector, leading to sculpting of early success stories. This dispelled the myth on the bankability of the sector, making it attractive for the commercial banks and private financial institutions to venture into. This has resulted in achieving tremendous year-on-year growth in terms of installed Renewable Energy capacity, which recently surpassed 23GW, with a record US$10 billion worth of investments made in the year 2011.

The public financial institutions, on account of their quasi-government structure, are ideally suited to provide insights and feedback to the policy makers towards the development of a more conducive policy framework. They further act as a knowledge repository, sharing information and best practices with the broader stakeholder community, both domestic and international.

Given the fact that the renewable energy sector has been the focus of global attention for its unique role in meeting the energy requirements sustainably, substantial research work is being carried out towards bringing out cost-effective and scalable energy solutions. This shall require funding support to the new and upcoming Renewable technologies under innovative business models, necessitating creation of public financing institutions akin to IREDA in other developing economies so as to build upon the initial edifice till the commercial financing agencies join in.

The Global Status of Wind Power in 2011

The global wind power market recovered somewhat in 2011, thanks to a strong year in a number of national markets. The market grew by about 6% compared to 2010, and the 40.5 GW of new wind power brought on line last year represents investments of more than €50 billion (about $68 billion).

The US market made a respectable recovery, Canada had a record year, and Europe remained on track to meet its 20/20 targets but with essentially a flat market. Offshore installations in Europe decreased slightly last year, but strong growth figures were posted in Romania, Poland and Turkey; and a strong year in Germany reflects a renewed and even stronger commitment to renewables in the wake of the nuclear phase-out decision.

The new global total at the end of 2011 is just shy of 238 GW, representing cumulative market growth of more than 20%, which is certainly a respectable figure for any industry in this economic climate, even though it is lower than the average over the last 10 years, which is about 28%.

The main drivers of growth in the global market, as they have been for the past several years, are the Asian powerhouses of China and India. While the era of double and triple digit growth in China's wind market may be over for the time being, it still represented about 43% of the global market, and India posted yet another year of record installations; the two countries together accounted for just over 50% of the global market in 2011.

Elsewhere, Brazil is beginning to live up to its promise, and along with Mexico will be the major growth markets in the western hemisphere for the coming years; and South Africa has finally taken the decision to get into the wind market in earnest.

For the second year running, the majority of wind power installations were outside of the OECD, and this is a trend which is likely to strengthen even further in the near future. India moved up to third place in terms of annual market share last year, and consolidated that position in 2011, and is likely to start its march up the cumulative table, surpassing Spain to move into fourth place by the end of 2013.

Looking ahead, the picture is mixed across the different markets, and a bit difficult to read. Major uncertainties about the future of federal support for wind power in the US are the single biggest variable, but not the only one. Grid issues in China, changes in the Indian tax code, questions about the pace of offshore development in Europe, and unsettled politics in the Middle East are just some of the issues we face going forward.

China and India lead Asian market

China installed nearly 18 GW for the second year running, but for the first time in nearly a decade, we didn't see double or triple digit growth. It seems that the market is entering a consolidation phase, to work out some of the issues created by its tremendous growth. First of all, there is the grid, and the lacklustre efforts of the grid companies to improve the grid infrastructure to keep up with the installations. New planning and operational rules which came into effect in 2011 should help with this, but there is still the matter of political will, and although State Grid's rhetoric has changed, it seems that its behaviour has not, as of yet. There is also the matter of the substantial manufacturing oversupply, which is a large enough problem to have warranted a mention by Wen Jia Bao at the National People's Congress in Beijing this March.

China's offshore target of 5 GW by 2015 seems less likely to be achieved with each passing month; regulatory and siting issues are still problematic. But there is great appetite both on a governmental and industrial level to move forward with this segment, as there is for new developments in lower wind zones in the south and east of the country; both have moved up the priority list as a result of some of the grid and interconnection issues mentioned above. The message seems to be that it's time to build more wind power closer to the load centers.

The Indian market passed the 2 GW milestone for the first time in 2010, and the 3 GW milestone in 2011. Continued increase in demand and policy priority for renewables has turned India into one of the most dynamic markets in the world. At the same time, the introduction of a new tax code and uncertainty about the future of the tax benefits that have driven much of India's growth to date are cause for concern.

Global installed wind power capacity (MW) – Regional Distribution

Africa & Middle East	End 2010	New 2011	Total End 2011
Cape Verde	2	23	24
Morocco	286	5	291
Iran	90	3	91
Egypt	550	-	550
Other [1]	137	-	137
Total	**1,065**	**31**	**1,093**
Asia			
PR China	44,733	17,631	62,364
India	13,065	3,019	16,084
Japan	2,334	168	2,501
Taiwan	519	45	564
South Korea	379	28	407
Vietnam	8	29	30
Other [2]	69	9	79
Total	**61,106**	**20,929**	**82,029**
Europe			
Germany	27,191	2,086	29,060
Spain	20,623	1,050	21,674
France**	5,970	830	6,800
Italy	5,797	950	6,737
UK	5,248	1,293	6,540
Portugal	3,706	377	4,083
Denmark	3,749	178	3,871
Sweden	2,163	763	2,970
Netherlands	2,269	68	2,328
Turkey	1,329	470	1,799
Ireland	1,392	239	1,631
Greece	1,323	311	1,629
Poland	1,180	436	1,616
Austria	1,014	73	1,084
Belgium	886	192	1,078
Rest of Europe [3]	2,807	966	3,708
Total Europe of which EU-27 [4]	**86,647** 84,650	**10,281** 9,616	**96,606** 93,947
Latin America & Caribbean			
Brazil	927	583	1,509
Chile	172	33	205
Argentina	50	79	130
Costa Rica	119	13	132
Honduras	-	102	102
Dominican Republic	-	33	33
Carribean [5]	91	-	91
Others [6]	118	10	128
Total	**1,478**	**852**	**2,330**
North America			
USA	40,298	6,810	46,919
Canada	4,008	1,267	5,265
Mexico	519	50	569
Total	**44,825**	**8,127**	**52,753**
Pacific Region			
Australia	1,990	234	2,224
New Zealand	514	109	623
Pacific Islands	12	-	12
Total	**2,516**	**343**	**2,859**
World Total	**197,637**	**40,564**	**237,669**

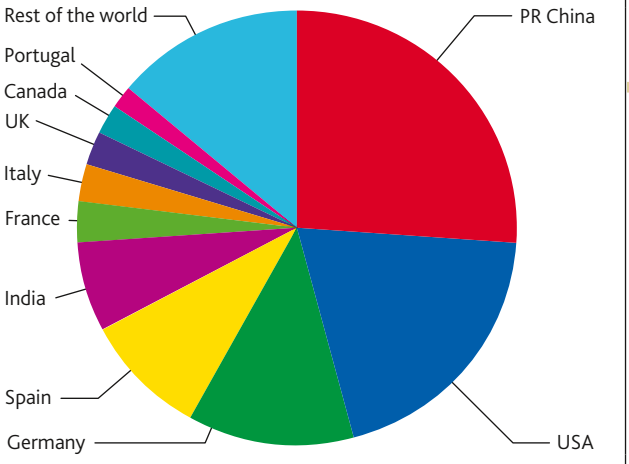
1 South Africa, Israel,Nigeria, Jordan,Kenya, Libya, Tunisia
2 Bangladesh, Indonesia, Philippines,Sri Lanka, Thailand
3 Romania, Norway, Bulgaria, Hungary, Czech Republic, Finland, Lithuania, Estonia, Croatia, Ukraine, Cyprus, Luxembourg, Switzerland, Latvia, Russia, Faroe Islands, Slovakia, Slovenia, FYROM, Iceland, Liechtenstein, Malta
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 Carribean: Jamaica, Cuba, Dominica , Guadalupe ,Curacao,Aruba ,Martinica,Bonaire
6 Colombia, Ecuador, Nicaragua, Peru, Uruguay

** **Provisional Figure**

Please note: Project decommissioning of approximately 528 MW and rounding affect the final sums

Source: GWEC

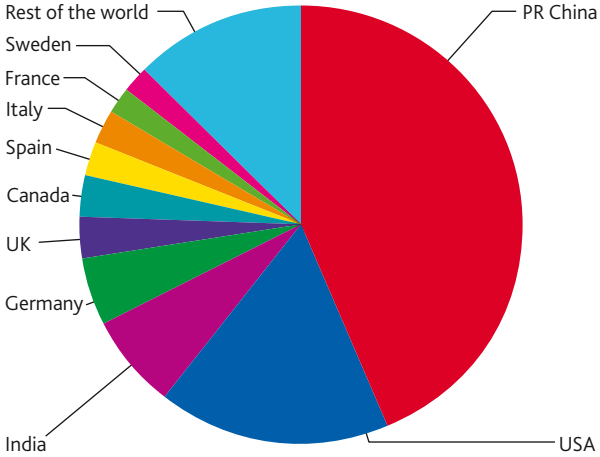
Top 10 cumulative capacity Dec 2011



Country	MW	% SHARE
PR China	62,364	26.2
USA	46,919	19.7
Germany	29,060	12.2
Spain	21,674	9.1
India	16,084	6.8
France**	6,800	2.9
Italy	6,737	2.8
UK	6,540	2.7
Canada	5,265	2.2
Portugal	4,083	1.7
Rest of the world	32,143	13.5
Total TOP 10	205,526	86.5
World Total	**237,669**	**100.0**

** *Provisional Figure* *Source: GWEC*

Top 10 new installed capacity Jan-Dec 2011



Country	MW	% SHARE
PR China	17,631	43
USA	6,810	17
India	3,019	7
Germany	2,086	5
UK	1,293	3.2
Canada	1,267	3.1
Spain	1,050	2.6
Italy	950	2.3
France**	830	2.0
Sweden	763	1.9
Rest of the world	4,865	12.0
Total TOP 10	35,699	88
World Total	**40,564**	**100.0**

** *Provisional Figure* *Source: GWEC*

While the rest of Asia didn't make much progress in 2011, there are some bright spots on the horizon. The Japanese market is potentially on the verge of a new round of growth, depending on how the debate over the future of the country's energy sector pans out. While nuclear power is rejected by the overwhelming majority of Japanese, the incumbents are fighting back. This will be clearer once the new feed-in tariff and connection regulations are agreed and enter into force, no later than 1 July. South Korea is also a country to watch, and with major offshore ambitions and improvements to the onshore regulatory regime, wind power will likely play a role in the Korean government's 'green growth' strategy.

Finally, 2012 will mark the commissioning of Mongolia's first commercial wind farm of 50 MW some 40 km outside the capital city of Ulaanbaatar. While this is a small development, it could be the harbinger of major developments to come: the largest mining operation in the world is being constructed in the southern Gobi desert, where there are no roads, no power and no water. Mongolian officials and the private sector are keen to help supply this operation from Mongolia's more than 1,000 GW of wind potential as well as its massive solar resources. This potential energy bonanza has attracted the attention of Japanese entrepreneur Masayoshi Son who, through his newly established Japan Renewable Energy Foundation, is spinning out plans for an 'East Asian Supergrid' which would, among other things, bring Mongolia's massive renewable energy resources to market in China, Russia, Japan, Korea and elsewhere.

North America

The US market posted annual market growth of more than 30% in 2011, adding 6,810 MW in 31 states for a total installed capacity of almost 47 GW, and cumulative market growth of nearly 17%. While the US market struggles with uncertainty surrounding the extension of the federal Production Tax Credit (PTC), wind power is now established in 38 states, and the footprint of the US turbine and component manufacturing industry covers 43 states. This means that US manufacturers were able to supply about 60% of the content for the US market in 2011, up from just 25% a few years ago. All things point towards more growth in 2012, although this is clouded by dim prospects for the 2013 market, depending on the fate of the PTC.

Xiao Yan Kau Farm, Rudong, China © *Wind Power Works*

Canada had a record year in 2011, installing 1,267 MW, and passing the 1 GW milestone for the first time in a single year. While the federal government has backed away from supporting wind power, provincial governments are stepping up to fill the gap. Looking at a market of up to 1,500 MW in 2012, Canada now has a total installed capacity of 5,265 MW, and is on track to meet the industry-set target of 10 GW by 2015.

New procurement processes are underway now in a number of provinces, and it was gratifying to see that the government of Ontario, Canada's leading wind province, chose to highlight its progressive renewables policy in the recent provincial election, despite the controversy surrounding the issue in some quarters.

Mexico, which as a result of it joining the OECD and NAFTA is now considered part of North America, also saw a great deal of activity in 2011. Despite only commissioning 50 MW of new wind power, an additional 300 MW was constructed but not connected to the grid until early 2012, so we'll have to count them in the 2012 totals. While there is no direct support for wind power or other renewables in Mexico, a number of fiscal and regulatory measures have been improved recently which makes Mexico an attractive market. Mexico ended 2011 with 569 MW, but expects to pass the 1 GW mark in May of this year, and will perhaps pass the 2 GW mark by the end of 2012.

Europe

Europe as a whole installed 10,281 MW in 2011, of which 9,616 was installed in the EU-27 countries. If these numbers look familiar it is no surprise, as they are almost identical to the 2010 market numbers, which is symbolic of the stability of the European market provided by the long term policy framework of the renewables directive. Total European capacity now stands at 96.6 GW, of which 93.95 GW is in the EU-27 countries.

Lake Ostrowow, Wolin, Poland © *Wind Power Works*

While the distribution of the market changes from year to year, the industry marches forward towards its 2020 target of supplying 14-16% of Europe's electricity by the end of the decade, up from the 6.3% of EU demand supplied by the current level of installations in an average wind year.

Offshore installations declined very slightly in 2011 to 866 MW, just 17 MW less than in 2010, bringing total installations to 3,813 MW, accounting for about 9% of the European market. The majority of these installations were in the UK, cementing the UK's position as the European (and global) leader in offshore deployment, passing 2,000 MW installed in 2011. Denmark is in second place with 857 MW.

In terms of annual installations, Germany was by far the largest market in 2011, installing 2,086 MW of new capacity. The UK came in second with 1,293 MW including 752 MW of offshore capacity, followed by Spain (1,050 MW), Italy (950 MW), France (830 MW), Sweden (763 MW) and Romania (520 MW). Turkey and Poland also had good years, installing 470 MW and 436 MW respectively.

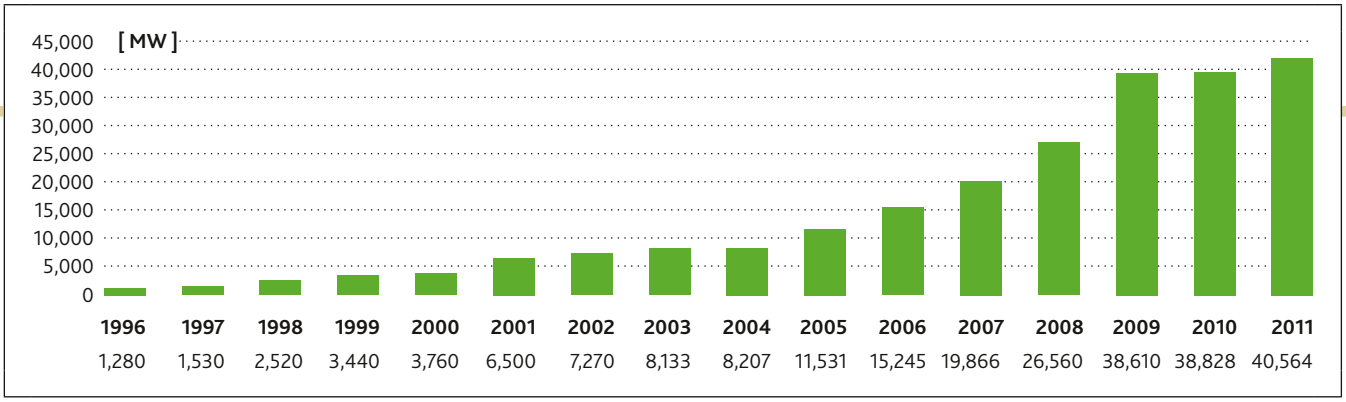
Latin America

Brazil led Latin America with 583 MW of installed capacity, pushing the country beyond the 1 GW mark early in the year and ended 2011 with a total of 1,509 MW. Brazil has a strong pipeline of up to 7,000 MW to be installed by 2016, and this has attracted many manufacturers and component suppliers to establish factories, with the idea of supplying not only the Brazilian market, but regional markets such as Argentina, Chile and Uruguay.

The Argentinian market moved ahead strongly in 2011, installing 79 MW which represents a more than 100% increase in total installed capacity. With its excellent wind resources, Argentina could be a major market if ways could be found to reduce the country risk. Chile installed 33 MW in 2012, with many more projects under construction which should come to fruition in 2012.

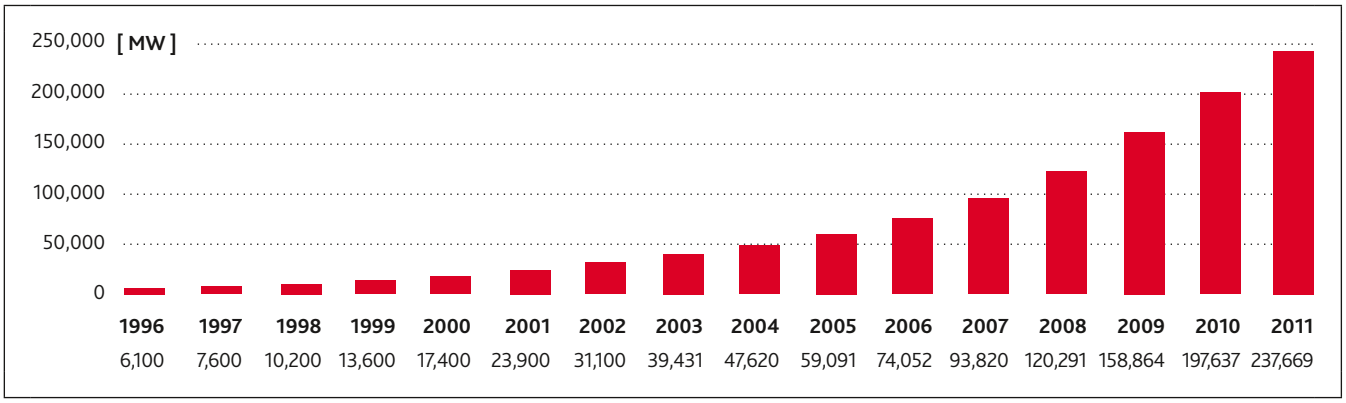
In Central America, Honduras was the big story, with the first big project of 102 MW coming on line. The Dominican Republic (33 MW) and Costa Rica (13 MW) also added capacity in 2011.

Global Annual Installed Wind Capacity 1996-2011



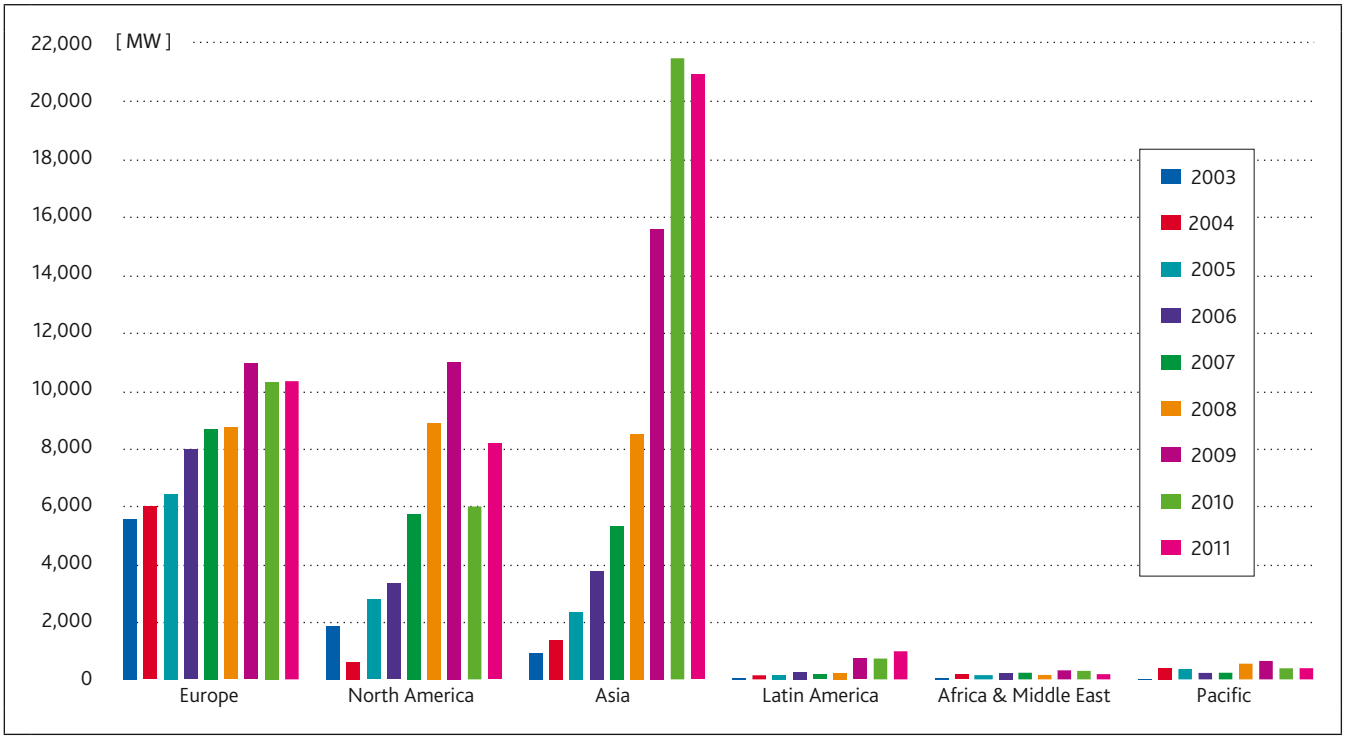
Source: GWEC

Global Cumulative Installed Wind Capacity 1996-2011



Source: GWEC

Annual Installed Capacity by Region 1996-2011



Source: GWEC

Africa

While the established markets in North Africa took the year off – the 'Arab Spring' put a damper on all industrial development in the region – the big story was Cape Verde's 23 MW plant coming on line, as the first stage in the government's plan to raise the share of wind energy production to 25% by 2012 and eventually to 50% by 2020.

The other big story in Africa in 2011 was the announcement on 7 December of the preferred bidders for the first round in South Africa's 'ReBid' programme. Wind energy garnered 630 MW in the first round out of a total of 1,450 MW of renewable power, and is set to be awarded another 1,200 MW or so in the remaining rounds which will be announced during the course of 2012; and this is just the first round of bidding under South Africa's long range plan which envisages more than 8,000 MW of wind energy by 2030.

If successful, the establishment of the wind industry in South Africa could be a regional manufacturing and supply hub, not only for the projects in Ethiopia and Kenya which are expected to come on line in 2012, but for others in Tanzania, Namibia and elsewhere further down the line.

Pacific region

The Australian market added 234 MW in 2011 (up from 167 MW in 2010), bringing the total cumulative installed capacity up to 2,224 MW. South Australia has now passed the 1,000 MW mark with 1,151 MW, and the state now receives 20% of its electricity from wind power.

2011 was also notable for the passage of Australia's landmark carbon legislation, which cleared the final hurdle in November, just in time for the UN Climate Negotiations in Durban. The scheme sets a price of carbon for major industrial emitters of AUD 23/ton beginning in July 2012 for three years, after which the price will float on a carbon exchange. The legislation also establishes a Clean Energy Finance Corporation to provide finance for renewable energy projects, and it is expected that this new legislation, combined with the revised Renewable Energy Target scheme will give a substantial boost to wind and other renewables in the coming years.

Te Rere Hau wind farm, New Zealand © *Windflow Technology*

New Zealand installed 109 MW in 2011 for a total of 623 MW, a 20% increase in cumulative installed capacity. Wind now supplies just over 4% of New Zealand's electricity with no subsidy or special treatment whatsoever.

Emerging markets drive growth

2011 was a tough year in the established markets in the OECD and was uneven across the various regional markets. China and India powered ahead, but everything else in Asia is 'on the cusp'. The European market was steady, as expected; and the US returned to growth for at least 2011 and 2012 but with a very uncertain future after that, although Canada's solid growth is taking up some of the slack. Latin America and Mexico are beginning to take off, but it will be a while before they can add significantly to global growth numbers, and Africa is just at the beginning.

So what conclusions shall we draw from 2011?

First, that competitiveness is the new byword for the industry. In an increasingly tight market, with tremendous downward pressure on prices through oversupply in the turbine market and fierce competition with new sources of 'cheap' gas, the industry is being challenged to compete on a price basis directly with heavily subsidized fossil fuel and nuclear, while at the same time seeing an assault on the existing price mechanisms in many markets due to government budget shortfalls.

Public financial institutions are filling in some of the gaps left by the credit crisis/recession that plagues much of the OECD, but not completely. New sources of finance still need to be developed for the industry to reach its potential in the coming decade.

Finally, although governments made some significant progress at the UN climate negotiations in Durban last year, we are no closer to a global price on carbon than we were twelve months ago; and the timetable that they have adopted leaves little hope of meeting the ambition of an emissions peak before the end of the decade, and an even smaller hope of keeping global mean temperature rise to less than 2°C above the pre-industrial average. The uncertainty over the future of the international carbon market remains, although Australia, Korea and China are all moving towards domestic systems which, combined with the European ETS, can serve as some sort of a surrogate in the meantime.

But the good news is that wind technology continues to get better and cheaper. The number of markets where wind competes favourably - even in direct competition with heavily subsidised conventional energy - keeps growing; and the benefits from large quantities of indigenous generation whose marginal cost is very low is becoming more and more apparent, especially when it brings local industrial development and much-needed jobs.

Market Forecast for 2012-2016

Bons Ventos Taiba Albatroz, Brazil © *ABEEólica*

It doesn't get any easier to make short term market forecasts for the wind industry. While the market continues to diversify across all continents, it is at the same time plagued by continued slow economic growth and budget crises in the OECD, as well as the continuing credit crunch.

While at GWEC we are expecting the industry to continue to grow during the coming five years, it's not going to be easy. It will be especially tough for manufacturers, with chronic oversupply adding to existing downward price pressure from general economic conditions to cut margins dramatically; and this is only expected to improve very gradually in the short term.

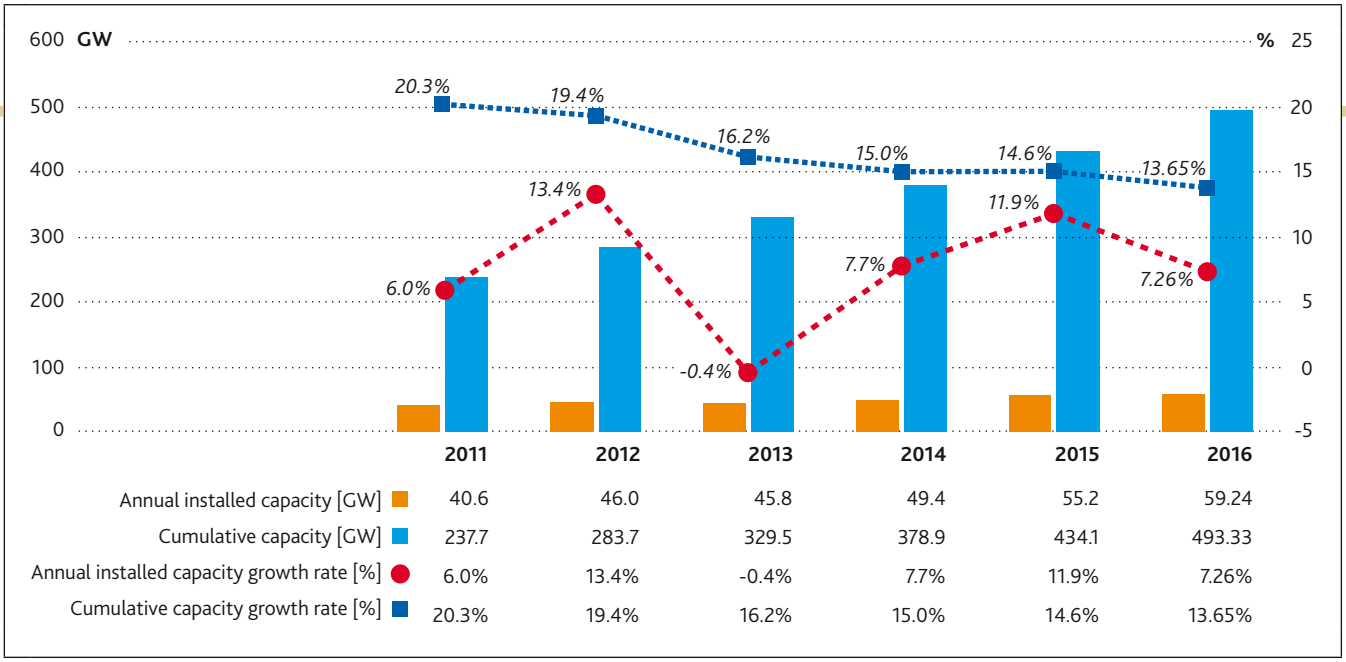
Uncertainty about the future of carbon markets is also a factor. There is little prospect of a revitalisation of the CDM markets in the next five years, other than a modest new source of demand from Australia. The European ETS is flooded with credits from too generous allocations in the earlier periods, and there is no certainty that it will be 'fixed' any time soon. However, new potential markets in South Korea and China may start to have an impact by the end of this period.

The biggest uncertainty is the future of the US Production Tax Credit, and its impact on the world's second largest wind market. Whatever happens, it seems likely that after a strong 2012, there is going to be a drop in 2013. How big a drop, how long it will last, and what effect it will have on both project and manufacturing investment, is the single largest variable affecting the overall market size in the next few years.

For the second year running, the majority of new installations were outside of the OECD, and this trend will no doubt continue. Most of the growth markets in the world now are outside the traditional markets in Europe and North America. While the Chinese market has now stabilised for a while, the Indian market is growing strongly as are Brazil and Mexico. There are also some bright spots in new 'emerging' markets in Eastern Europe, as the EU continues its steady if unspectacular march towards its 2020 targets. Canada and Australia are potentially substantial markets which could add significantly to global growth figures, and South Africa has now entered the market in earnest.

Our outlook for the coming period is a bit somber compared with previous forecasts, but this reflects the market realities from where we sit in late March 2012. Overall, we expect to see average annual market growth rates of about 8% for the next five years, but with a strong 2012 and a substantial dip in 2013. We see total installations for the 2012-1016 period

Market Forecast 2012-2016



	2011	2012	2013	2014	2015	2016
Annual installed capacity [GW]	40.6	46.0	45.8	49.4	55.2	59.24
Cumulative capacity [GW]	237.7	283.7	329.5	378.9	434.1	493.33
Annual installed capacity growth rate [%]	6.0%	13.4%	-0.4%	7.7%	11.9%	7.26%
Cumulative capacity growth rate [%]	20.3%	19.4%	16.2%	15.0%	14.6%	13.65%

Source: GWEC

of about 255 GW, and cumulative market growth averaging just under 16%. This is well below the 28% average for the last 15 years, but substantial growth in difficult times. Overall, we see total capacity ending up at just under 500 GW by the end of 2016, with an annual market in that year of just under 60 GW.

Regional distribution

While there is great interest and excitement in new, fast growing markets with large potential in Latin America and Africa, the majority of the global market remains in Asia, Europe, and North America, and that's not going to change substantially over the next five years. While Brazil is well on its way towards becoming a 1,000 MW or more annual market, the other markets in Latin America are just not big enough to put up large numbers, especially now that we have, in accordance with current practice, included Mexico and its burgeoning market in North America. South Africa is expected to become a substantial market over the next five years, and perhaps begin to emerge as a regional hub for the industry towards the end of this period, but along with Morocco and Egypt, the two other substantial markets on the continent, are not going to start to figure prominently in the international picture until after 2016, at least.

Asia will continue to be the world's largest market, although with a slower growth rate than over the past five years. China has entered a consolidation phase, and most of the growth in the region over the next five years will be in India. Having achieved a 3 GW market for the first time in 2011, we expect the Indian annual market to reach 5 GW by 2015, and how much further it can grow from there will be dependent upon continued economic growth, improvements in grid infrastructure and management and a clear national policy framework for the power sector.

The future of Japan's energy system is still up for grabs, but the overwhelming majority of the public wants to see a future where renewables replace all or most of the existing nuclear power plants as soon as possible; and the government is heavily pushing offshore wind development. So we expect some growth in Japan over the next five years, but anticipate that it will get larger towards the end of the period.

Korea seems set to develop a major offshore wind industry, but how quickly and how much that will be complemented by increased exploitation of its onshore resources remains to be seen, which is why we are also cautious about Korea over the next five years, although we expect the numbers to start to grow substantially toward the latter part of this decade.

Mongolia gets its first commercial wind farm in 2012, and has tremendous potential, as do Viet Nam and the Philippines; although we don't expect major installations in any of these markets before 2016.

We expect Asia to install 118 GW between now and 2016, far more than any other region, and to surpass Europe as the world leader in cumulative installed capacity sometime during 2013, ending the period with about 200 GW in total.

The **European market** is the hallmark of stability, and given the EU's clear policy framework and targets out to 2020, there are unlikely to be any major surprises. Germany had a strong year last year, and the government's decision to phase out of all nuclear power by 2020 gives the industry a new boost. Spain had a disappointing 2011, and 2012 is likely to be even more so, but Romania, Poland, Turkey and Sweden have taken up the slack.

The offshore market continues to grow steadily, and we will start to see it play an even larger role in Europe in the period to come. Offshore accounted for about 9% of the total MWs installed in 2011, and that is expected to increase to around 20% by 2016. Total installations in Europe from 2012-2016 are expected to increase by about 65 GW, bringing total installed capacity to just over 160 GW.

The **North American market** (incl. Mexico) is expected to have a strong 2012, as both Canada and Mexico will install more than 1,000 MW to complement what is expected to be a strong year in the US, which began the year with more than 8 GW under construction.

From where we sit today, it seems unlikely that the reauthorisation of the PTC will happen in time to have a major impact on the 2013 market, so we are expecting a substantial drop in 2013 in the US market, while Canada and Mexico remain strong. We expect the US market to recover slowly over the following years, while Canada seems on track to achieve its target of 10 GW by 2015, and the Mexican market seems to be on its way towards meeting its (as yet unofficial) target of 12 GW by 2020. Overall, we expect just over 50 GW to be installed in North America from 2012-2016, bringing total installed capacity to just over 100 GW at the end of 2016.

The **Latin American market** is dominated by Brazil, now becoming established as a major international market with a strong manufacturing base which could supply a growing regional market in the Southern Cone, at least, and will constitute the vast majority of the regional growth in the period out to 2016. Chile, Argentina, Uruguay and some smaller Central American markets will contribute during the period, but Brazil will account for about three quarters of the 8.6 GW of new installations that we are projecting for 2012-2016, which will bring the region's total installed capacity up to almost 11 GW.

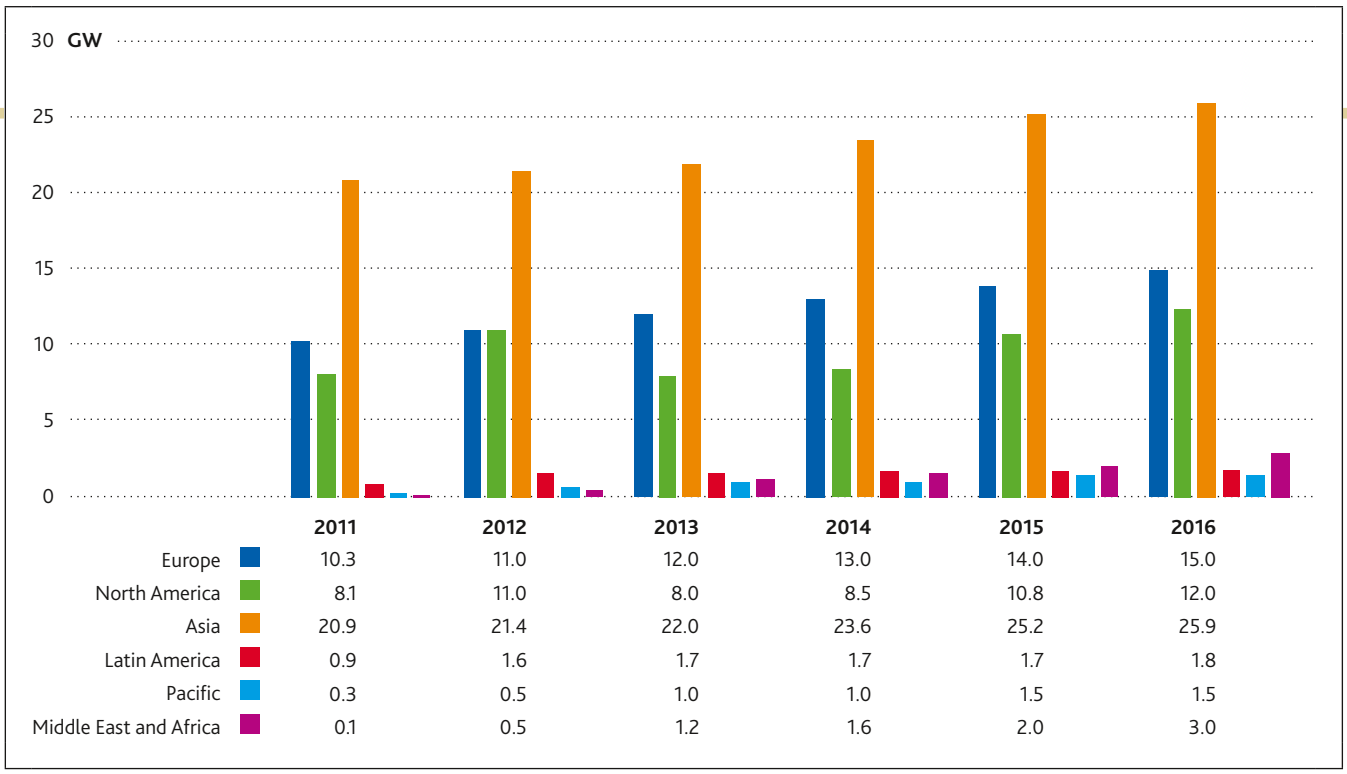
Fântânele-Cogealac , Romania © *BBB-Umwelt/Thomas Latacz*

There was not much activity in the **Africa and Middle East region** in 2011, which is no surprise given the turmoil across the Arab world, including in the main historical regional markets of Egypt, Morocco and Tunisia. We expect Egypt and Morocco to start up again in 2012 and grow towards their respective national targets over the coming period. New projects in Ethiopia, Kenya and Tanzania will come on line during the 2012-2016 period, and a number of others besides.

But the main story is South Africa, where finally, a substantial market seems to be ready to get underway. The first of the 634 MW of wind projects announced last December may in fact come on line already in late 2012, and the market is expected to evolve into at least 400 MW/year during this decade. Overall, we expect more than 8 GW to be installed in the region over the coming 5 years, bringing total capacity to almost 10 GW.

In the **Pacific region**, we expect the revamped Renewable Energy Target in Australia, combined with the new carbon legislation, to yield substantial results in the next five years. Combined with the small but dynamic New Zealand market, we expect installations of more than 5 GW from 2012-2016, bringing the region's total installed capacity to over 8 GW.

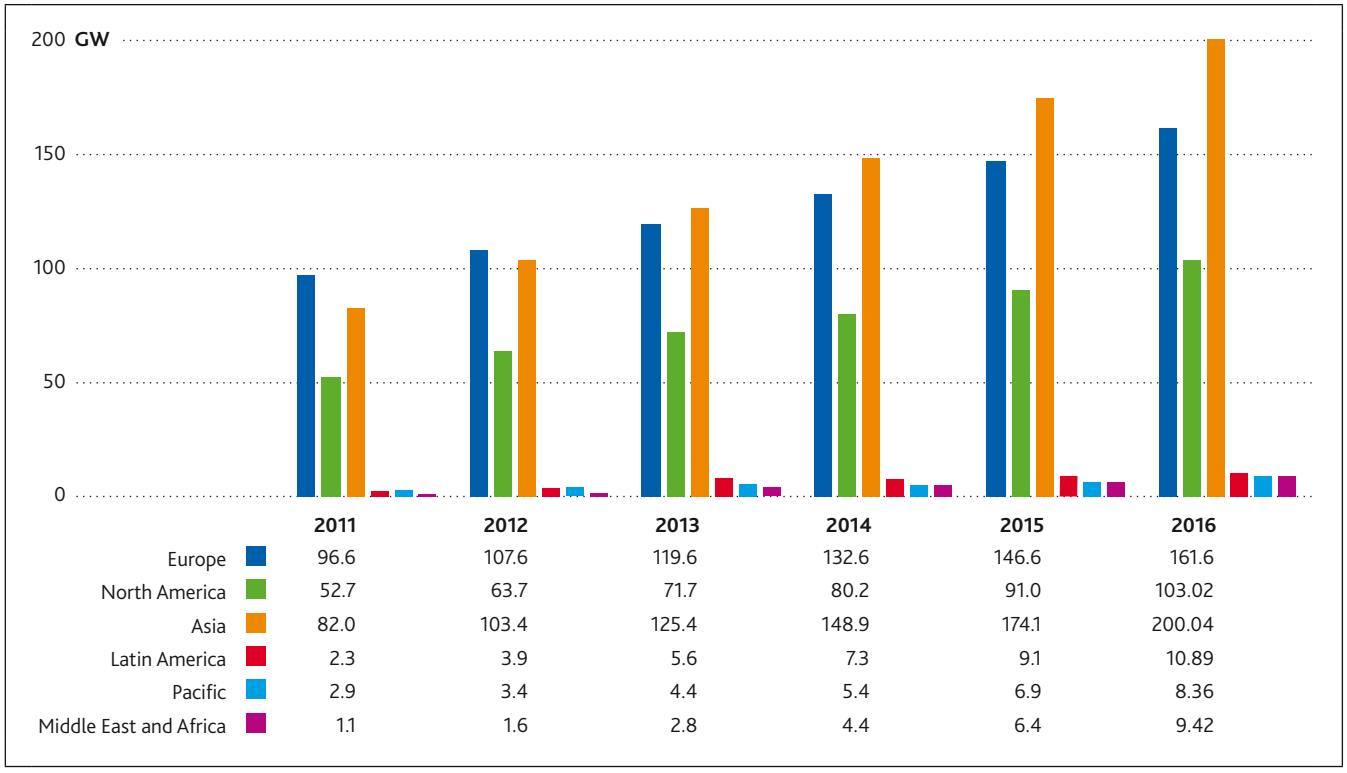
Annual Market Forecast by Region 2012-2016



	2011	2012	2013	2014	2015	2016
Europe	10.3	11.0	12.0	13.0	14.0	15.0
North America	8.1	11.0	8.0	8.5	10.8	12.0
Asia	20.9	21.4	22.0	23.6	25.2	25.9
Latin America	0.9	1.6	1.7	1.7	1.7	1.8
Pacific	0.3	0.5	1.0	1.0	1.5	1.5
Middle East and Africa	0.1	0.5	1.2	1.6	2.0	3.0

Source: GWEC

Cumulative Market Forecast by Region 2012-2016



	2011	2012	2013	2014	2015	2016
Europe	96.6	107.6	119.6	132.6	146.6	161.6
North America	52.7	63.7	71.7	80.2	91.0	103.02
Asia	82.0	103.4	125.4	148.9	174.1	200.04
Latin America	2.3	3.9	5.6	7.3	9.1	10.89
Pacific	2.9	3.4	4.4	5.4	6.9	8.36
Middle East and Africa	1.1	1.6	2.8	4.4	6.4	9.42

Source: GWEC

Australia

Woolnorth, Tasmania ©*Clean Energy Council*

Breakthrough in carbon legislation

Australia's exceptional wind resources have allowed wind energy to make an increasing contribution to Australia's energy mix. Although it is still a relatively new industry, wind power today supplies over 6,400 GWh annually, which represents more than 2% of national electricity consumption. At the end of 2011, Australia had 1,211 operating wind turbines across 58 wind farms with a total installed capacity of 2,224 MW. The total installed capacity of wind power has grown by an average of 35% per year over the past five years.

Although the cost of wind energy continues to fall, government support such as the Renewable Energy Target (RET) Scheme[1] is crucial to support investment in the industry and enables the wind power sector to play a major role in helping Australia's transition to a low carbon economy. The introduction of a price on carbon, which is anticipated for mid-2012, will provide the focal point of the government's strategy to reduce emissions.

Main market developments in 2011

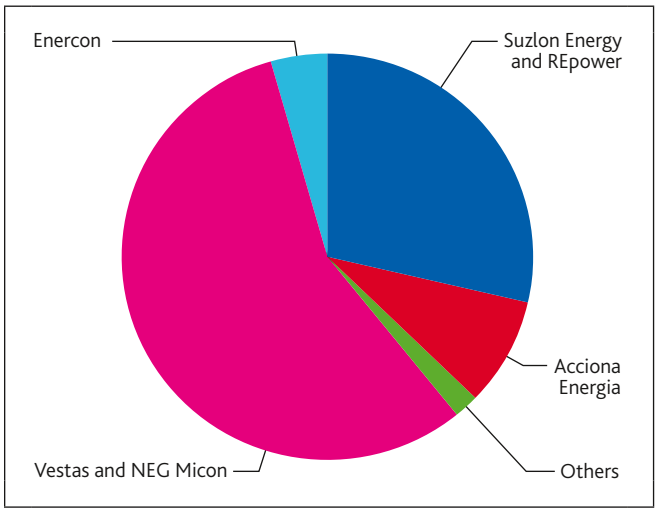
Five new projects were commissioned in 2011, adding 234 MW of capacity to the Australian electricity grid: Hallett 4 (132.3 MW), Woodlawn (48 MW), Gunning (46.5 MW), Hepburn (4.1 MW) and Mt Barker (2.4 MW). A further seven projects, totaling 1,060 MW, are currently under construction and expected to be completed within the next three years in the states of Victoria, W Australia, Tasmania, New South Wales and South Australia.

An additional 13 GW of projects are proposed for development in Australia, and have either received planning and environmental approvals or are currently applying for them, and another 5 GW of projects are undergoing feasibility studies.

The size of Australian wind farms is increasing. Acciona's 192 MW Waubra wind farm in Victoria is currently the largest in the country with 128 turbines spread over 173 square kilometres. However, AGL / Meridian Energy's 420 MW Macarthur Wind Farm in Victoria will be significantly larger if constructed in its proposed form. Nationally, wind power is spread over most states. South Australia has the highest capacity (1,151 MW), accounting for 52% of the total national wind capacity, and produces more than 20% of its electricity from wind power. Victoria follows with 432 MW, New South Wales (282 MW), Western Australia (204 MW), Tasmania (143 MW) and Queensland with 12 MW.

A number of new turbine manufacturers have entered the Australian market recently, but the market remains dominated by two main suppliers, namely Vestas/NEG Micon and REpower, which merged with Suzlon's Australian operation in 2011.

Installed wind capacity in Australia by turbine supplier

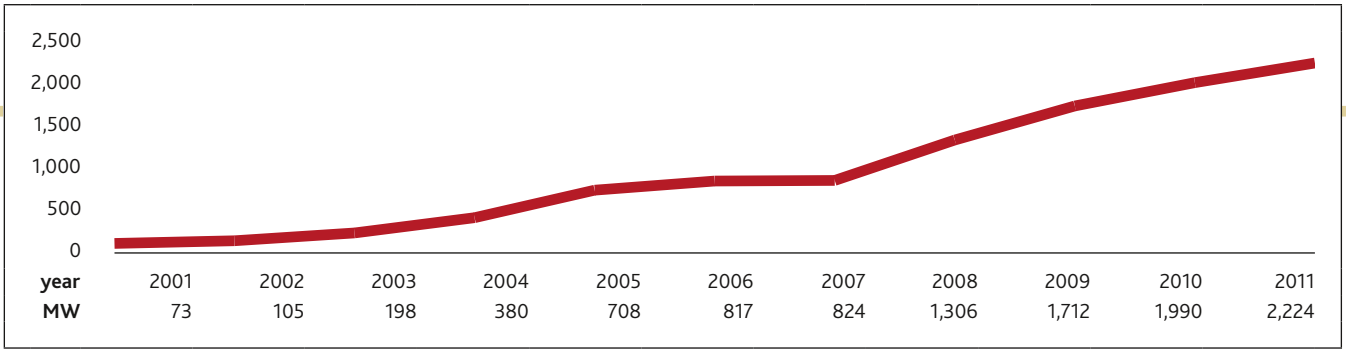


Source: Review of the Australian Wind Industry for the Clean Energy Council, Garrad Hassan, 2011

The policy environment

The Australian Government's Renewable Energy Target (RET) Scheme is designed to deliver 20% of Australia's electricity supply from renewable sources by 2020. The Large-scale Renewable Energy Target (LRET)[2] and the Small-scale Renewable Energy Scheme (SRES)[3] 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.

Total installed capacity



year	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
MW	73	105	198	380	708	817	824	1,306	1,712	1,990	2,224

Source: GWEC

The RET is crucial in supporting investment in the renewable energy industry and it provides the main incentive for wind power development in Australia, unlocking an expected investment of more than AUD 20 billion (EUR 16.09 billion / USD 21.14 billion) over this decade.

New legislation on carbon pricing

The Australian government has introduced new legislation on carbon pricing, setting the foundation for a national strategy to cut carbon pollution. A fixed carbon price of AUD 23 (EUR 18.5 / USD 24.3) per metric tonne will apply from 1 July 2012 rising by 2.5% every year for three years before moving to an emissions trading scheme from July 2015 onwards. Around 500 companies - those that emit more than 25,000 tonnes of CO^2-e/year - will be covered under the carbon pricing mechanism. Companies will need to buy and surrender to the government a permit for every tonne of pollution they produce. This will provide support to the wind industry by making the cost of wind energy more competitive with the cost of electricity generated from fossil fuels which will attract the carbon tax. The Clean Energy legislation also sets up a Clean Energy Regulator which from 2 April 2012 will become the statutory authority responsible for administering the carbon pricing mechanism, the National Greenhouse and Energy Reporting Scheme and the Renewable Energy Target.

As part of the carbon price package, AUD 10 billion (EUR 8.04 / USD 10.56) of the revenue collected will go towards the commercially oriented Clean Energy Finance Corporation (CEFC)[4]. The CEFC operates independently of the Government to provide loans for promising clean energy initiatives, helping to unlock sources of private capital. Its purpose is to enhance the commercialisation and deployment of renewable energy, enabling technologies, energy efficiency and low emission technologies.

Additionally, a new independent statutory body, the Australian Renewable Energy Agency (ARENA)[5] will coordinate AUD 3.2 billion (EUR 2.57 / USD 3.38) in existing funding programmes to promote research and development, demonstration and commercialisation of renewable energy projects.

Federal and state planning laws are very important to the successful deployment of wind power across the nation. A change of government in some states has resulted in proposed or implemented amendments to planning laws which have introduced significant uncertainty into the wind industry.

Outlook for 2012 and beyond

Wind energy today is the fastest growing large scale renewable energy source for electricity generation in Australia. A report prepared by Garrad Hassan for the Clean Energy Council predicts that an additional 6.9 GW of wind power would be constructed under the enhanced RET by 2020. With the right policy mix and increased demand for low emission energy, wind energy can remain a major contributor to the challenge of decarbonising Australia's energy mix. A transmission system that can accommodate high rates of wind penetration in some areas is required. Upgrades and extensions to parts of the electricity grid would support the expansion of the wind sector.

In the past year, the Australian wind industry has been working extensively to ensure that communities are engaged and informed about the economic benefits that wind projects can bring to the community.

With input from the Clean Energy Council, Australia

1 Australian Government, Department of Climate Change and Energy Efficiency: Renewable Energy Target Scheme. http://www.climatechange.gov.au/en/government/initiatives/renewable-target/legislation.aspx
2 Australian Government, Office of the Renewable Energy Regulator: The Large-scale Renewable Energy Target. http://www.orer.gov.au/About-the-Schemes/lret
3 Australian Government, Office of the Renewable Energy Regulator: The Small-scale Renewable Energy Scheme. http://www.orer.gov.au/About-the-Schemes/sres
4 Australian Government: Clean Energy Future Package/Clean Energy Finance Corporation. http://www.cleanenergyfuture.gov.au/clean-energy-future/our-plan/clean-energy-australia/financing-clean-technologies/
5 Australian Government, Department of Resources, Energy and Tourism: Australian Renewable Energy Agency. http://www.ret.gov.au/energy/clean/arena/Pages/arena.aspx

Brazil

History of Proinfa projects

Year	Wind projects	Annual	Cumulative MW
Up to 2005	10 wind farms	26.55 MW	26.6 MW
2006	05 wind farms	208.3 MW	236.8 MW
2007	01 wind farm	10.2 MW	247.0 MW
2008	05 wind farms	94.0 MW	341.0 MW
2009	15 wind farms	261.4 MW	602.4 MW
2010	14 wind farms	326.6 MW	926.5 MW
2011	**13 wind farms**	**399.1 MW**	**1,325.6 MW**

Tramandaí Wind Farm, Rio Grande do Sul, Brazil © *ABEEólica*

As Brazil's economic growth and electricity demand continue to increase, local and global climate change makes the country's traditional reliance on hydropower more and more challenging, and has led the government to diversify its power mix. Given Brazil's extraordinary wind resources, increasingly competitive costs and the complementarity of rainy and windy seasons in some large parts of the country, wind energy is an attractive option. Development of Brazil's more than 350 GW of potential wind resources contributes to Brazil's energy security and diversity of supply, creating new industries and jobs and helping to keep the country's electricity system clean and green.

The Brazilian wind market in 2011

The Brazilian wind sector installed 583 MW in 2011, bringing total installed capacity up to 1,509 MW, an increase of 63% in installed capacity, and a 56% increase in terms of annual market growth. Brazil reached the 1 GW milestone in June 2011 and has more than 7,000 MW in the pipeline to be completed by 2016.

Final year for the PROINFA programme

2011 was the final year of the Proinfa Programme, which was established by the government a decade ago to spur renewable energy development in Brazil. The Proinfa scheme was based on a system of feed-in tariffs, designed to attract investments in wind, biomass and small hydro power. This pioneering programme ended on 31 December 2011, much later than planned, but with positive results in terms of boosting the wind industry towards sustained growth.

In 2011, 13 Proinfa wind farms came online. Overall, by the end of the Proinfa programme, 1,325.6 MW were operational and connected to the grid. The rate at which new wind power capacity was installed significantly increased during the last two years of the programme, a reflection of the fact that the wind power industry is becoming firmly established in Brazil.

The first wind auction held on 14 December 2009 marked a turning point for wind power development in Brazil, when 1,805 MW were added to the MW's contracted under Proinfa. In addition, new financing policies were introduced by the Brazilian Development Bank (BNDES) giving a boost to the program as well as to the new impetus created by the wind power auctions, which were carried out in 2009, 2010 and 2011. As a result, the Brazilian wind market has attracted eleven significant WTG OEMs to the country, competing for new contracts in Brazil today.

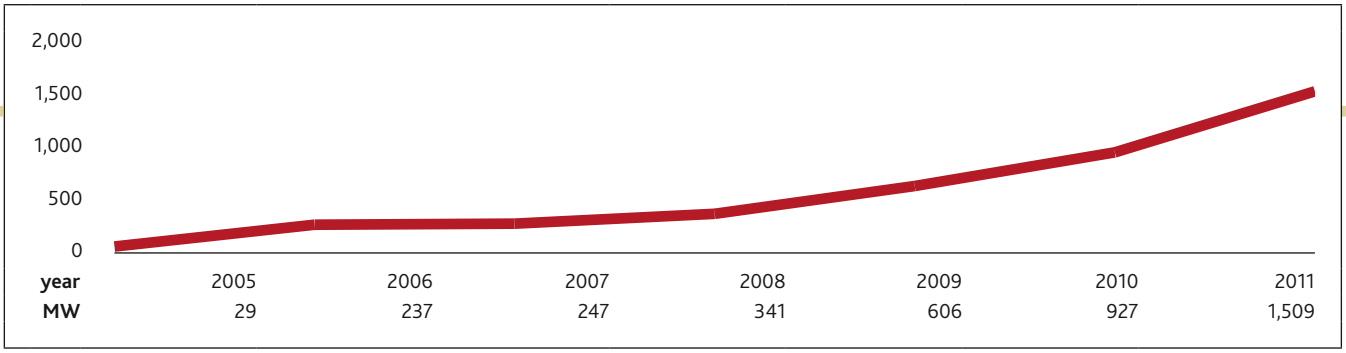
Wind energy auctions in 2009, 2010 and 2011

Reserve Energy Auction LER-2009

Brazil held the first wind-only auction in December 2009 (LER-2009). 71 wind energy projects were contracted with a total capacity of 1,805 MW. The six main manufacturers who successfully received orders following the auction were GE, IMPSA Wind, Siemens, Suzlon, Vestas and Wobben/Enercon.

From this auction, 11 projects consisting of 276 MW were completed in 2011, well ahead of schedule: Rio Grande do Sul (4 projects totalling 82 W), Bahia (3 projects totalling 90 MW), and Rio Grande do Norte (4 projects, totalling

Total installed capacity



Source: GWEC

104 MW). Most of the remaining 60 projects, accounting for 1,529 MW, are expected to be commissioned by the deadline of 30 June 2012.

Alternative energy auction LFA-2010 and Reserve Energy Auction LER-2010

In August 2010 in Alternative Energy Auction LFA-2010, a total of 1,519 MW of wind power were contracted, spread over 50 projects - these projects will need to be online by 1 January 2013. The developers with the most contracted capacity were Impsa-Energimp (270 MW) and Iberdola (258 MW), followed by CHESF (180 MW), Contour Global (150 MW) and Energisa (150 MW).

The Reserve Energy Auction LER-2010, held on the same day, awarded contracts to 20 wind projects totalling 528 MW, which need to be online by 1 September 2013. The main winning developers were Renova Energia (153 MW), Iberdola (115 MW) and ENEL (90MW).

A-3 2011 and Reserve Energy Auction LER-2011

In August 2011, a total of 2,047 MW were contracted spread over 70 wind projects, the sole winning bidder being Total Wind. The projects contracted under the A-3 2011 auction need to be online by 1 March 2014 and those from LER-2011 by 1 July 2014.

At the end of the year, another A-5 Auction took place. A total of 976.5 MW of capacity including 39 projects were contracted to Total Wind. These projects will need to become online by 1 January 2016.

The Brazilian wind industry

Free Market – ACL

Measures put in place by the Brazilian government, along with the attractive financing offered by BNDES have facilitated improvements in general market conditions, strengthened the competitiveness of the wind industry and brought increased confidence to the market. As a result, wind power has become the second cheapest energy source in Brazil after large hydropower.

The WTG OEM's that have closed contracts with the winners of the 2009, 2010 and 2011 auctions, and have also contracted to supply new wind farms under construction in the free market scheme are: Alstom, Gamesa, GE Wind, Impsa Wind, Siemens, Suzlon, Vestas and Wobben Enercon, each of which will qualify for BNDES financing.

The increasing competitiveness and reduced prices per MWh have motivated a group of private investors to start building 18 wind farms, totalling 546 MW, to be operated exclusively in the "Non-Regulated Market", a market segment which until recently has not seen any wind power development. Under the ACL – Free Market one 14.4 MW wind farm already came online in 2011, in the State of Rio Grande do Norte.

Outlook for 2012 and beyond

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. The Electrical Energy Ten-year Plan could help to provide the long term investor certainty required by the wind energy industry in order to keep the pace of growth strong.

With input from the Brazilian Wind Energy Association (ABEEólica)

Canada

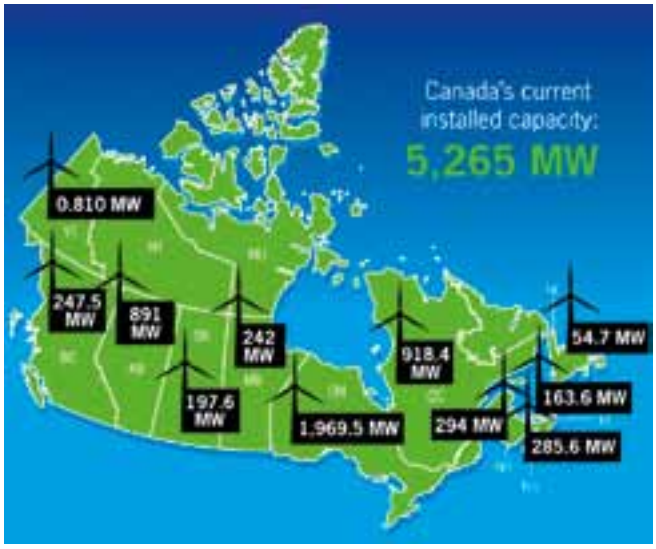
Erie Shores Wind Farm, Port Burwell, Ontario, Canada © *CanWEA*

A Record Year for Wind Energy Development

Wind energy in Canada enjoyed a record year in 2011 with 1,267 MW of new wind energy capacity, representing an investment of $3.1 billion Canadian dollars and creating 13,000 person-years of employment. Canada ended 2011 with a total of 5,265 MW of installed capacity. In 2011, new wind energy projects were commissioned in British Columbia, Alberta, Saskatchewan, Manitoba, Ontario, Quebec, New Brunswick, and Nova Scotia.

Ontario is the current provincial leader, with 1,969.5 MW of wind energy installations, and in 2011 the first projects were approved under Ontario's Green Energy Act (GEA)[1]. Alberta and Quebec follow at 891 MW and 918.4 MW respectively. Nova Scotia and British Columbia are also seeing new developments with a total of 285.6 MW and 247.5 MW now in place. Looking ahead, more than 5,000 MW of wind energy projects are already contracted to be built over the next five years.

Installed capacity by province



Source: CanWEA

Investment in new manufacturing facilities is at an all-time high, creating high quality jobs across the country. This year saw Enercon and REpower begin production at new facilities in Quebec; Siemens and CS Power building blades and towers in Ontario; and DSME opened a tower plant in Nova Scotia.

Main market and policy developments in 2011

This year marked the end of the federal government's ecoEnergy for Renewable Power program. The federal government has now clearly signaled that the next phase of wind energy development in Canada will need to rely on political leadership from provincial governments.

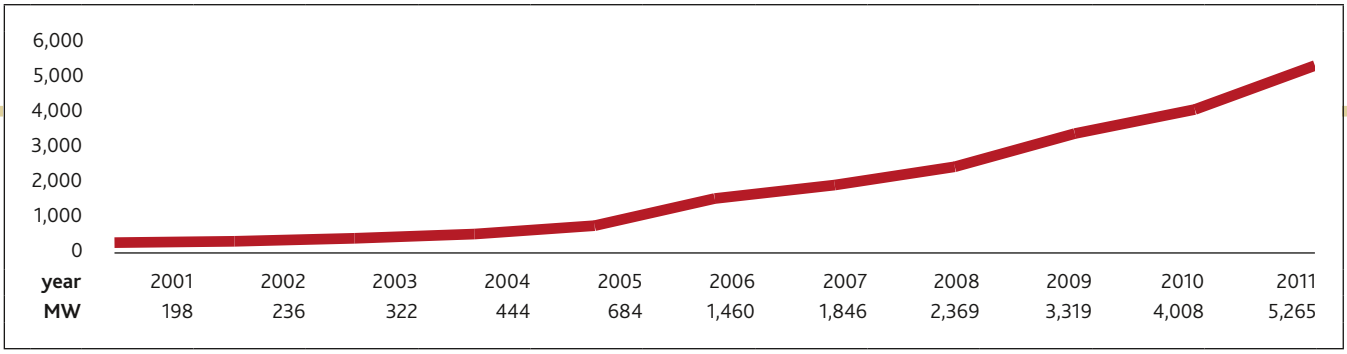
There have been important new procurement initiatives undertaken in 2011 that set the stage for further and accelerated growth. Ontario built on its position as a North American wind energy leader by awarding feed-in tariff contracts for another 1,688 MW of wind, bringing the total capacity to be built under the program to nearly 3,200 MW. SaskPower agreed to buy the output of three small-scale projects totaling 24.8 MW and received final bids in September in its request for proposals for 175 MW of large-scale wind, while Manitoba Hydro signed a power purchase agreement for a 16.5 MW expansion of the St. Leon Wind Farm.

Quebec has announced plans for a new Request for Proposal (RFP) that will allow it to both reach its goal of 4,000 MW of wind by 2015 and add an additional 300 MW targeted under its Plan Nord.

The province of Nova Scotia has moved to enshrine its goal of 40 per cent renewable energy by 2020 in regulation, appointed an independent administrator to oversee bids for another 100 MW of wind to help meet its interim target of 25 per cent by 2015, and has implemented feed-in tariffs for small and community wind projects.

The Canadian Wind Energy Association (CanWEA) launched a strategic vision for British Columbia –Windvision 2025[2] which calls for 5,250 MW of cost-competitive and low-impact wind power capacity to be installed in the Province by 2025. Achieving this target will generate jobs and economic benefits for British Columbians, greatly lower the greenhouse gas emissions of an expanding economy, and provide reliable power to meet more than 17 per cent of the province's total electricity requirements.

Total installed capacity



Source: GWEC

CanWEA also released a comprehensive guidance document[3] for the planning and development of wind energy projects in Canada. The guide joins a growing list of resources to help lead responsible and sustainable development of wind energy in Canada. Last year CanWEA released the industry's first Best Practices in Community Engagement and Public Consultation[4].

Challenges for the industry

Price for carbon

One area where policy clarity is still required is in Canada's approach to climate change. The absence of any national carbon pricing framework in Canada that recognises wind energy's environmental attributes in market prices is critical to future wind energy development. 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.

Improving public acceptance

Further improvements are also needed to demonstrate and quantify more clearly the economic benefits wind is providing to communities across Canada. Some progress on that front has been made in the last year, with the publication of detailed studies on the economic benefits of wind energy development in Ontario[5] and Quebec[6] as well as CanWEA's 'Friends of Wind'[7] program which gives supporters of wind energy the opportunity to share their success stories and make their voices heard.

Ontario has seen wind energy linked to issues around electricity pricing and local decision-making and this became an issue in the 2011 provincial election. The "politicization" of wind energy in Ontario created uncertainty and increased risk for investors, but the industry successfully came together to advocate for policy stability and continues to work with stakeholders to promote responsible and sustainable wind energy development in the province.

Wind turbines and health

In 2011, development in Ontario faced a judicial review and Environmental Review Tribunal (ERT) related to the issue of perceived health effects. In the end, the ERT ruled to uphold the Renewable Energy Approval (REA) of the wind project in question, allowing the first project to be approved under the Green Energy Act to proceed as planned. In March 2011, the Ontario Superior Court of Justice ruled in favour of the provincial renewable energy framework, noting that standards were developed following public consultation and review of science-based evidence.

Outlook for 2012 and beyond

Clear and long-term policy objectives and stable policy frameworks are critical to making Canada a competitive destination for wind energy investment. The national WindVision 2025 strategy, along with the regional WindVision targets proposed for Quebec and now British Columbia, are part of the industry's attempt to kick start discussion on what Canada's long-term wind energy future could look like. 2012 is expected to be another record year with approximately 1,500 MW of new developments to come online in Quebec, Ontario, Alberta, British Columbia, Prince Edward Island and Nova Scotia. With similar or higher levels of growth expected over the next four years, Canada's wind energy industry will surpass 10,000 MW of total installed capacity by 2015 – keeping the country on track to meet the national WindVision target of supplying 20 per cent of Canada's electricity needs by 2025.

With input from the Canadian Wind Energy Association (CanWEA)

1 The Green Energy Act (GEA) changes the way that renewable energy projects are approved in Ontario. The GEA provides a Province-led, coordinated approvals framework for renewable energy projects, with clear rules and transparent decision-making. The Green Energy Act facilitates the development of a green energy economy and enables consumers to benefit from green energy at the lowest cost.
2 CanWEA: WindVision 2025 – A strategy for British Columbia, 2011. http://www.canwea.ca/pdf/canwea-bc-windvision-web-e.pdf
3 CanWEA: An Introduction to Wind Energy Development in Canada, 2011. http://www.canwea.ca/pdf/canwea-sitingreport-e.pdf
4 CanWEA: Best Practices for Community Engagement and Public Consultation, 2011. http://www.canwea.ca/pdf/canwea-communityengagement-report-e-final-web.pdf
5 ClearSky Advisors: The Economic Impacts of the Wind Energy Sector in Ontario 2011-2018, 2011.
6 CanWEA: Economic Benefits of the Wind Energy Sector in Quebec (Full report available in French only). http://www.canwea.ca/pdf/economic_benefits_qc_full_fr.pdf
7 http://friendsofwind.ca/

Chile

Canela Eco wind farm, Chile © *Endesa*

Unlike many of its South American neighbours, Chile has limited indigenous fossil energy resources, and relies heavily on imports, the disruption of which has led to periodic energy shortages over the past decade. Chile is also vulnerable to long dry spells during the summer months. As a result, energy prices in Chile have nearly tripled in the last five years. Fortunately, Chile is blessed with abundant renewable energy resources, including wind, solar and geothermal, but to date they represent less than 1% of the energy mix.

Currently about 65% of Chile's electricity is generated in thermal plants burning imported fossil fuels, mostly natural gas and coal, while 34% is generated from domestic hydro-power. It is expected that in the coming decade, the country's power consumption will increase by 6-8% per year.

New legislation is currently under preparation, called "Law 20/20", which sets a target of 20% renewable electricity by 2020. If approved, it would establish a 4.5 GW market for renewables, including 2 GW for wind energy, over the next nine years.

Chile has good wind resources from the northern deserts to the extreme south, including the south-central zone which is home to around 80% of the country's population and two thirds of its industry. Chile's wind energy potential is estimated at more than 40 GW.

Chile's electricity system

Energy policy in Chile is founded on the principles of free market competition between private companies, the regulation of natural monopolies and the limited role of the state. The electricity industry consists of about 40 generation companies, 10 transmission companies and 30 distributors. The electricity system in Chile is divided into four interconnected grids: the Northern Interconnected System (SING), the Central Interconnected System (SIC), the electricity system of Aysén, and the electricity system of Magallanes.

Main market developments in 2011

Chile's renewable energy portfolio grew considerably in 2011 and more than 5,000 MW of renewable energy projects are currently under development. Wind projects account for more than 3.000 MW, including both installed capacity as well as projects under development. Although the market is moving, there are still major obstacles to the construction and implementation of these projects, and actual installed capacity for renewables is only about 600 MW.

Renewable energy development in Chile in 2011

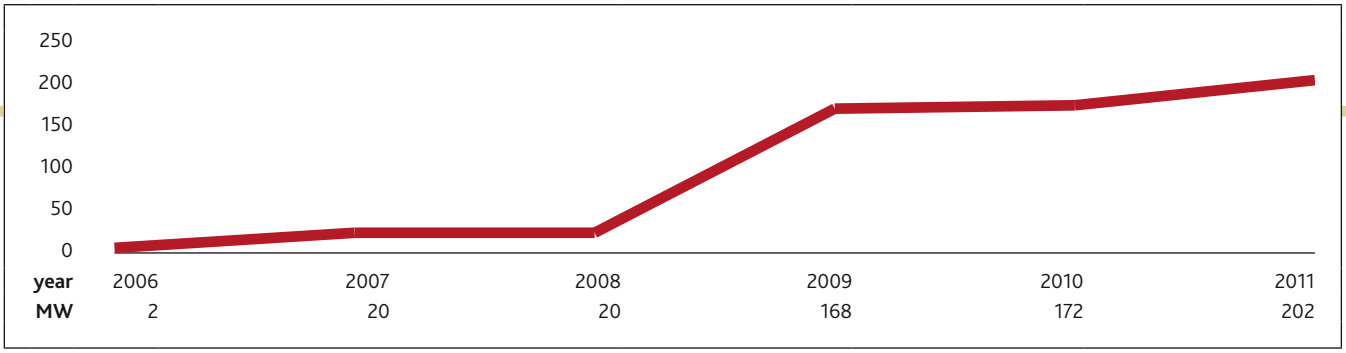
Technology	Installed Capacity (MW)			
	Built	Under Construction	With EIA[1]	In progress (EIA)
Wind	202	220	1,628	1,103
Solar	0	0	435	93
Biomass	219	0	286	35
Geothermal	0	0	0	50
Mini Hydro	228	0	87	204
Total	**649.27**	**220**	**2,436.2**	**1,484.2**

In terms of installed capacity, wind power represents about 30% of the total installed capacity of renewables. In 2011, 33 MW of new wind capacity became operational, including new projects and the expansion of existing ones: the Monte Redondo II wind farm (10 MW) and the Punta Colorada wind farm (20 MW) are both new, and the Lebu self-supply wind farm was expanded by 3 MW in 2011. Overall, this represents nearly 20% growth compared to 2010 figures, bringing the cumulative installed wind capacity to 202 MW.

The leading players in the Chilean renewables market are Vestas, Seawind Engineering and Enel Green Power.

According to a study carried out by Mainstream Renewable Power, Chile's wind potential is 44 GW. The areas with the greatest potential have been identified by the Ministry of Energy and the Department of Geophysics at the University of Chile in Santiago, who have created a 'Wind & Solar Explorer'[2], providing information on wind velocity across the country.

Total installed capacity



Source: GWEC

Wind power projects in Chile in 2011

Wind farm	Region	MW	Number of turbines	Potential	Manufacturer	Developer	Year
Alto Baguales	XI	1.98	3	0.66	Vestas, V47	Empresa Eléctrica de Aysen (Edelaysen)	2001
Canela	IV	18.15	11	1.65	Vestas, V-82	Endesa	2007
Parque Eólico Lebu	VIII	3.54	5	0.6 (2) - 0.780 (3)	Bonus & HEAG	Cristalerías Toro	2009
Canela II	IV	60	40	1.5	40 ACCIONA AW 82/1500	Endesa	2009
Monte Redondo I	IV	38	19	2	Vestas, V-90	Suez Energy Andino	2009
Totoral	IV	46	23	2	Vestas, V-90	Norvind, SN Power	2009
Cabo Negro	XII	2.55	3	0.85	Vestas V-52	Methanex	2010
El Toqui	XI	1.5	6	0.275	Vergnet	Seawind	2010
Ampliación Parque Eólico Lebu	VIII	3	2	1.5	HEAG	Cristalerías Toro	2011
Monte Redondo II	IV	10	5	2	Vestas, V-90	Suez Energy Andino	2011
Punta Colorada	IV	20	10	2	Dewind D8.2	Barrick Chile Generation SA	2011

The policy framework for wind energy

Chile does not have a specific policy to encourage wind power development. In 2008, the Renewable energy law (law 20.257) came into force, which obliges power companies who sell directly to final customers, to source 5% of their power from renewable energy. This percentage will increase gradually to 10% by 2024, and non-compliance will lead to penalties. The Chilean Association for Renewable Energy (ACERA) and others have proposed a number of amendments to the Renewables law, including increasing the quota of renewables to 20% by 2020 and the introduction of a tendering system, which would guarantee a fixed price for 12 years for all renewables.

The amendments have already been approved by the Chilean Senate and are likely to be passed by the Chamber of Deputies in March 2012. If everything goes to plan, Chile will have a new renewables law in place in 2012, opening a 2GW wind energy market for the country over the next 9 years, adding an average of 200 MW of new capacity annually.

Obstacles to wind energy development

Wind energy has proven to be a competitive technology, being the most developed renewable energy technology in Chile. Leading players worldwide are expanding their activities in the Chilean wind market. The main barrier for wind development is the difficulty to secure financing for projects. Due to the lack of a support system with fixed prices, banks are not willing to take the risk.

Outlook for 2012 and beyond

A number of new wind projects, accounting for 256.8 MW, are expected to be constructed in the course of 2012.

Wind energy projects expected for 2012

Project	MW
Parque Eólico Talinay	99
Parque Eólico El Arrayán	100
Parque Eólico Chome	12
Parque Eólico Raki	9
Parque Eólico Negrete Cuel	36.8

With input from the Chilean Association for Renewable Energy (ACERA)

1 Environmental Impact Assessment is an important milestone for energy projects in Chile. The projects under the EIA are considered to have a better chance to be built, even if installations have not been scheduled for a specific year.
2 http://ernc.dgf.uchile.cl/Explorador/Eolico2/

PR China

Xiao Yan Kau Farm, Rudong, China © *Wind Power Works*

Main market developments in 2011

In 2011, China led the global market again by adding 17,630.9 MW of new wind capacity, and cemented its place as the leading wind market with a total of 62,364.2 MW installed as of the end of the year.

Thirteen Chinese provinces have passed the 1 GW milestone, including the top ten (see table) followed by Shan Xi (1,881.1MW), Guangdong (1,302.4MW) and FuJian (1,025.7MW). Inner Mongolia has the highest wind capacity with a total of 17.6 GW at the end of 2011.

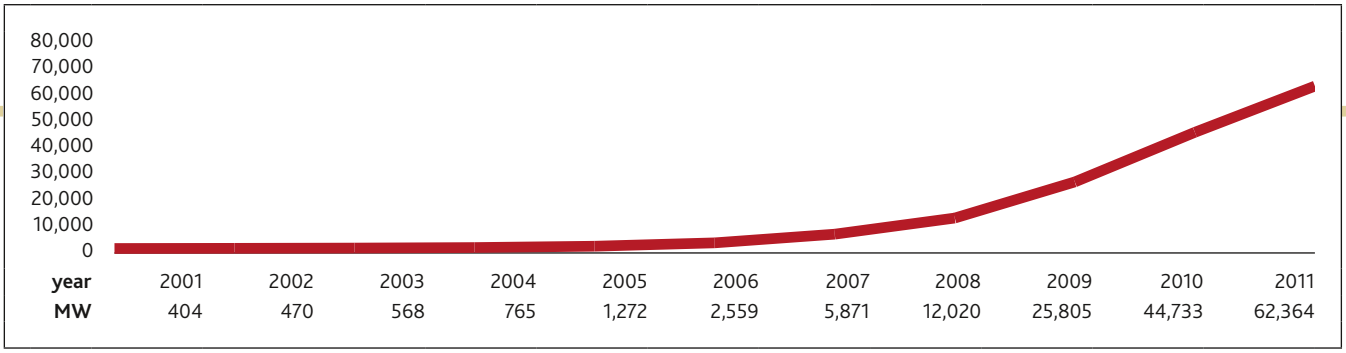
China has one of the largest power systems in the world, with a total installed capacity of about 1,060 GW by the end of 2011; and total power generation was about 4,600 TWh, with wind representing a bit more than 1.5% of the total electricity supply.

Chinese turbine manufacturers continue rise up the list of top global manufacturers, with Sinovel, Goldwind, United Power and Mingyang all in the top 10 in 2011.

Top 10 wind power provinces in China

		2010 Cumulative (MW)	2011 Annual (MW)	2011 Cumulative (MW)
1	Inner Mongolia	13,858.0	3,736.4	17,594.4
2	He Bei	4,794.0	2,175.5	6,969.5
3	Gansu	4,944.0	465.2	5,409.2
4	Liao Ning	4,066.9	1,182.5	5,249.3
5	Shan Dong	2,637.8	1,924.5	4,562.3
6	Ji Lin	2,940.9	622.5	3,563.4
7	Hei Longjiang	2,370.1	1,075.8	3,445.8
8	Ning Xia	1,182.7	1,703.5	2,886.2
9	Xin Jiang	1,363.6	952.5	2,316.1
10	Jiang Su	1,595.3	372.3	1,967.6

Total installed capacity



year	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
MW	404	470	568	765	1,272	2,559	5,871	12,020	25,805	44,733	62,364

Source: GWEC

Technically exploitable potential of onshore wind resources (GW)

Height above the ground	Grade 4 or higher (wind power density ≥400w/m²)	Grade 3 or higher (wind power density ≥300w/m²)	Grade 2 or higher (wind power density ≥200w/m²)
50 m	800	2,000	2,900
70 m	1,000	2,600	3,600
100 m	1,500	3,400	4,000

Source: ERI & IEA : China Wind Energy Development Roadmap 2050, 2010.

Wind energy potential in China

China has abundant exploitable wind resources both onshore and offshore due to its large land area and long coastline. The 4th National Wind Resource Investigation, using data from 400 wind masts refined with computer simulations, gives the results summarised in the table above. China's commercial onshore potential is between 1,000 and 4,000 GW; and the offshore potential in waters from 5-50m deep is another 500 GW.

The policy framework for wind energy

2011 was the first year of the twelfth Five-Year plan (2011-2015), and early in 2011, the National Energy Administration (NEA) released the 12th Five-Year plan for renewable energy. This includes a target of 100 GW of wind by 2015, consisting of 70 GW from the large Wind Base programme, 30 GW from smaller projects, and an additional 5 GW from offshore wind.

Shortly afterwards, there were a series of incidents involving the interface between some of the wind base projects and the transmission system where large numbers of turbines tripped off the grid. While most of the turbines had LVRT (low voltage ride through technology) capability, some did not, which led to the usual three way finger pointing between the grid operator (State Grid), the project developers and the manufacturers; with the manufacturers ending up with most of the blame, as most of them are smaller companies than either the large utilities or State Grid. More importantly, the incidents highlighted the fact that more careful planning and coordination among the various parties is required when developing such massive projects. However the blame is apportioned, it emerged clearly that integrating such massive quantities of wind power into the grid in such a short period of time needs more careful planning and exacting standards than have been applied in the Chinese wind industry's 'rush to scale' over the past five years or so.

A positive result of this episode was the introduction of a grid code, along with 17 other technical standards for the industry. The vast majority of manufacturers now equip their turbines with the LVRT function; but henceforth LVRT is a requirement, along with other measures to ensure smooth grid integration, effective as of 1 June 2012.

The NEA subsequently put the wind base projects on temporary hold; and by the middle of the year, the NEA launched two important new initiatives, marking some significant changes for the wind sector.

New regulations to improve quality and solve transmission bottlenecks

The first new initiative introduced was the "Wind Farm Development and Management Interim Rules and Regulations". Among other things, the regulations state that wind farms cannot start construction before the approval process is completely finished, or the project will not be granted the

Nan'ao, Guangdong, China © *Greenpeace*

feed-in tariff and grid access. In addition, all the wind farms are now required to have a formal evaluation one year after beginning operation, and all performance data needs to be reported. The objective is to have more control over the quality of the projects, rather than merely encouraging quantity.

This regulation was soon followed by the publication of the "Safety Management of Wind Farms: Rules and Regulations", which establishes rules for safety management of wind farms and the establishment of reporting and monitoring systems for wind farms' operations.

The second policy of great importance put forward by the NEA was to encourage the development of wind farms in lower wind speed regions closer to load centers. Since 2008, the emphasis has been on the wind base mega-projects, which are located primarily in remote regions and need major transmission upgrades to transport the power to load centers. The NEA and State Grid are working to solve the transmission bottlenecks and other grid issues. In the meantime, however, the NEA is actively encouraging wind farm development in lower wind zones closer to the load centers, which will have the added benefit of encouraging manufacturers to develop more sophisticated machines with longer blades and taller towers to extract the maximum energy from lower speed winds.

Progress on offshore

China installed another 107.9 MW of offshore wind in 2011, bringing its total to 258.4 MW, third in the world after the UK and Denmark. The main project in 2011 was the first 99.3 MW of the Jiangsu Rudong demonstration project, which will eventually reach 150 MW. China has an ambitious target for offshore development of 5 GW by 2015, and 30 GW by 2020. According to the policy, China's offshore development should follow the concession tender model, in which both developers and tariffs are determined by a tender. The second round of offshore concession tendering of 2,000 MW was supposed to take place take place in 2011, but has been postponed until 2012, primarily as a result of planning and siting difficulties faced by the projects tendered in the first round in 2010.

These delays have not completely stopped offshore development, however. Smaller 'demonstration' projects are being approved and built, initially in the range of 20-30 MW, but last year the Jiangsu Rudong 150 MW project was developed as a 'demonstration project', enjoying more favorable tariffs than those received in the first round of tenders, while at the same time building the offshore industry's knowledge and experience. For more details on China's offshore development, see the chapter dedicated to Global Offshore.

The grid challenge

The grid remains the most serious challenge to wind development in China. One of the problems in past was that the local grid infrastructure did not expanded quickly enough, causing connection delays, although that is improving. At the same time, there is now the new policy which requires approval of

Nan'ao, Guangdong, China © *Greenpeace/Xuan Canxiong*

wind farms from a central planning perspective and hence coordination of local grid build out.

However, 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. There is no public data available to show how much of the wind is lost in the curtailment, but all major wind operators report severe problems with this. There are new HVDC lines planned, but they are developing slower than planned. Basically, the large penetration of wind in certain regions requires the grid system and grid operator to be flexible and smart, but the current grid system is neither. The fact that the grid companies are the biggest monopolies in China makes discussion of improving grid services difficult.

Outlook for 2012 and beyond

The days when China's wind capacity doubles every year is past, and the industry is now on a more stable path. We can expect installations to remain at about current level for a few years, depending on the grid's ability to accommodate increasing quantities of wind. The government's goal of 150 GW target by 2020 can be easily met, and 200 GW or more by 2020 is very achievable if the grid issue is tackled effectively.

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

European Union

During 2011, 10,281 MW of wind power was installed across Europe, with European Union countries accounting for 9,616 MW of the total, very similar to the 9,648 MW installed in 2010. Investment in EU wind farms in 2011 was €12.6 billion (USD 16.89 billion), with onshore sector attracting €10.2 billion (USD 13.59 billion) and the offshore attracting €2.4 billion (USD 3.19 billion).

Of the 10,281 MW installed in Europe, 9,415 MW were installed onshore and 866 MW offshore. This means that in 2011, the offshore market decreased slightly (1.9%) compared to 2010, yet considerable preparatory work was carried out on new offshore projects and numerous financing deals were concluded, suggesting solid future growth.

In terms of annual installations, Germany was by far the largest market in 2011, installing 2,086 MW of new capacity. The UK came in second with 1,293 MW including 752 MW of offshore capacity, followed by Spain (1,050 MW), Italy (950 MW), France (830 MW), Sweden (763 MW) and Romania (520 MW).

Among the Central and Eastern European emerging markets, Poland was second after Romania, installing 436 MW. Both countries remain among the ten largest European markets for the second year running.

The total wind power capacity installed in the EU by the end of 2011 will, in a normal wind year, produce 204 TWh of electricity, enough to meet 6.3% of overall EU electricity consumption (up from 5.3% in 2010).

2011 was a record year for new power generation installations in the EU, with 44.9 GW of new capacity added to the grid, a 3.9% increase compared to 2010. Wind power accounted for 21.4% of the new installations, the third largest share after solar PV (46.7%) and gas (21.6%). New coal installations represented only 4.8% of added capacity, fuel oil 1.6%, large hydro 1.3% and CSP 1.1%. Nuclear, biomass, waste, geothermal and ocean technologies each represented less than 1% of new installations.

Meanwhile, 6.3 GW of nuclear capacity was decommissioned and over 1 GW of fuel oil capacity was taken offline in 2011. Simultaneously, more renewable generating capacity was installed in the EU than ever before, with 32.1 GW of new generating capacity, renewables representing 71.3% of all new installations. It is the fourth year running that renewables have represented more than 50% of all new installed capacity.

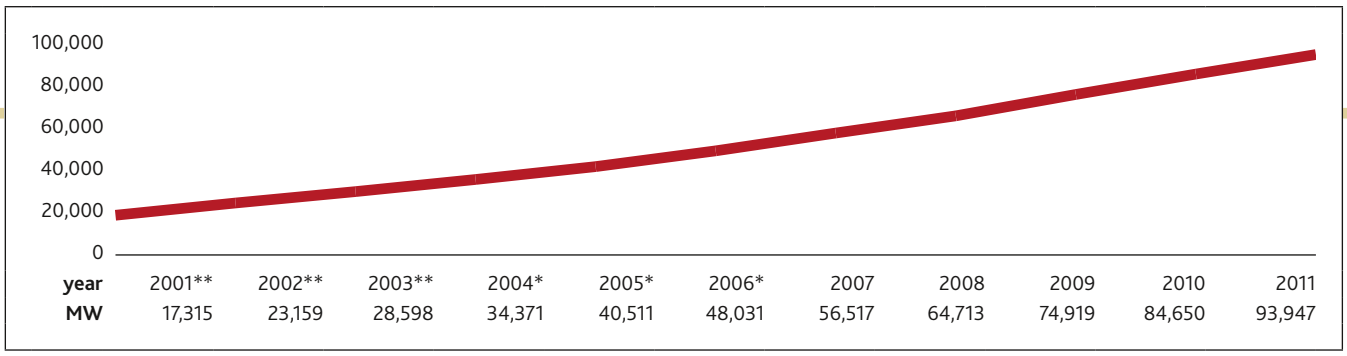
Maranchón wind farm, Guadalajara, Spain © *Wind Power Works*

Since 2000, a total of 302.6 GW of new power capacity was installed in the EU, of which 28.2% was wind power, 47.8% renewables, and 90.8% combined renewables and gas.

EU 2010 targets met

The EU achieved the 21% target set in the 2001 EU directive 77/2002/EC for the end of 2010 by generating between 665-673 TWh from renewable resources, or 21% of total consumption of 3,115-3,175 TWh in 2010. Even more impressive is the fact that, if renewable electricity production in the EU continues to grow at the same rate as it did from 2005 to

Total installed capacity



year	2001**	2002**	2003**	2004*	2005*	2006*	2007	2008	2009	2010	2011
MW	17,315	23,159	28,598	34,371	40,511	48,031	56,517	64,713	74,919	84,650	93,947

***EU 15 *EU 25*

Source: GWEC

2010, it would reach 36.4% in 2020 and 51.6% of electricity consumption in the EU in 2030.

New policy developments

In autumn 2011, the European Commission published a proposal for legislation for the EU's "Multi-annual Financial Framework" for 2014-2020. The draft legislation includes a proposal for an increased budget for EU research, "Horizon 2020[1]", with 7 billion euros (USD 9.33 billion) earmarked for energy research. The European Parliament, jointly with the Council of Ministers, is expected to adopt the legislation by the end of 2013.

A further € 9.1 billion (USD 12.13 billion) is anticipated for projects related to energy grids and for promoting the streamlining of permit and grant procedures for electricity infrastructure under the European Commission's "European Infrastructure Package". The package also includes revised guidelines for trans-European energy infrastructure.

In December 2011, the European Commission also presented its Energy Roadmap 2050[2], which models pathways aiming at delivering the EU's decarbonisation objective with 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.

The Roadmap is not legally binding but a debate on the renewable energy targets for 2030 and a trajectory for implementation has been launched, which is anticipated to be approved before the current Commission's mandate ends in 2014.

EU offshore

In 2011, 235 new offshore wind turbines, in nine wind farms, were fully grid connected totalling 866,4 MW, and bringing European cumulative offshore capacity to 3,813 MW with 1,371 turbines in 53 wind farms spread across ten European countries.

For more details on the EU offshore market, see the chapter dedicated to Global Offshore.

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

France

The French government has set a target of 25 GW of wind power, including 6 GW offshore, as part of its obligation under the EU Renewables Directive, which requires France to meet 23% of final energy demand with renewable sources by 2020. 25 GW of wind energy would produce 55 TWh every year, thereby accounting for 10% of the country's total electricity consumption. France has the second largest wind potential in Europe, and the wind resource is well distributed across the country.

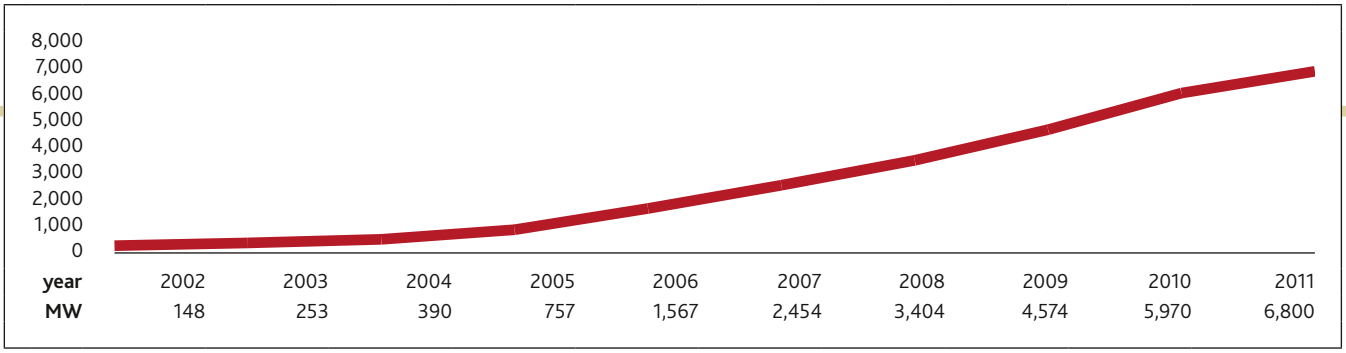
In 2011, 830 MW of new wind power was connected to the French electricity grid, making a total installed capacity of 6,800 MW, with 4000 operating wind turbines spread across the country. Overall, wind power now produces 2.5% of France's electricity demand, yet on 7 December 2011, this share reached 7% (5,350 MW). However, the current pace shows a slowdown in installations, which should be at least 1,300 MW per year to meet the 2020 targets.

Main market developments in 2011

In July 2011, the French government launched a first call for tender for 3 GW of offshore wind development in five zones in the Atlantic, the North Sea and the Channel. The call was closed on 12 January 2012. The winning tenders will be announced in April 2012, selected according to the following criteria: price of the electricity delivered (40%), industrial development (40%) and environmental performance (20%). It is expected that this call will result in the creation of

Hétomesnil wind farm, Picardie, France © *Wind Power Works*

Total installed capacity



year	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
MW	148	253	390	757	1,567	2,454	3,404	4,574	5,970	6,800

Source: GWEC

10,000 new jobs and new wind power development from 2018 onwards.

The key players who responded to the call are: EDF-EN with Alstom; GDF-Suez with Areva, Siemens and Iberdrola; and Eole-Res with Areva and Technip. Both Areva and Alstom announced the opening of factories in Saint-Nazaire and Cherbourg for Alstom and in le Havre for Areva. The selection of the winning tenders is expected to be made in April 2012, right before the presidential elections.

Three main turbine manufacturers dominate the onshore market in France: Enercon, Vestas and Repower, with a total share of more than 70%, continuing the trend observed in 2010.

The policy framework for wind energy

A feed-in tariff was introduced in France in 2001. This was revised in 2006 and reconfirmed in 2008. The level of the tariff is EUR 8.2 cent/kWh (USD 10.84 cent) for onshore installations and EUR 13 cent/kWh (USD 17.19 cent) for offshore installations for the first ten years of operation, and then adjusted for the following ten years depending on the actual wind conditions and corresponding turbine performance. The level of the tariff is revised each year taking into account general economic conditions.

As part of its new environmental law, *Grenelle 2*, France set a goal that 23% of the country's energy use must come from a mix of renewable energy sources by 2020. For the wind energy sector this means a target of 25 GW. In August 2011, a new regulation was introduced, according to which wind turbines are subject to a specific procedure, usually applied to industrial installations, assessing environmental risks starting from the construction phase until the end of operation. This adds yet another regulatory layer on what is already a complex and time-consuming consent process.

Moreover, by the end of June 2012, each region will have to define a regional wind power development scheme which includes objectives and a definition of 'favourable zones' for wind power development. This means that in the future, it will only be possible to install turbines in areas designated in the regional wind power plans. This adds to the already existing procedure of "ZDE" (areas for the development of wind power), which defines the only zones where projects can benefit from the feed-in tariff. On top of that, each new production unit must consist of a minimum of five wind turbines in order to benefit from the feed-in tariff, which reduces the possibilities for wind farm development in certain areas where the development of small wind farms is more suitable for local conditions.

As a result, four administrative steps will need to be completed before starting a new project, making the development phase longer.

Challenges to wind energy development

The constant changes in the legislative framework and regulations bring uncertainty and complexity to wind energy development in France, slowing down the market and threatening the achievement of the 2020 targets set for wind power.

Outlook for 2012 and beyond

A second call for tender for offshore wind capacity is anticipated for the spring of 2012. There is no certainty about the scale of onshore wind development in 2012 yet, but the recent regulatory changes, along with the lack of grid capacity in certain regions are likely to slow down the pace. Also, the real impact of the economic crisis for financing wind projects still remains to be seen.

With input from Syndicat des Energies Renouvelables (SER), France

Germany

Main market developments

In 2011, the German wind market recovered from the financial and economic crisis of 2010. Germany maintained its position as the European leader in wind energy with 29,060 MW of installed capacity and 22,297 operating wind turbines. In 2011, a total capacity of 2,085 was added, including 238 MW in repowering and 108 MW offshore. Onshore turbines with an installed capacity of 123 MW were decommissioned in 2011. Compared to 2010, the annual German wind market grew by 30%.

Wind energy generated 48 TWh of electricity in 2011, which accounted for 7.8% of the country's net electricity consumption. In total, 20% of electricity was generated from renewable sources in Germany in 2011, with wind being the single largest contributor.

The average size of newly installed turbines in 2011 was 2.1 MW. The leading manufacturers of these new onshore installations were Enercon (59.5%), Vestas (21%), REpower Systems (9.7%) and Nordex (3.9%). Offshore projects using Siemens and Bard turbines which were constructed in 2010 were fully commissioned in 2011.

Heuchelheim, Germany © *Enercon*

In terms of wind power deployment, Lower Saxony is the leading German federal state with 7,039 MW of wind power capacity. A number of states now generate more than 40% of their electricity from wind energy: Saxony-Anhalt (48.11%), Brandenburg (47.65%), and Schleswig-Holstein (46.46%).

The policy environment

In the summer of 2011, the German parliament voted in favour of fully phasing out nuclear energy by 2022. 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.

The 2012 amendment to the Renewable Energy Sources Act (EEG)

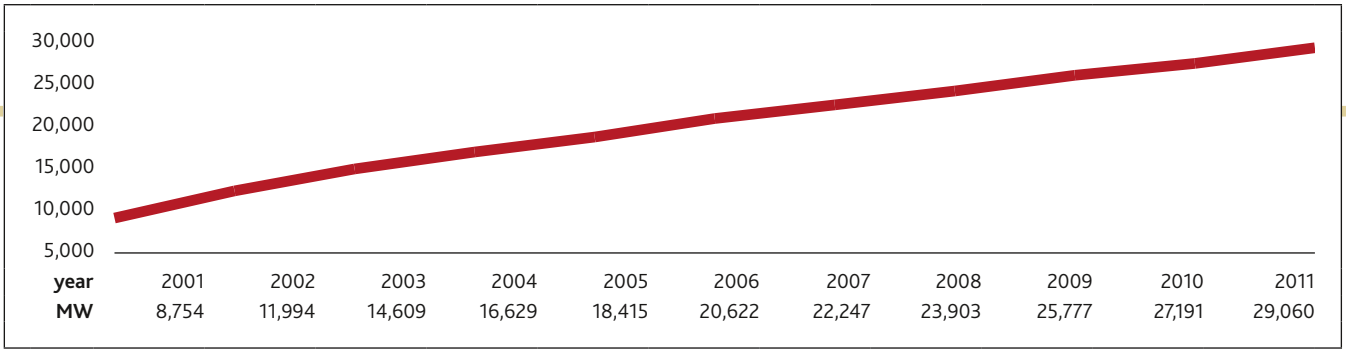
The amended EEG[2], which entered into force on 1 January 2012, continues to provide stable support for onshore wind power and has improved support conditions for offshore wind power; it is expected to support further growth in the German wind sector in the future.

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 8.93 cent/kWh (USD 11.75 cent). The basic tariff stays at EUR 4.87 cent/kWh (USD 6.40 cent). In addition, a system services bonus for turbines with advanced technological capacities was set at EUR 0.48 cent/kWh (USD 0.63 cent) and a repowering bonus of EUR 0.5 cent/kWh (USD 0.65 cent) is paid when replacing old turbines with new ones. In 2012, the annual digression rate for new onshore wind turbines was increased from 1% to 1.5%.

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). By February 2012, more than 18,000 MW of renewable capacity including over 16,500 MW of wind capacity had already opted for the feed-in-premium.

Total installed capacity



year	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
MW	8,754	11,994	14,609	16,629	18,415	20,622	22,247	23,903	25,777	27,191	29,060

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 also restarted the commissioning of new sites. In Brandenburg, for example, a 50% increase in designated sites was announced for new projects with a target to reach a wind capacity of 7,500 MW by 2020. Schleswig-Holstein declared that wind power will be the leading energy source of the state with 4,000 MW of installed capacity by 2020. Lower Saxony has also set an ambitious target of 50% of the electricity consumption in the state from wind energy by 2012 and over 100% 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 larger role in Germany in the future, and it is estimated to have the potential to double the amount of onshore wind capacity and to triple the energy yield in Germany with significantly fewer turbines deployed.

Obstacles to wind power development

In many regions, height restrictions inhibit the installation of turbines yielding the maximum amount of energy. In 2010, the government and some states started rethinking their framework conditions to allow for continuous onshore development and have entered into discussions with local and regional planning authorities at a broader level.

Another challenge for expanding renewable energy is system optimisation and speedy grid expansion, which includes underground cabling in critical areas. In the meantime, it will be important to improve the overall grid transport capacity in Germany through soft measures such as temperature monitoring of overhead lines, 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 200.30 MW in 2011, and a further 2,000 MW are under construction, although only 200 MW of new offshore capacity are expected to be installed in 2012. More details on Germany's offshore plans can be found in the chapter dedicated to Global Offshore.

Outlook for 2012 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, such as general distance regulations and height limits. This is primarily a political issue, yet both the national and federal state level targets for renewable electricity require a growing contribution from wind energy in Germany.

In 2012, the German wind industry expects new installations of about 2,200 MW including 200 MW of offshore wind. Offshore projects are expected to gain larger shares of annual capacity growth 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 Federal Ministry for the Environment, Nature Conservation and Nuclear Safety: The path to the energy of the future - reliable, affordable and environmentally sound, June 2011. http://www.bmu.de/english/energy_efficiency/doc/47609.php
2 For more information on the EEG and the text of the law in different languages please visit: http://www.eeg-aktuell.de/ and http://www.erneuerbare-energien.de/inhalt/47585/ (EEG in English).
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

Horns Rev II, North Sea, Denmark © *Wind Power Works*

The state of play of the global offshore market

Although offshore wind is often the most talked about part of the wind sector, today it represents less than 2% of global installed capacity. 2011 installations of about 1,000 MW represented ~2.5% of the annual market. By 2020, even the most optimistic projections show offshore wind as no more than 10% of global installed capacity.

So why all the fuss? Because offshore is a relatively new technology, with significant opportunities for cost reduction, technical innovations and indeed, 'revolutionary' developments which change the face of renewables in some parts of the world; because the wind resource offshore is generally much greater; and because it is particularly suitable for large scale development near the major demand centers represented by the major port cities of the world, avoiding the need for long transmission lines to get the power to very large concentrations of demand, as is so often the case onshore. Finally, offshore makes sense in very densely populated coastal regions with high property values, where there are real constraints for onshore development.

More than 90% of the world's offshore wind power is currently installed off northern Europe, in the North, Baltic and Irish Seas, and the English Channel. Most of the rest is in two 'demonstration' projects off China's east coast. Offshore wind is an essential component of Europe's binding target to source 20% of final energy consumption from renewables, and China has set itself a target of 30 GW of installations off its coast by 2020. It's an exciting new technology and a new business, and governments and companies in Japan, Korea, the United States, Canada and even India have shown great enthusiasm. We'll have a much better picture of offshore wind's long term prospects outside of northern Europe and China by 2020, and we'll see how many of these ambitious plans become reality.

EU offshore

A total of 866.4 MW consisting of 235 turbines in nine wind farms were fully grid connected in 2011, bringing European cumulative offshore capacity to 3,813 MW. 87% of the new additions (752 MW) were in UK waters, Germany installed 108 MW, followed by Denmark (3.6 MW), and a full scale 2 MW floating prototype in Portugal. Two further down-scaled floating prototypes were tested in Norway and Sweden.

The UK (2,094 MW) and Denmark (857 MW) remain the two biggest markets for offshore wind in Europe, followed by the Netherlands (247 MW), Germany (200 MW), Belgium (195 MW), Sweden (164 MW), Finland (26 MW) and Ireland (25 MW). Norway and Portugal each have a full-scale floating turbine.

Currently, almost 6 GW[1] of offshore wind capacity is under construction in Europe, 17 GW has been consented, and there are plans for a further 114 GW. It is expected that during this decade, offshore wind power capacity in Europe will grow tenfold. The European Wind Energy Association (EWEA) estimates that by 2020, 40 GW of offshore wind power will produce 148 TWh annually, meeting over 4% of the EU's total electricity demand and avoiding 87 million tonnes of CO^2 emissions.

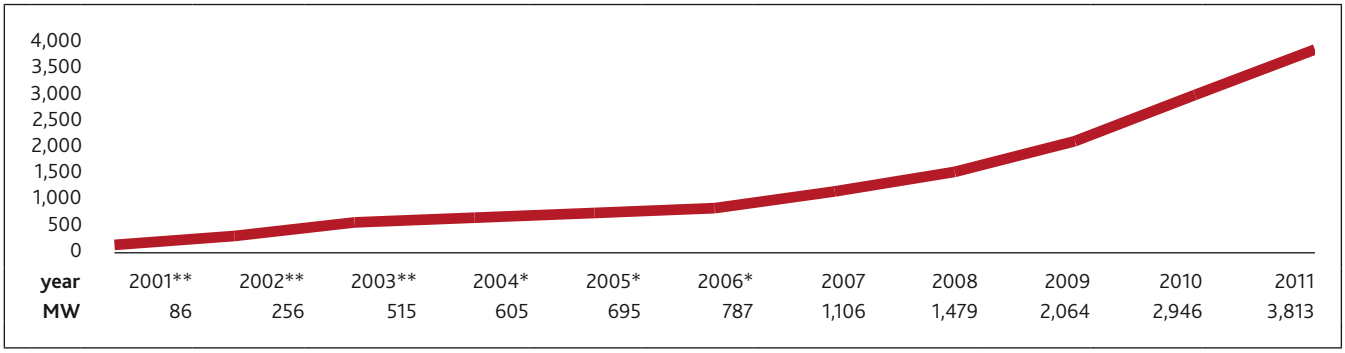
Industry and technology

Siemens supplied the majority of the 2011 offshore wind market, accounting for nearly 693 MW of grid connected capacity, followed by Repower (111.7 MW) and BARD (60 MW). Vestas connected a 2 MW floating turbine in Portugal. In terms of cumulative installed offshore capacity Siemens (53%) and Vestas (36%) have the largest shares in the European market, followed by Repower (5%).

The vast majority (around 80%) of installed offshore capacity was developed and is owned by utilities. DONG, Vattenfall

1 SEE EWEA's offshore wind stats at http://www.ewea.org/fileadmin/ewea_documents/documents/publications/statistics/EWEA_stats_offshore_2011_02.pdf

EU Offshore Total Cumulative Installed Capacity



year	2001**	2002**	2003**	2004*	2005*	2006*	2007	2008	2009	2010	2011
MW	86	256	515	605	695	787	1,106	1,479	2,064	2,946	3,813

***EU 15 *EU 25*

Source: GWEC

and E.On together have around 53% of the market. The Belgian Belwind consortium remains the largest independent offshore developer in Europe. The first phase of their Bligh Bank project was successfully completed in 2010, and the second phase is under construction.

UK maintains its position as the world leader

At the end of 2011, the UK's offshore wind power totalled more than 2,000 MW, cementing its world leadership in offshore wind. The UK is expected to install a total of 8 GW by 2016, and a further 10 GW by 2020. In fact, the UK already gets close to 2% of its net electricity consumption from offshore wind, and this share is set to grow to between 17% and 20% in ten years' time.

According to a study by Cambridge Econometrics, in 2011, the UK offshore wind industry employed around 3,100 people, with the potential to create 47,000 direct and indirect jobs by 2020. In terms of offshore policy developments in 2011, the UK government published in the Renewable Energy Roadmap which sets out the plan to reach the UK's target of 15% energy from renewables by 2020, including 18 GW for offshore wind.

Strong growth continues in Denmark

Offshore development in Denmark continues to be driven by a tendering system, with the government pre-screening, evaluating and selecting sites for the tender. The bidders compete for the rights to build on pre-selected sites, where a pre-screening for environmental impact assessment (EIA) has already been performed and where the Transmission System Operator (TSO) is obliged to deliver the offshore grid connection to the wind farm. The bidder asking for the lowest Contract-for-difference for the first 50,000 full-load hours wins. This system has proven very effective in the Danish context, delivering offshore wind at considerably lower prices than in any other country in Europe, and with relatively short construction periods.

Operational, under construction & planned offshore wind farms in Denmark:

Wind farms in operation		No of turbines	MW	Year
1	Vindeby	11	5	1991
2	Tunø Knob	10	5	1995
3	Middelgrunden	20	40	2000
4	Horns Reef I	80	160	2002
5	Rønland	8	17	2003
6	Nysted	72	165	2003
7	Samsø	10	23	2003
8	Frederikshavn	3	7	2003
9	Horns Reef II	91	209	2009
10	Avedøre Holme	3	10-13	2009/10
11	Sprogø	7	21	2009
12	Rødsand II	90	207	2010
Wind farms under construction				
13	Anholt	N/A	400	2012
14	Frederikshavn	6	N/A	N/A
Wind farms expected to be constructed prior to 2020				
15	Kriegers Flak		600	Prior to 2020
16	Horns Reef 3-5		600	Prior to 2020
17	various near shore		400	Prior to 2020

Source: DWIA

Burbo Bank, Liverpool Bay, UK © *Wind Power Works*

Obstacles for offshore development in Denmark
The major challenge for offshore wind is to continue to bring down the 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 technology has been able to drive them down. Further, financing costs are on the increase.

On the technology side, cost reductions continue to be achieved, and this is the main reason for confidence regarding offshore wind. The cost of energy from offshore wind will come down substantially as the industrialization of the next generation of offshore wind turbines begins to take place. In the next round of tenders for the Danish waters, it's expected that between 2010 and 2020, costs at comparable sites will be reduced by 50%.

8.5 GW of offshore under way in Germany

Offshore wind energy in Germany grew to 200.30 MW in 2011, and a further 2,000 MW are under construction, although only 200 MW of new capacity is expected to be installed in 2012. Most German offshore wind farms will be built 20-60 km from the coastline in waters 20-40 meters deep. To date, 25 projects have been licensed by the national maritime authority and the federal states, bringing the overall licensed capacity close to 8,500 MW.

The costs for connecting offshore wind farms to the mainland grid have been assumed by transmission system operators, and they have started to plan for connecting lines for clusters of offshore projects. 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, if the policy framework is not adapted in time to speed up the process and to secure the investments in the offshore grid.

Progress on offshore in China

At the end of 2011, the cumulative offshore installed capacity in China was 258.4 MW, ranking number three globally, after the UK (2,093.7 MW) and Denmark (857.3 MW). The biggest offshore project built in 2011 was the 150 MW demonstration project in Jiangsu Rudong, with 99.3 MW installed and connected by the end of the year. The other projects are small-scale demonstration projects, including the second phase of Shanghai Donghai Bridge project, with 8.6 MW installed in 2011, out of an eventual total of 65 MW.

China has an ambitious target for offshore development of 5 GW by 2015, and 30 GW by 2020. According to the policy, China's offshore development should follow the concession tender model, in which both developers and tariffs are determined by tender. The second round of offshore tenders, originally scheduled to take place in 2011 has been post-poned to 2012, and will seek to award about 2000 MW in total. The first round of concession tenders, completed in 2010, raised some serious challenges for offshore wind, as the

development of marine areas is much complicated than was foreseen.

The delay of the concession projects hasn't completely stopped offshore development. Smaller, 'demonstration' projects are being approved and built. In the beginning, these demonstration projects were quite small, consisting of a few turbines of a maximum of 20-30MW in total. But last year, the 150 MW Rudong project was approved as a demonstration project, thereby enjoying favourable tariffs, much higher than in the concession projects. These medium sized projects can play a positive role in gaining knowledge and experience in the offshore sector.

Floating offshore farms under way in Japan

The Japanese government has decided to support the development of offshore wind power. Currently, four large national projects have been approved. The budget for the first three projects will be several billion JPY each, and 12.5 billion JPY for the fourth project.

The first is an "Offshore wind power generation demonstration project" supported by NEDO (Organisation for New Energy and Industrial Technology Development). Two offshore wind turbines will be installed in the summer of 2012. The machines will be tested for reliable operation in severe weather conditions including typhoons, strong gusts and high turbulence. Mitsubishi Heavy Industry's 2.4 MW wind turbines will be installed in the Pacific Ocean 3 km offshore of Choshi, 100 km east of Tokyo. Japan Steel Works' 2 MW turbine will be installed in the Sea of Japan near Fukuoka City.

The second project, also supported by the NEDO, will test an innovative drive train with 80 meter long blades for large offshore wind turbines. The third project, "Floating offshore wind turbine demonstration" project is supported by the Japanese Ministry of the Environment. A Fuji Heavy Industries 2 MW wind turbine will be installed in 2012 on a spar buoy in the East China Sea, 1 km offshore of the Goto islands.

The last project, "Floating offshore wind farm demonstration" is supported by the Ministry of Economy, Trade and Industry, and foresees several floating offshore turbines with a total output of 15 MW, utilizing various types of floating substructures. They will be installed in the Pacific more than 20 km offshore from Fukushima over the course of the next 4 years. This project symbolizes the rehabilitation of Fukushima through new renewable energy.

Japan has the world's 6th largest Exclusive Economic Zone (EEZ) and the Japanese shipbuilding industry has high technical capabilities. Therefore, floating offshore wind power development is expected to significantly contribute to the domestic energy supply, creating a new industry in Japan.

Korea's offshore masterplan

The Korean government released a roadmap for offshore wind development in 2010, with the first priority a 2.5GW offshore wind farm project located in the West-South Sea.

In addition, a master plan identifying three stages for further offshore development was published by a specially designated task force. The first stage calls for eight domestic manufacturers to deliver a total of 15 prototype turbines totalling 80 MW to a test bed facility for testing and certification, which should be finalized by 2014; the second stage will consist of a 400MW demonstration project scheduled to be operational by 2016; and the final 2,000 MW the project will be carried tendered out from 2017-2019, and will be open to all bidders.

Global offshore 2011 and cumulative installed capacity

Country	2011 [MW]	Cumulative Total [MW]
Belgium	0	195.0
Denmark	3.6	857.28
Finland	0	26.3
Germany	108.3	200.3
Ireland	0	25.2
Netherlands	0	246.8
Norway	0	2.3
Portugal	2.0	2.0
Sweden	0	163.7
UK	752.4	2093.7
China	99.3	258.4
Japan	0	25.0
Total	**965.6**	**4,096**

India

Kutch, Gujarat, India © *Wind Power Works*

India had another record year of new wind energy installations during 2011, breaking the 3 GW barrier for the first time. It added 3,019 MW of new capacity to reach a total of 16,084 MW. As of January 2012, renewable energy accounted for 12.1% of total installed capacity, and about 6% of electricity generation, up from 2% in 1995. Wind power accounts for about 70% of this installed capacity.

India's economic policy is based on its Five Year Plans, and its fiscal year runs from April to March. The current 11th Five Year Plan runs from April 2007 to March 2012. During the first four years of the current plan period, 7,063 MW of wind had been installed by the end of March 2011. By March 2012, the total wind installations are expected to top 10,000 MW, surpassing the target of 9,000 MW set for the 11th plan period.

Main market developments in 2011

India introduced a Renewable Energy Certificate (REC[1]) market in 2011, adding to the list of available support mechanisms such as the accelerated depreciation tax benefit and the recently introduced Generation Based Incentive (a fixed premium per kWh[2]). The volumes traded in the REC market have steadily increased since trading started in February 2011. Trading takes place on the last Wednesday of each month, and 11 trades took place during the year. 850,424 non-solar RECs were issued by the REC Registry as of February 2012[3]. Wind made up approximately 45% of the accredited generation capacity.

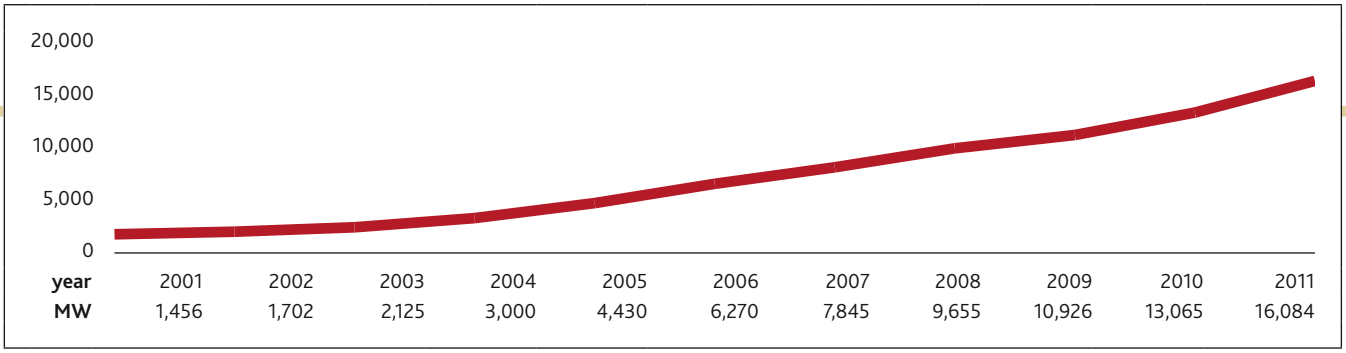
The bids for buying RECs increased from a level of 120 RECs in February 2011 to 285,272 RECs in December 2011. Against this demand, the number of RECs that came into the market increased from 150 RECs in March 2011 to 180,336 RECs in December 2011. The market clearing price for RECs ranged from between INR 1,500 (EUR 22.8/USD 29.8) to INR 3,900 (EUR 59.2/USD 77.7) per REC[4]. The increase in volumes suggests that more and more States are seeking to meet their prescribed Renewable Purchase Obligations. This augurs well for the wind power market in India.

Policy framework for wind energy

After the enactment of the Electricity Act (2003), the wind sector has registered a compound annual growth rate of about 28.8%. The central and state governments' policies have provided policy support for both foreign and local investment in renewable energy technologies. In 2011, India saw $10.3 billion (EUR 7.76 billion) invested in clean technology of which $4.6 billion (EUR 3.4 billion) was invested in wind energy. This accounted for 4% of the world's clean technology investments in 2011 [BNEF, 2012].

Currently, 13 of the 25 State Electricity Regulatory Commissions (SERCs) have issued feed-in tariffs for wind power. Almost all of the SERCs have also specified state-wide Renewable Purchase Obligations (RPOs). Both of these measures have helped to create long-term policy certainty

Total installed capacity



year	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
MW	1,456	1,702	2,125	3,000	4,430	6,270	7,845	9,655	10,926	13,065	16,084

Source: GWEC

and investor confidence, which have had a positive impact on the wind energy capacity additions in those states.

The report of the sub-group for wind power development appointed by the Ministry of New and Renewable Energy (MNRE) to develop the approach paper for the 12th Plan Period (April 2012 to March 2017) has fixed a reference target of 15,000 MW and an aspirational target of 25,000 MW for the next five year period. Importantly the report recommends the continuation of the Generation Based Incentive[5] scheme during the 12th Plan Period. The report has prioritised the issue of transmission which was a weak link in the value chain until now. This is being dealt with by a joint working group of the MNRE, the Ministry of Power, the Central Electricity Authority and the Power Grid Corporation of India.

Under the latest budget proposal of March 2012[6], the limit for tax-free bonds for the power sector has been doubled to INR10,000 crores [EUR 1.5 bn/ USD 2 bn]. The 80 percent accelerated depreciation tax benefit for wind projects is likely to continue till March 2013. The budget proposes an additional depreciation of 20 percent in the initial year to be extended to new assets acquired by power generation companies. These proposals come against the backdrop of severe conventional fuel shortage as well as financing issues hurting the power sector, which is expected to see a capacity addition of over 80,000 MW in the 12th Plan (2012-17).

Obstacles to wind energy development

Inadequate grid infrastructure is an increasing challenge. However the possibility of linking the southern regional grid with the national grid, which is currently scheduled for 2013-2014, will play an important role in fast-tracking the development of the REC market.

This inter-linkage of regional and national grids is important to enable the high wind states to continue to increase wind power penetration in the state grids without resorting to curtailment. One way to mobilise higher outlays of financial resources to create improved grid infrastructure could be to tap the National Clean Energy Fund[7] created by the Government in 2010. The Central Electricity Regulatory Commission is mandating scheduling and forecasting in the next plan period which will help raise the credibility of wind energy and will lead to a shift in its status from 'infirm' to 'variable' power.

Outlook for 2012 and beyond

The Indian economy is expected to continue to grow in the 12th plan period, albeit at a slower rate. In order to realise this growth, the country needs to invest in its infrastructure; and with most of the power projects based on conventional sources running behind schedule, renewable energy has a greater role to play both in terms of helping India achieve its economic growth targets as well as addressing its energy security concerns. Wind installations are likely to go up to 5,000 MW per year by 2015.

Ongoing government initiatives to provide long term policy certainty are very likely to attract large quantities of private investment to the sector. Recently, the Centre for Wind Energy Technology reassessed India's wind power potential as 102,778 MW at 80 meters[8]. This study could have a significant impact on future policy and regulatory framework for the wind sector in India.

With input from Indian Wind Turbine Manufacturers Association (IWTMA); World Institute for Sustainable Energy (WISE); And Vestas Wind Technology India Pvt. Ltd.

1 One REC = One MWh of electricity fed into the grid from renewable energy sources
2 GBI and Accelerated Depreciation are mutually exclusive schemes. A project can only claim support under one or the other
3 https://www.recregistryindia.in/
4 Conversion of INR to EUR and USD done at rates prevailing on 13-March -2012
5 The GBI is currently fixed @ INR 0.50 per unit of electricity fed into the grid with a cap of INR 6.2 million per MW. The GBI is over and above the tariff approved by State Electricity Regulatory Commissions. There is no floor or ceiling for a developer in terms of the MW capacity that can be considered for availing the incentive. www.mnre.gov.in
6 The final gazetted notification approving these proposals is due to be published by 31-March-2012
7 The fund comprises of a tax (cess) of INR 50 (~EUR 75 cent / USD 1) per ton on indigenous and imported coal.
8 C-WET: http://www.cwet.tn.nic.in/html/departments_ewpp.html . In the current fiscal year the MNRE will engage the Lawrence Berkley Lab of the University of California USA, to re-do the current wind resource assessment for India.

Japan

Entering a new era of wind power development

Japan entered a new era after the Eastern Japan earthquake/tsunami and nuclear disaster of 11 March 2011: an overwhelming majority of the Japanese public now rejects nuclear power, and are calling for a transformation of the energy system towards reliance on renewable energy. Since the share of renewables in the energy mix in Japan is low, major efforts are required to replace the old energy system with a more modern and flexible system, suitable for large deployment of renewables. There is now a real struggle for the future of the Japanese electricity system.

At the end of 2011, 2,501 MW of wind capacity had been installed in Japan consisting of 1,832 operating wind turbines supplying about 4200 GWh annually. This represents around 0.5% of the total power supply in Japan.

The 2011 market saw the installation of 78 turbines producing 166 MW of new wind power, a 34% decrease from the 252 MW installed in 2010. This decrease was caused by the lack of incentives. The old support system expired at the end of the 2009 fiscal year, yet the new feed-in tariff (FIT) will only come into force in July 2012. The price level for the tariff has also yet to be defined. The Japanese Wind Power Associations have called for an ambitious long-term target for wind development, along with a decision on an adequate price level for the feed-in tariff.

Wind turbines survived the Tohoku earthquake

Almost all of the 190 wind turbines (270 MW capacity) in the 'Tohuku' region survived the massive earthquake and tsunami that struck the north-eastern region of Japan on 11 March 2011 without damage.

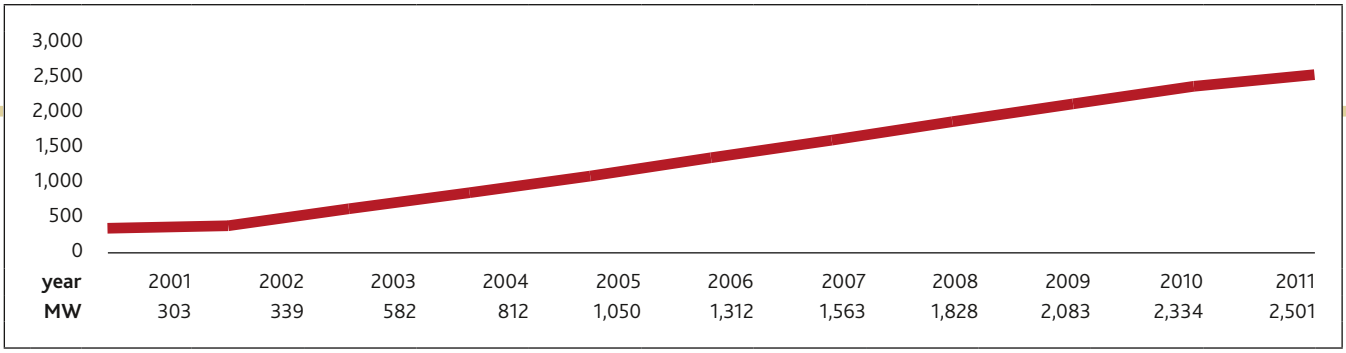
Although some wind turbines did stop operating as a result of grid failure caused by the earthquake and tsunami, most turbines remained fully operational, and contributed to Japan's power supply throughout the crisis. The SUBARU80 2 MW turbines of the Kamisu semi-offshore wind farm, located about 300 km from the epicenter of the quake, received a direct hit from a 5 meter tidal wave. They survived and were put back into service 3 days later. Only one wind turbine, not far from Kamisu, was put out of service as it tilted over slightly due to extreme soil liquefaction. This was the only damage caused by the earthquake, to a single wind turbine; and the turbine was put back in position and back into service during the course of 2011. This clearly shows the success of the anti-earthquake "battle proof design" of Japanese wind turbines.

Kamisu Offshore wind farm after the tsunami © *Wind Power Ibaraki Co. Ltd*

The wind power industry in Japan

The wind power industry in Japan is maturing. The sector employs about 3,100 people in 75 companies with an estimated annual turnover of about 250 billion JPY (USD

Total installed capacity



year	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
MW	303	339	582	812	1,050	1,312	1,563	1,828	2,083	2,334	2,501

Source: GWEC

3 billion / EUR 2.3 billion), according to a report published by the Economic Research Institute of the Japan Society for the Promotion of the Machine Industry. The Japanese manufacturers of large bearings and electrical components are particularly competitive.

Three large wind turbine manufacturers dominated the Japanese market in 2011. They are: Mitsubishi Heavy Industries Ltd. (supplying 1 MW, 2.4 MW and 2.5 MW wind turbines, MHI has announced the development of a 7 MW hydro-drive offshore wind turbine); Japan Steel Works (supplying 2 MW gearless PMSG wind turbines with a 2.7 MW turbine coming soon); and Fuji Heavy Industries Ltd. & Hitachi Co. (supplying the 2 MW "SUBARU" downwind type wind turbines).

The main Japanese producers of bearings for wind turbine are NSK, JTEKT and NTN. They are well known for their reliability, a reputation gained through long experience in the Japanese automotive industry. Meanwhile, Hitachi Co., TMEIC, Meidensha Co. and Yasukawa Electric Co. are the main producers of wind turbine generators in Japan.

Main policy developments

Japan's new feed-in tariff law was passed in August 2011. Despite this positive move, several concerns regarding the future of wind power development in Japan still remain. An integrated plan for the promotion of wind power is critically needed. Currently both supportive and obstructive policies coexist, blocking large scale future development.

One of these restrictions comes with new environmental regulations which will slow down wind power development. An environmental assessment of wind farms over 10 MW is to be applied after October 2012. This assessment, which may take several years to complete, means not only huge additional costs, but also major delays for new wind projects.

The geographical mismatch between the location of the best wind power resources and major load centers also continues to be a challenge for wind development in Japan. The best potential wind power sites are located in the remote rural regions of the north, which have small populations, low electricity demand and few grid lines connecting them to large demand centers such as Tokyo, Nagoya and Osaka.

Therefore, interconnections between rural regions and the big cities are urgently needed. Some cabinet members have proposed expanding grid infrastructure to enable electricity to be transported more effectively between regions, and have proposed the establishment of a real market where electricity is traded between regions to provide the lowest cost to consumers. The Japanese Wind Energy Associations (JWPA and JWEA) welcome these new initiatives to expand wind power potential, but the building of the necessary grid infrastructure should begin soon as it will require many years to complete.

However, the most serious problem in Japan is still the lack of an official long-term target for wind power development. The Japanese government's new long-term post-Fukushima energy plan will not be released until summer 2012. The two Japanese Wind Energy Associations have called for at least 25 GW (equivalent to 5% of total electricity supply in Japan) of wind power development by 2030.

Offshore wind power development

The Japanese government has also decided to support the development of offshore wind power. Currently, four large national projects have been approved. For more details on the Japanese offshore market, see the chapter dedicated to Global Offshore.

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

Mexico

Wind power potential in Mexico

Mexico is blessed with outstanding wind resources, ideal for large scale wind deployment. The wind potential has not yet been fully mapped, although according to meso-scale and regional studies there are several large areas with favourable conditions for wind farm development with high capacity factors and mean annual wind speeds above 8 m/s; some of them as high as 11 m/s.

The Mexican Wind Energy Association (AMDEE) conservatively estimates the country's wind power potential at around 30 GW, which includes sites with capacity factors above 25%; of these, 21 GW are above 30% and 16 GW are in the range of 35% to 45%.

A national wind energy target of 12 GW by 2020 is feasible, yet an official target is still to be determined.

The region with the best prospects for wind development is the Isthmus of Tehuantepec in the southern state of Oaxaca, where an estimated 10 GW could be developed, despite challenging wind and seismic conditions. It is likely that the 1 GW milestone will be reached in the second quarter of 2012, and double that by early 2013. An additional 1.9 GW is currently under development and scheduled to come online by 2015.

Other promising sites for wind development are located in the northern and central regions of Mexico, as well as on the coast of the Gulf of Mexico and on the Yucatan Peninsula. Recent technological developments, which have translated into more reliable and efficient turbines with higher hub heights and larger rotors, have significantly increased the number of sites which are feasible to develop in a market where there are no direct economic incentives for wind power, such as tax credits, feed-in tariffs, etc.

The policy framework for wind development

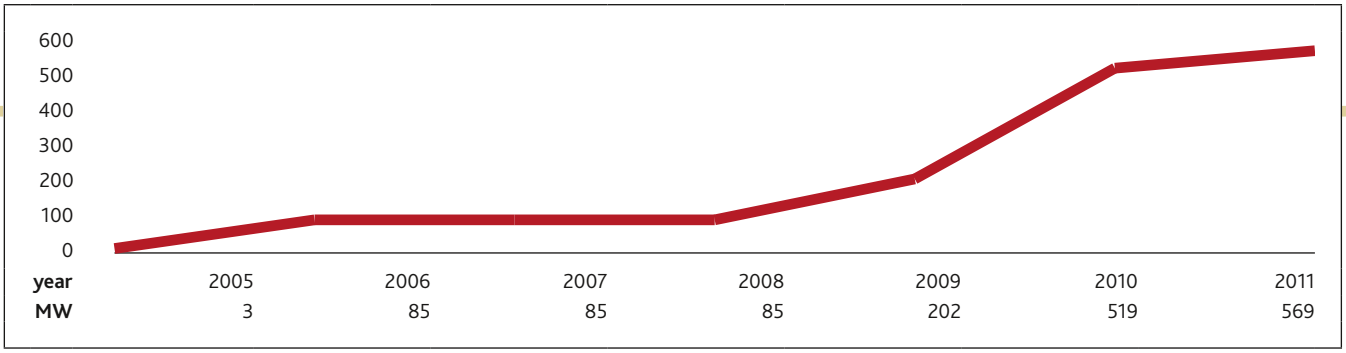
The private sector can participate in the electricity business either through self-generation for particular entities or individuals, through generation from Independent Power Producers (IPP), or for export to other countries. Currently, 85% of wind capacity in Mexico is developed under the self-generation scheme, where power consumers produce electricity for their own use, which is delivered to the CFE (the national utility) interconnection point and then transported to the consumer. The balance is owned by the CFE. In the coming years, this balance is expected to be 76% for self-generation and the rest 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. Direct electricity sales from privately owned generators to private customers in a spot market is not allowed in Mexico.

Some important incentives for private projects under the self-generation 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.

EVM-EDFLaMata-LaVentosa, Mexico © *AMDEE*

Total installed capacity



year	2005	2006	2007	2008	2009	2010	2011
MW	3	85	85	85	202	519	569

Source: GWEC

Main market developments in 2011

At the end of 2010, Mexico had a total of 519 MW of installed wind capacity connected to the grid, with only 10 MW installed outside of the State of Oaxaca (in Baja California). In 2011, an additional 50 MW were installed and interconnected, but this figure is misleading in terms of the progress made by the Mexican wind industry in 2011, since construction work was completed for a further 304 MW, which came online in early 2012, bringing the total up to 873 MW.

A new milestone for the Mexican wind sector was reached in 2011 when projects in states outside Oaxaca were started and are now under construction. The Mexican wind energy market has been dominated by four main turbine manufacturers: Acciona, Gamesa, Vestas and Clipper. GE also announced its first wind project in northern Mexico, and other major players are now becoming active in the Mexican market.

Outlook for 2012 and beyond

In 2011, the key industry players led by AMDEE, together with the Mexican government, conducted an important study assessing economically feasible wind power potential in Mexico. This joint effort resulted in a common understanding of a long-term national wind target.

According to the assessment, a target of 12,000 MW of installed wind capacity by 2020 is considered feasible. If the target is adopted and achieved, this would represent 15% of total power generation capacity in Mexico. The official long-term target is critically needed to provide the sector with a vision and to ensure sustainable growth of the industry and its supply chain.

It is anticipated that the 1 GW milestone will be reached by May 2012, and a further 1,800 MW is expected to come on line by the end of 2012. 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.

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. Reinforcing the national transmission infrastructure and fully developing the small producer (< 30 MW) scheme are key areas for improvement. In addition, speeding-up and simplifying the permitting procedures is also essential.

With input from the Mexican Wind Energy Association (AMDEE)

Poland

Lake Ostrowow, Wolin, Poland © *Wind Power Works*

The Polish wind industry installed 437 MW in 2011, maintaining Poland's spot in the top 10 in Europe. With a total installed capacity of 1,616.4 MW by the end of 2011, wind farms generated 2.349 TWh, 27% of all electricity produced from renewable sources in Poland. Wind energy is the leading RES technology in terms of generation capacity in Poland.

In order to meet the EU Renewables Directive target, Poland must source 15% of its final energy demand from renewable sources by 2020, up from 7.2% in 2005. In 2011, the Polish government submitted its National Renewable Energy Action Plan (NREAP) to the European Commission, anticipating a 15.5% share by 2020. The NREAP is based on 'Energy policy of Poland up to 2030' strategy, which was released in 2009; and on a detailed study on renewable energy resources in the country.

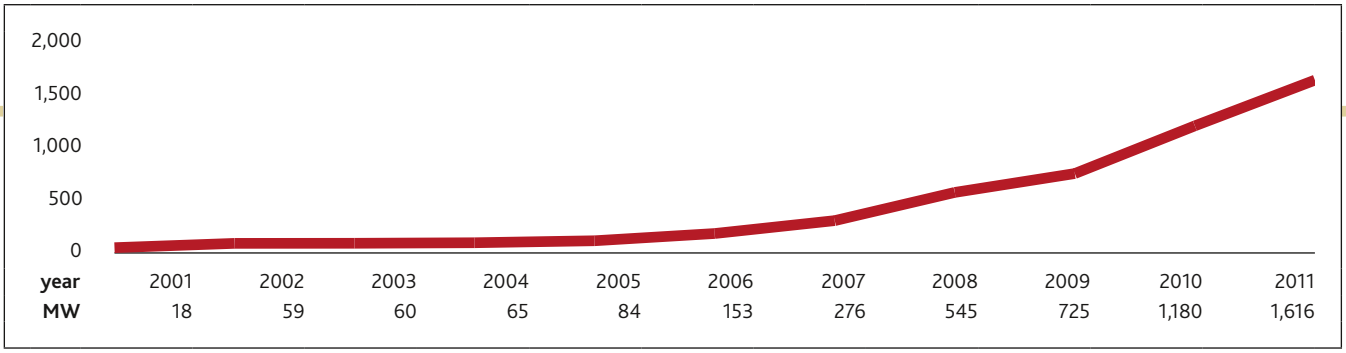
Wind is the fastest growing renewable energy source in Poland and it is expected to contribute about half of the renewable electricity required to reach the 2020 target. The NREAP predicts that wind power will reach 6,550 MW by 2020, including 500 MW offshore and 550 MW in small installations.

The wind industry in Poland

The pace of development of the wind energy sector in Poland has accelerated in recent years. The latest Ernst & Young "Renewable energy country attractiveness index" ranks Poland as having the 10th (tied with Romania and Ireland) most attractive wind market in the world. Despite the existing barriers, companies investing in wind in Poland have successfully created ways of overcoming market obstacles, and the country is attracting significant foreign investment, particularly in component manufacturing.

The Polish wind turbine market is dominated by Vestas, Gamesa, GE and Enercon, which between them cover 70% of the market. Vestas has the largest share (35%), followed by Gamesa (16%) and GE (12%). The rest of the market is divided between German companies, including Enercon, Fuhrländer, Siemens, Nordex and REpower.

Total installed capacity



year	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
MW	18	59	60	65	84	153	276	545	725	1,180	1,616

Source: GWEC

In terms of domestic manufacturing, Poland is still at an early stage of development, yet its technological know-how and development potential, particularly in the steel and smelting industries, provides an opportunity for component manufacturing for the wind industry. Shipyards and similar companies are already taking advantage of this. The Gdańsk Shipyard is ramping up tower manufacturing, expecting to produce up to 400 towers in 2012.

The Policy framework

The Renewable Energy Sources Act

On 22 December 2011, the Ministry of Economy presented a draft Renewable Energy Sources Act, implementing provisions of the EU Renewables Directive. The Act is expected to provide for comprehensive regulation of the Polish renewables market. However, some of the provisions of the new Act have raised concerns that the new rules will in fact jeopardise and/or slow down renewables development, particularly in the case of wind power.

Green Certificates Scheme

The Polish support system for renewable energy is based on a tradable green certificate mechanism and on the obligation for electricity sellers to purchase electricity produced from RES. Energy companies can either acquire a certificate of origin or pay a substitution fee. The substitution fee is subject to an annual indexation and the national Energy Regulatory Office (ERO) publishes the value of the substitution fee each year in March, in order to take into account the official inflation data from the previous year.

Each year, the ERO increases the substitution fee by the national inflation rate for the previous year. The value of the substitution fee, hence the reference value of the green certificates, has grown as follows: 248.46 PLN/MWh (EUR 59.8 / 79.4 USD) in 2008, 258.89 PLN/MWh (EUR 62.3 / 82.7 USD) in 2009, 267.95 PLN/MWh (EUR 64.5 / 85.6 USD) in 2010 and 274.92 PLN/MWh (EUR 6.2 / 87.8 USD) in 2011.

The reference value of a certificate of origin is set annually by the ERO through the substitution fee, which defines the green certificate price when demand exceeds supply.

The electricity is purchased at the average price of electricity in the previous year PLN 197.21/MWh (EUR 47.8/USD 63.8) in 2010 and PLN 195/MWh (EUR 47.19/USD 63) in 2011. The redeemed certificates need to cover a quota of 7.0% in 2008 and increasing gradually to 12.9% in 2017. In case of non-fulfilment a penalty is applied. According to the law of 14 August 2008, this scheme runs until 2017.

Offshore wind Energy in Poland

The theoretical offshore wind potential in Poland is estimated at 130 GW, however, when current spatial constraints applicable to the location of offshore wind farms and environmental regulations (mainly NATURA 2000) are taken into account, the feasible offshore wind potential goes down to 7.5 GW. No offshore development is expected before 2018 but it could reach 500 MW by 2020.

Outlook for 2012 and beyond

Poland is set to continue its healthy wind power development with an average annual growth of 500 MW, in line with the government's commitment of reaching 6,550 MW by 2020 in the Polish National Renewable Action Plan. However, some of the changes that are being considered under the current review of the draft Energy Sources Act raise concern within the wind industry as they will have a direct negative impact on wind power development. The provisions of the Renewable Energy Sources Act, providing detailed regulations for the Polish renewables market, will determine the future of the sector. Public consultations are currently taking place, but it is likely that delays in the legislative process will mean that the Act won't take full effect until 2013.

With input from the Polish Wind Energy Association (PWEA)

Romania

Fântânele-Cogealac, Romania © *BBB-Umwelt/Thomas Latacz*

Despite Romania's vast wind resources, wind power only accounts for about 2% of its national electricity production today. Romania continues to be powered predominantly by fossil fuels, which accounted for 54% of generation in 2011, followed by large hydropower at 25%, and nuclear at 19%. The share of hydro was lower than usual due to a dry year in 2011. However, wind power has grown dramatically in the past three years.

Romania's 982 MW of operating wind farms are mainly located (97%) in Dobrogea on the Black Sea coast, which boasts average wind speeds of 7 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 undergo significant wind development in the near future (see map).

Wind map for Romania

Source: RWEA

Main market developments in 2011

Romania was the leader among Europe's emerging markets in 2011, installing 520 MW; following 462 MW in 2010 and only 14 MW in 2009, for a cumulative capacity of 982 MW at the end of 2011. The country has a significant development pipeline, and will soon be the 16th European country to pass the 1 GW mark.

Czech utility CEZ dominates the Romanian wind market, having completed 338 MW of its Fântânele Cogealac project which, at 600 MW, will be the largest onshore wind farm in Europe once completed at the end of 2012. The two other main developers are EDP with three wind farms totalling 238 MW, followed by Enel Green Power, also with three wind farms accounting for 174 MW.

As of November 2012, wind generated electricity will begin to receive two green certificates /MWh, and it is expected that this will open the door for investment by commercial banks.

So far, Romanian wind development has not been seriously impacted by the financial crisis, but the real impact remains to be seen. However, continually growing electricity demand combined with the new targets and EU Directive means that the sector seems at present to have a bright future.

The policy framework

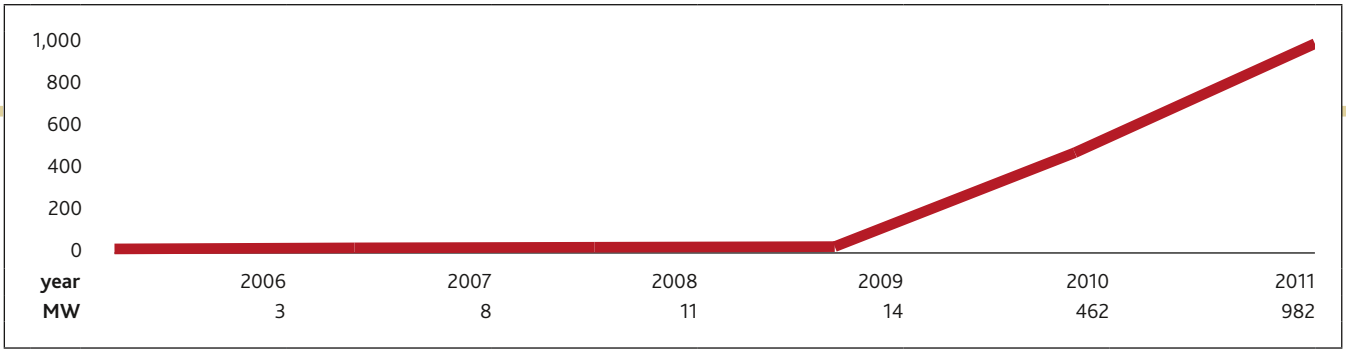
The renewable energy law adopted in November 2008 was a major step forward for wind development in Romania, introducing a green certificate (GC) scheme for renewable electricity for a period of 15 years, as well as loan guarantees and tax exemptions for renewable energy investments.

In 2010, the renewable energy law was amended in a positive fashion. The amendments reiterated the previous renewable energy target of 8.3% (excluding large hydro) for total gross electricity produced in Romania by 2010, and also introduced a 20% (excluding large hydro) target for 2020.

The most important points of the amended law are:

- Wind power projects coming on line before the end of 2016 will receive two green certificates per MWh produced

Total installed capacity



Source: GWEC

until 2017 and one certificate/MWh for the balance of the 15 years of the scheme, encouraging early deployment.
- The value of the green certificates, initially set between EUR 27-55 (USD 35.84-73), 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 76.54).
- The penalties for suppliers for each non-produced certificate increased from EUR 110 (USD 146) to EUR 115.34 (USD 153.08) in 2012.

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 by more than 10%, the number of green certificates may be reduced. For wind, the maximum allowable rate of IRR is 11.99%. However, any change in the scheme will only take place starting from 1 January 2014 and the provisions will affect only new entrants starting generation after 1 January 2014.
- Wind farms generating over 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 2 GCs /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.

According to Ernst and Young's "Renewable Energy Country Attractiveness Index"[1] Romania was ranked as having the 13th most attractive RES development conditions in the world, and was the 10th most attractive for wind. These numbers are from February 2012, and once the RES scheme is fully implemented, it is expected that Romania will rank even higher.

Obstacles to wind power development in Romania

Now that the legal framework is in place in Romania, the most important remaining obstacle is the grid, especially in the wind rich region of Dobrogea, where the existing grid can only integrate about 400 MW of wind. Overall, the Romanian energy system could currently absorb about 3,000 MW of wind power, and this is expected to increase to 5,000 MW with the addition of new flexible thermal capacity in the near term. However, there is currently more than 7,000 MW under contract to be developed; if grid capacity is not improved, then connections will only be received on a 'first come, first serve' basis. Stronger transmission links to the rest of the country are also urgently needed.

Outlook for 2012 and beyond

Despite the considerable progress made in 2011, only 3.2% of Romania's electricity demand came from renewable sources, compared to the 10% target set by the renewables law. Depending on how financial sector support evolves in Romania, the Romanian Wind Energy Association predicts that 3,000-3,500 MW of wind power will be installed by the end of 2013, and at least 5,000 MW by 2016. In 2012, it is expected that about 1,000 MW will be installed, reaching 2,000 MW by the end of the year, and overtaking many EU countries where wind development started much earlier.

With input from the Romanian Wind Energy Association (RWEA)

1 http://www.ey.com/GL/en/Industries/Power---Utilities/Renewable-energy-country-attractiveness-indices

South Africa

Wind power in South Africa seems poised to shake off its slow start and move towards very rapid growth. After taking a decade to install the first 10 MW of wind power, the tide turned on 7 December 2011, when Energy Minister Dipuo Peters announced[1] the winners of the first round of bids for renewable power. Wind power secured 634 MW, and it is expected that another 1,200 MW will be awarded during the course of 2012. The industry in South Africa is currently developing between 3,000 and 5,000 MW of wind power, of which at least 1,500 MW is in the procurement stage. In addition, there is a long term energy blueprint giving a significant allocation of new electricity build to wind power 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 90% of South Africa's electricity comes from coal fired power stations. The bulk of it is produced by parastatal 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 includes: 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 are currently being 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 the next decade bodes well for wind power development.

South Africa's electricity price has traditionally been one of the lowest in the world. Despite some increases it is still low. Eskom is selling electricity at an average price of about ZAR 60.6 cent/kWh (EUR 0.06 / USD 7.82 cent)[2]. New coal based power is likely to cost about ZAR 0.90/kWh (EUR 0.09 / USD 0.11) if not cross-subsidised from existing plants. 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.

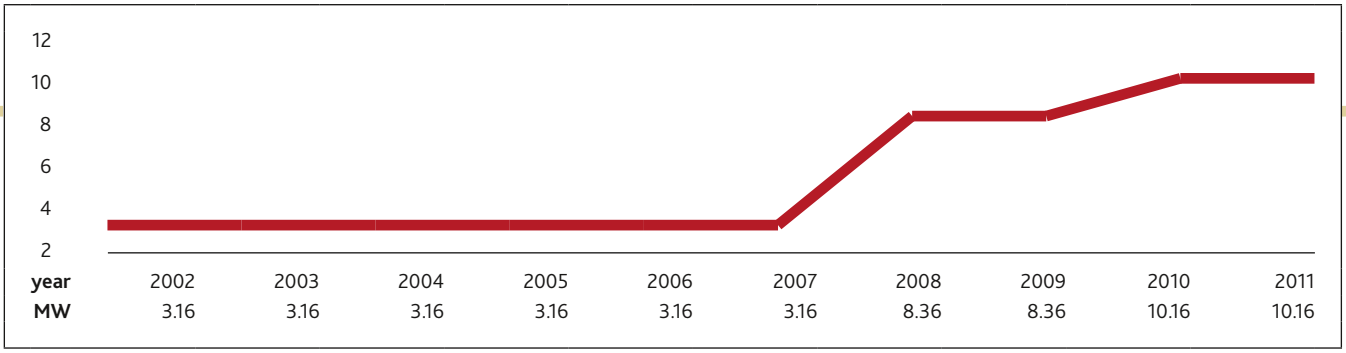
Coega IDZ (industrial development zone), South Africa
© *Electrawinds Africa and Indian Ocean Islands*

Wind Power in South Africa has to be sold at around ZAR 1.15/kWh (EUR 0.115 / USD 0.14) to be viable at sites with moderate wind resources, although at high wind sites this figure will be lower. The result of the economics is that the PPA counterpart to wind developers is almost invariably Eskom, backed by the SA government.

Main market developments in 2011

The progress in 2011 was focused on the procurement and regulatory framework, with a great many projects also making their way through the consent processes. The installed capacity of the country did not increase in 2011, but construction of several large wind farms of up to 138 MW in size will likely begin during 2012.

Total installed capacity



Source: GWEC

In terms of the 634 MW of projects awarded so far (pending financing and final PPAs), the top three players in the market are:

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

It is projected that the current procurement round, which calls for a total of 1,850 MW of wind power, will see capacity rise to about 1,000 MW installed by the end of 2013, with quick further growth to follow.

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.

In terms of local manufacturing, an early lead was taken by DCD[3], who will be making blades and assembling turbines in Cape Town under licence from Aerodyne. It is understood that LM, Siemens, Sinovel, Suzlon and Vestas have plans to produce blades in South Africa.

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, as follows:

- There are logistical challenges associated with the very rapid ramp up of the industry that is foreseen;
- The Integrated Resource Plan[4] (IRP - energy master plan until 2030) is reviewed every two years, with the first review due in 2012. 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 2012;
- 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;
- It is not yet clear how future procurement will occur and whether this will enable local manufacturing by ensuring a steady growth in the industry.

Outlook for 2012 and beyond

The industry in South Africa is on the cusp of potentially very rapid growth. 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 IRP 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 http://www.energy.gov.za/files/media/pr/2011/MinisterRemarks_IPP_BidsAnnouncement_7Dec2011.pdf
2 http://www.eskom.co.za/content/NERSAreviewEskomtariffs1Apr2012-31Mar2013~2.pdf
3 http://www.dcd.co.za/miningandenergy/DCDWindEnergy.aspx
4 http://www.energy.gov.za/files/irp_frame.html

South Korea

Nue (Silkworm) Island, Kyonggi-do, West Sea of Korean peninsula.
Unison 750KW x 3 WTG's, Commissioned in 2009 © *KWEIA*

The South Korean government has continued to invest in its green growth strategy, both financially and in terms of policy development, but this has yet to translate into concrete results for the wind energy sector. Wind capacity grew by only 29.8 MW in 2011, an 8% increase, bringing total installed capacity to 407 MW. The sector generated 857 GWh in 2011, an 18.8% increase over the previous year; but a combination of complex permitting procedures and continued local opposition to onshore wind farm development hampered the sector's growth. There is evidence, however, that the attitudes of local governments and residents are gradually becoming more positive towards wind power.

The policy framework

On 1 January 2012, South Korea's new Renewable Portfolio Standard came into effect, replacing the old feed-in tariff regime. The RPS starts at 2% in 2012, gradually increasing to 10% by 2022. The RPS is fulfilled through tradable Renewable Energy Certificates (RECs) and will have a starting value estimated at about 50,000 won (€33.65, USD 44.6). Onshore wind project operators will earn one REC per MWh produced, and offshore projects will earn two RECs. 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.

Improvements have been made in terms of grid access for wind projects. Previously, any project larger than 3 MW was not allowed to connect to the local distribution system, but had to build their own line to the transmission system. That limit has now been raised to 20 MW, and will facilitate further onshore development in Korea, where the high wholesale electricity prices mean that wind is already competitive with incumbent sources of generation in the country, especially considering the added incentive of the new REC system.

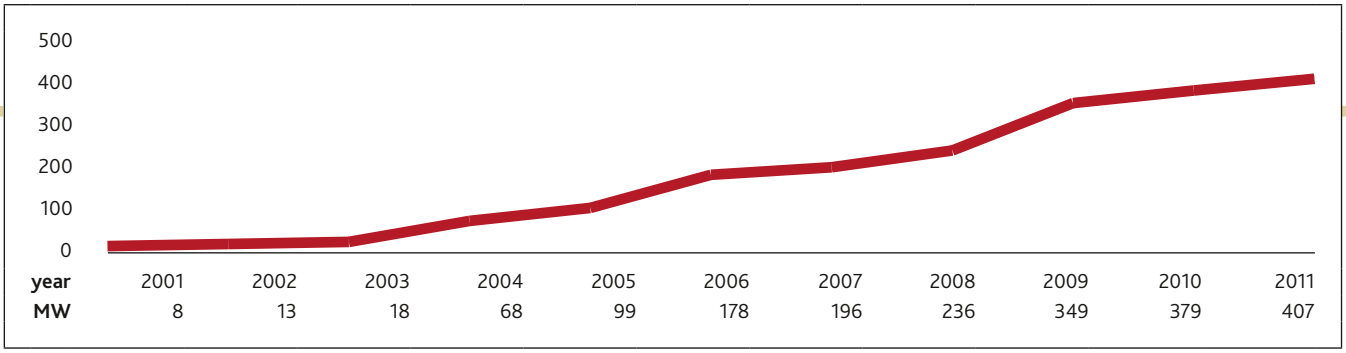
Offshore wind power in Korea

In 2010, The Ministry of Knowledge and Economy (MKE) released a roadmap for offshore wind development, with the first priority a 2.5GW offshore wind farm project located in the West-South Sea.

A specially designated task force published a detailed master plan for the project in November 2011. The first stage calls for eight domestic manufacturers to deliver a total of 15 prototype turbines totalling 80 MW to a test bed facility for testing and certification, which should be finalised by 2014.

The second stage will consist of a 400 MW demonstration project using the turbines which pass the certification test, scheduled to be operational by 2016.

Total installed capacity



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

Source: GWEC

The final 2,000 MW the project will be put out for tender from 2017-2019, and will be open to all bidders.

Another test facility was designated by the MKE in Yeonggwang in South Jeolla Province, in Southern Korea and is expected to be ready in 2014. Manufacturers can use the site for testing and certification of their pwroducts. In 2011, the two first offshore turbines (2 MW and 3 MW) were installed and are currently undergoing performance testing.

In addition to the government tender, a further 6 GW of offshore wind projects are being promoted by local governments across the country.

The turbine manufacturing market

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.

- Domestic manufacturers have developed onshore machines up to 3 MW size and are developing a positive track record.
- Manufacturing giants such as Samsung Heavy Industries (SHI), Hyundai Heavy Industries (HHI), and Daewoo Shipbuilding & Marine Engineering (DSME) continue to develop 5~7 MW turbines for offshore applications.
- Doosan Heavy Industries, which has a long track record in related fields, have also signaled their intention to enter the market, with a prototype turbine promised by 2014.

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.

Domestic cap and trade regime by 2015

South Korea has taken a step towards becoming part of the emerging group of Asia-pacific countries (besides Australia, New Zealand and the regional trials in China) with domestic cap and trade legislation. According to the International Energy Agency (IEA) South Korea was the world's ninth-largest carbon emitter in 2009. Under the Cancun Agreements, South Korea has pledged a 30% reduction from business-as-usual levels by 2020.

On 8 February 2012 a special committee of the Korean National Assembly on climate change voted in favour of legislation to establish a cap-and-trade system by 2015. The latest version of the bill will set emission targets for 485 of the largest polluters starting in 2012 as a lead-up to the cap and trade system in 2015. Under this bill, 95% or more of the permits, each representing a tonne of carbon emissions, would be awarded for free in the scheme's first two phases, spanning 2015-2017 and 2018-2020.

It remains to be seen if the bill gets parliamentary approval before the April 2012 general elections. However, if the parliament fails to pass the bill, it is likely to be resubmitted later in 2012.

Outlook for 2012 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 around 10% of the country's total energy demand.

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

Spain

Maranchón, Guadalajara, Spain © *Wind Power Works*

Main market developments in 2011

A year of modest growth due to recession

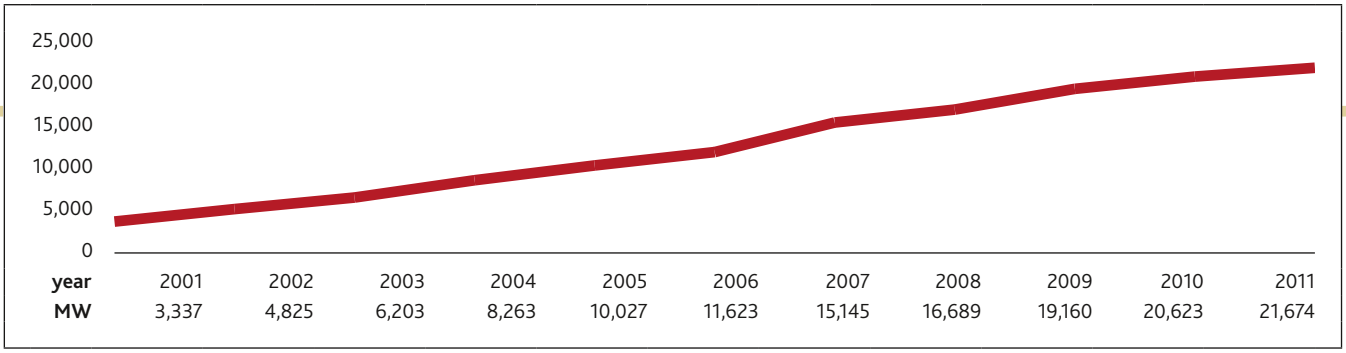
In 2011, the Spanish wind market shifted into a lower gear due to the economic recession and experienced only modest growth. According to the Spanish Wind Power Association (AEE), 1,050 MW of new capacity were added, bringing total installations up to 21,673 MW. Spain remains in second position in Europe, after Germany, in terms of total installed wind capacity.

2011 was again a windier year than average in Spain, and the country's wind farms generated 42 TWh of electricity, accounting for 15.7% of national net power consumption. All renewable energy sources combined produced around 33% of Spain's electricity needs, with wind being the largest single contributor.

According to the National Energy Commission, the average total remuneration for wind power in 2011 was 87 €/MWh (USD 115.3), (market price + premium) while the average market price was 49.93 €/MWh (USD 66.21). However, by displacing a large quantity of the most expensive 'peaking power', the effect of wind power on the average market price (merit order effect) has been estimated by AEE to amount to a reduction of 6 €/MWh (USD 7.95) in 2011.

The average size of turbines installed during 2011 in Spain was above 2 MW, and the leading manufacturers supplying the Spanish market are Gamesa, Vestas, Alstom-Ecotécnia and Acciona. Castilla y León is the leading region in terms of installed capacity in Spain with over 5,000 MW.

Total installed capacity



Source: GWEC

New record wind day in Spain
On 6 November 2011 at 2 am a new record was reached, when 59.6% of Spain's power demand was supplied by wind power.

The policy environment

Wind power potential
Spain is endowed with significant wind power resources. According to estimates by the Institute for Energy Diversification and Saving (IDAE), published in the National Renewable Energy Plan for 2011-2020, the technical-economical potential for onshore wind power is more than 100 GW by 2020, and more than 150 GW by 2030. The objective set for 2020 stands at 35 GW of installed wind capacity. For offshore wind power the current potential is estimated at 8.5 GW with a target of 750 MW by 2020.

The Spanish National Renewable Energy Plan (PER) 2011-2020
The Royal Decree 661/2007 established the incentives for all new wind power projects installed before the end of 2012. In 2011, the Spanish government adopted the National Renewable Energy Plan (PER 2011-2020). According to the PER, wind power will become the most important power technology in terms of installed capacity with 35,750 MW - 35 GW onshore and 750 MW offshore. Wind power would then meet 19.5% of national electricity demand, second only to natural gas (35.4%). In total, renewables would increase their installed capacity by 62% and power production by about 50% compared to 2010 figures.

The objectives set for wind power and other renewables in the PER are lower than the ones presented by the government in the National Renewable Energy Action Plan, which was sent to the European Commission in 2010 under the obligations specified in the Renewables Directive. The reasons for lowering the targets can be explained by the economic crisis, the growing deficit of the power sector (the difference between what is charged to customers and the cost of providing them with electricity) and the sluggish evolution of power demand. As a result of these considerations, the Ministry of Industry lowered the objectives for offshore wind for 2020 by 75% (from 3,000 MW to 750 MW), but maintained the target for onshore wind at 35,000 MW.

The figures in the PER were a disappointment to the Spanish wind power sector, as the potential for 2020 had been estimated at 45,000 MW (40,000 MW of onshore and 5,000 MW of offshore wind) by the Spanish Wind Power Association (AEE) and the Spanish Association of Renewable Energy producers (APPA). However, given the economic difficulties that the country is facing, even the moderate objectives set out in the PER could be a challenge to achieve if the regulatory framework remains unclear and is not sufficiently funded for the period between 2011- 2020. Therefore, to meet the 2020 targets, the two Spanish associations consider it critical to establish sufficient framework conditions for the renewables sector.

Temporary moratorium for any new renewable energy installation (Royal Decree-Law 1/2012 adopted in January 2012)
After a year of negotiations with the previous Spanish government, no agreement on a regulatory framework for new wind power installations after 2012 was reached.

In January 2012, the newly elected government adopted a temporary moratorium on all new renewable energy installations. The moratorium doesn't apply to existing installations or to wind power installations scheduled to be connected to the grid in 2012 (in accordance with the Royal Decree 661/2007). The Decree leaves open the possibility of adopting specific economic regimes for renewable technologies and cogeneration in the future.

With input from the Spanish Wind Energy Association (Asociación Empresarial Eólica, AEE)

Turkey

Challenged by a rapidly growing economy, expanding population and growing power demand, Turkey has been one of the fastest growing power markets in the world for the last two decades. With very limited oil and gas reserves, Turkey is increasingly turning to renewable energy sources to improve its energy security and curb dependence on imported fossil fuels.

Turkey's wind sector has made rapid progress, with installed capacity increasing from 30 MW in 2007 to 1,800 MW at the end of 2011. Turkey has excellent wind resources, particularly in the Çanakkale-İzmir, Balıkesir and Hatay basins. The total feasible potential for wind energy has been estimated at 47 GW, allowing for significant growth for the Turkish wind market over the coming years.

Main market developments in 2011

In 2011, Turkey installed 470 MW of new wind power capacity taking the total up to 1,800 MW. This represents an annual growth rate of around 35%. Installed wind capacity is expected to grow between 500-1,000 MW per year reaching more than 5 GW by 2015. Turkey hopes to install up to 20 GW by 2023, helping the country to source 30% of its electricity generation from renewable energy by that date.

Main wind farms in 2011:

Project	Installed Capacity	Developer
Şah RES	93 MW	Galata Wind En. Ltd. Şti.
AkRES	45 MW	Akhisar Rüz. En. El. Ür. San. Ltd. Şti.
Susurluk RES	45 MW	Alentek En. A.Ş.
Seyitali RES	30 MW	Doruk En. Ür. San. Tic. A.Ş.

The Turkish wind energy market is mostly dominated by local developers. The main industry players producing towers include Ateş Çelik, Alke, Çimtaş and Enercon. The leading domestic blade manufacturers are Aero Wind, Ayetek Wind and Altema Energy. Enercon (32.65%) continues to be the supplier with the largest market share, followed by Vestas (28.57%), Nordex (22.45%) and GE (10.20%).

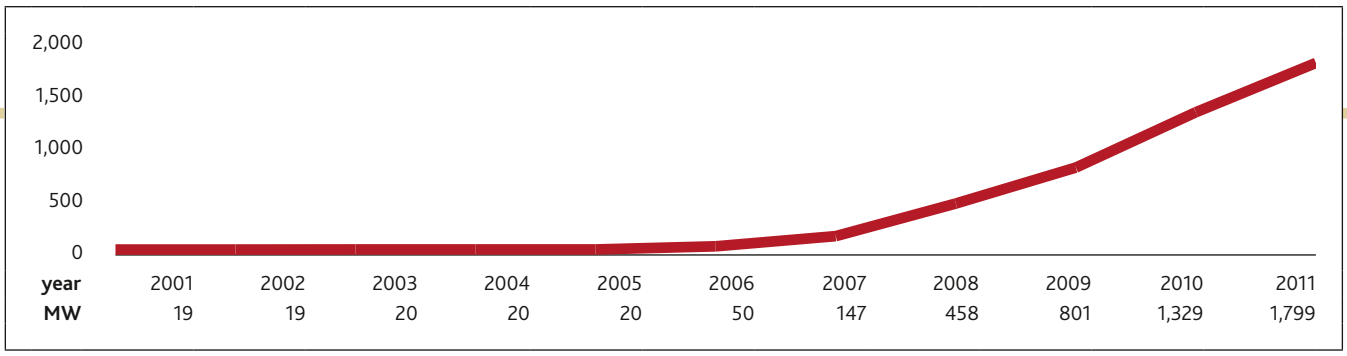
Bandirma Bares wind farm, Turkey © *TWEA*

Turkey's rapidly growing economy provides an increasingly attractive investment environment due to increased political stability and restructuring and liberalisation of the market.

The Turkish electricity market has also undergone significant structural changes. As a first step towards a competitive market, a new Electricity Market Law was introduced by the government in 2001, and the state owned utility was re-organised into three successor companies. In addition, the law established a national regulator (EMRA) for Turkey. A transition to a competitive electricity market is needed in order to attract private sector investments to help meet demand growth of an average of 6-9% per year, and also to reduce electricity prices.

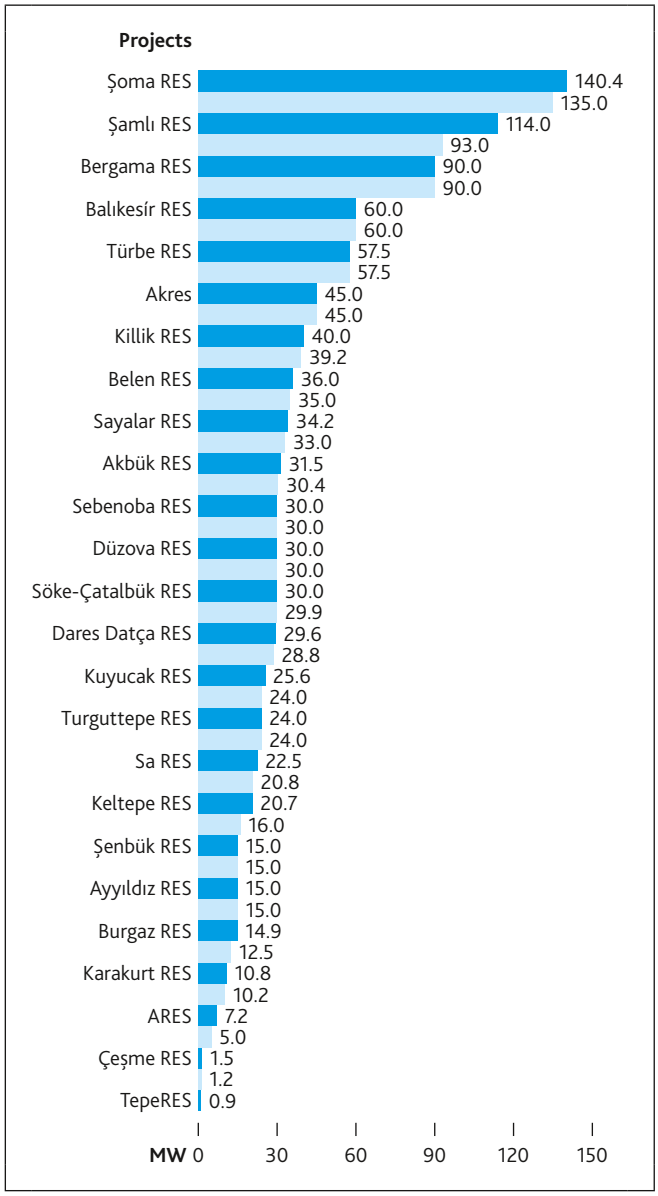
The tendering procedure first published in November 2007 was finalised in 2011, and EMRA is currently preparing for a new call for wind and solar.

Total installed capacity



Source: GWEC

Wind farms expected to be in operation in 2012



Source: TUREB

The policy environment

The first Renewable Energy Law[1] in Turkey was enacted by the government in 2005, introducing a feed-in tariff to promote electricity produced by renewable sources. The law was amended in 2010, when the feed-in tariff was re-set at USD 7.3 cent/ kWh (EUR 5.54 cent) for wind power for a period of ten years. In addition, a local content element was added to the Renewable Energy Law, and accordingly using local equipment may add USD 0.4-2.4 cent (EUR 0.3-1.82 cent) to the price for five years. While the level of support is low in comparison to other European countries, wind power producers are free to sell to the national power pool or engage directly with eligible customers in bilateral agreements where prices are generally higher than the guaranteed price.

A number of additional policy measures have helped to increase renewable energy production in Turkey in recent years. Of note is a new requirement for the national transmission company to provide grid connections for all renewable power projects and improved transmission links with the EU to stabilise the power system. Also, most restrictions on foreign investment in the Turkish power sector have been lifted.

Obstacles to wind energy development

The biggest obstacles to wind development in Turkey at present are the complex and bureaucratic administrative procedures. More clarity is needed in the applicability of the new local content regulations, and once clarified these should be extended until 2020. Finally the sector needs a roadmap: wind could easily supply 20% or more of Turkey's electricity, and with grid improvements, it could be even more. Future planning would also be aided by clear planning guidelines for watershed protection, and a resolution to real and perceived conflicts between wind farms and radar installations.

With input from the Turkish Wind Energy Association (TUREB)

1 Law No. 5346 Law on Utilization of Renewable Energy Resources for the Purpose of Generating Electrical Energy; http://www.emra.org.tr/web/electricity-market/legislation

United Kingdom

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

The UK has some of the best wind resources in Europe and is the world leader in offshore development; but onshore development has become increasingly controversial in some parts of the country.

Main market developments in 2011

The total market size for the UK is just over 6.5 GW, with 1,293 MW of new capacity installed in 2011, including 752.45 MW of offshore capacity. The two biggest onshore sites in the UK are located in Scotland: Clyde South with 56 turbines (128.8 MW) and Arecleoch with 60 turbines (120 MW).

Major manufacturing capacity was added in 2011 in both the onshore and offshore wind sectors. Mabey Bridge's £38 million (EUR 45.41 million / USD 60.51 million) onshore wind tower manufacturing facility in South Wales was launched in May, while in the offshore sector, TAG Energy opened their monopile manufacturing facility on the banks of the River Tees.

Following on from 2010 announcements from Siemens, General Electric & Gamesa to establish offshore turbine manufacturing facilities, in 2011 Vestas secured rights to land for a new facility in Kent to manufacture their new 7 MW offshore turbine. In December 2011, Siemens progressed with their plans for a new facility to manufacture the new 6 MW offshore wind turbine, with the submission of formal planning application to develop the Alexandra Dock in Hull on the East Coast of England.

While the global financial crisis has weakened the UK economy, there is evidence that investment in renewable technologies such as wind can be a critical part of restoring economic growth. As a leader in the industry, the UK has the potential for major employment growth in the sector. Currently 10,600 people work in the UK wind industry with that number expecting to rise to 88,300 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.

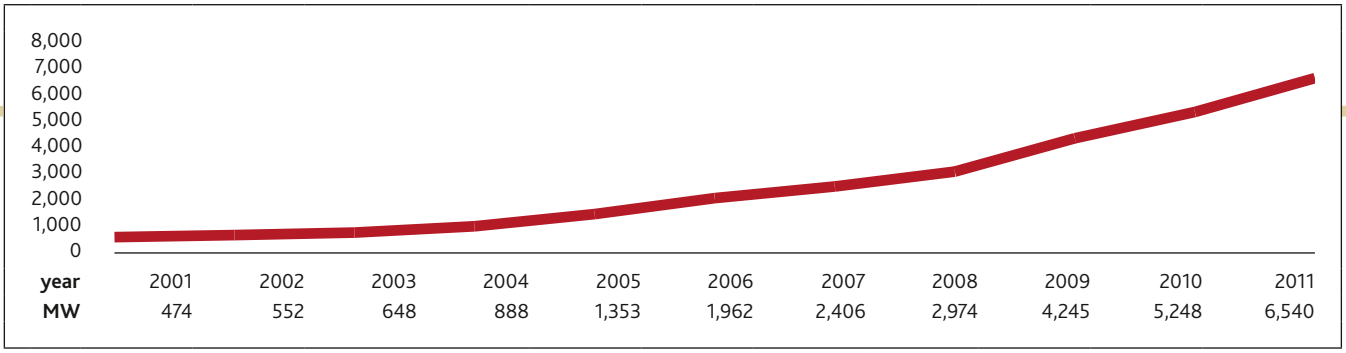
Despite the financial crisis, the UK wind industry made steady progress in 2011, meeting 12% of the UK's electricity demand on 28 December, and supplied an average of 5.3% of the UK's electricity for the month.

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. In July 2011, the Renewable Energy Roadmap[1] was published, setting out the path to achieving the UK's renewable energy targets. The top-level scenario indicates that offshore wind could contribute up to 18 GW (depending on cost reduction), and onshore wind up to 10-13 GW of installed capacity by 2020.

1 http://www.decc.gov.uk/assets/decc/11/meeting-energy-demand/renewable-energy/2167-uk-renewable-energy-roadmap.pdf

Total installed capacity



year	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
MW	474	552	648	888	1,353	1,962	2,406	2,974	4,245	5,248	6,540

Source: GWEC

The Localism Act

The Localism Act, which came into force in November 2011, gives communities and local government greater powers to influence policies and ensures that the elected Secretary of State signs off on major projects, i.e., above 50 MW onshore and above 100 MW onshore.

Electricity Market Reform

In July 2011, the UK government published a White Paper on Electricity Market Reform (EMR), setting the framework for support for low carbon technologies from 2017 onwards. The EMR is set to be the biggest shake-up of the electricity market in decades and is intended to promote greater investment in energy infrastructure and encourage growth in low carbon technologies. This development means moving away from the Renewables Obligation scheme towards a feed-in tariff with a Contract-for-Difference.

Support Framework for Wind Energy

The Renewables Obligation

The UK's Renewables Obligation (RO) has been the main financial instrument for stimulating growth in renewable energy since 2002, but ultimately will be replaced with a Contract-for-Difference 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) for each MWh of electricity generated and these certificates can then be sold to power suppliers in order to meet their obligation. According to the latest figures approximately 40% of the total ROCs go to onshore and offshore wind developments.

The UK's 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. The feed-in tariffs start at 35.9 pence (EUR 42 cents/USD 56 cents) for installations smaller than 1.5 kW. This has stimulated the installation of more than 17,000 small wind systems across the UK. The tariffs are expected to be revised in 2012.

Obstacles to wind energy development

Within the UK there is an increasingly well-organised opposition to wind power, particularly onshore, that is leading to political and media debate. This is having a knock-on effect on consenting at local level, with only 26% of onshore projects approved. Projects are also seeing significant delays in planning, unresolved issues around aviation, and inadequate grid infrastructure.

Outlook for 2012 and beyond

In addition to more growth in the wind industry supply chain, 1,000 MW of onshore wind and 1,000 MW of offshore are expected to be added in 2012.

Progress on offshore wind

By the end of 2011, offshore wind power amounted to a cumulative capacity of over 2,000 MW, enabling the United Kingdom to cement its world leadership position in offshore wind. According to the latest research, published in RenewableUK's annual State of the Industry report in October 2011, the country is set to retain this competitive advantage in years to come, with a total of 8 GW of capacity installed by 2016, and a further 10 GW by 2020. In fact, the UK already gets close to 2% of its net electricity consumption from offshore wind, and this share is set to grow to between 17% and 20% in ten years' time.

For more details on offshore wind development in the UK, see the chapter dedicated to Global Offshore.

With input from RenewableUK

United States

Wind power becoming a mainstream energy source

The wind industry installed 6,810 MW in the US in 2011, representing a 30% increase from the 5,216 MW installed in 2010. This shows an overall 17% annual growth in US wind power capacity in 2011, bringing total US wind installations to 46,919 MW. Average annual growth for the past five years remains a robust 33 percent. Equally impressive: electricity from wind power capacity in the US can supply electricity equivalent to that used by over 12 million American homes.

These numbers turned in by the wind power industry in 2011 tell a multi-faceted story, one characterised by wind energy becoming a mainstream energy source with a growing domestic manufacturing supply chain in spite of the difficulties caused by the short-term nature of federal policy incentives.

Wind was, after natural gas, the second largest source of new generation capacity in 2011 in the US. Measured in terms of carbon emissions avoided, America's wind power fleet avoids an estimated 75 million tons of carbon dioxide annually, equivalent to taking 13 million cars off the road, and conserves approximately 27 billion gallons of water annually, which would otherwise be consumed for steam or cooling in conventional power plants.

New capacity added in 31 States in 2011

In 2011, the US wind industry continued to see increased geographic diversity. The number of states with installed utility-scale wind projects sits at 38, with 31 states adding new capacity in 2011.

The most active states in 2011, installing between 500 MW and 920 MW of new wind power, include California, Illinois, Iowa, Minnesota and Oklahoma. While long-time leaders in the wind industry installed the largest number of megawatts, states seeing the largest growth rates in 2011 were Ohio, Vermont, Massachusetts, Michigan, and Idaho; all of which doubled or nearly doubled their installed wind capacity in 2011. These states have emerged as active wind regions as a result of new state policies, as well as benefiting from new technology using higher hub heights and larger rotor diameters which capture more energy.

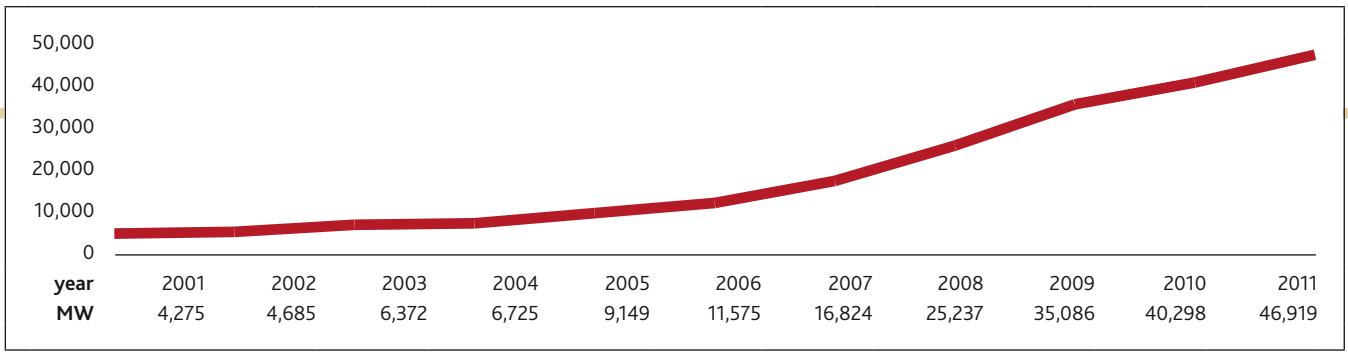
The wind power market in the US

While the ownership structure of US wind projects typically involves Independent Power Producers (IPPs) owning projects and signing long-term power purchase agreements (PPA) with electric utilities, there was an increase in the direct ownership of wind projects by electric utilities in 2011. Utility ownership of new wind capacity increased from 15% in previous years to 23% in 2011. Of the 6,810 MW installed in 2011, 79% of the capacity was able to secure a long-term power off-take agreement, either through a power purchase agreement or through direct electric utility ownership.

Horse Hollow wind farm, Texas © *Wind Power Works*

The turbine market saw continued diversification and evolution in 2011 with an increase in both the number of active turbine manufacturers as well as an increase in the number of models offered. US average turbine size continued its upward trajectory in 2011 - with an installed average of 1.99 MW, compared to 1.77 MW for turbines installed in 2010.

Total installed capacity



year	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
MW	4,275	4,685	6,372	6,725	9,149	11,575	16,824	25,237	35,086	40,298	46,919

Source: GWEC

Sailing against the winds of a down economy, lower demand for new power, and continued policy uncertainty, the industry invested billions in the US economy in 2011 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. The local tax payments and land lease payments to farmers and ranchers bring significant annual revenue to local communities across the country.

US wind energy manufacturing also continued to grow in 2011, with new manufacturing facilities opening to supply the domestic wind market. In the years up to 2005, less than 25% of wind power plants were manufactured locally; that has now increased to 60%. It is also worth noting the breadth of the footprint of wind power manufacturing, with 43 states now boasting manufacturing facilities.

Outlook for 2012 and beyond

The US wind power industry's greatest challenge for 2012 is one with which the industry has lived with for many years: short-term, unstable policy. The federal Production Tax Credit (PTC), a performance-based tax credit for kilowatt-hours produced by a wind farm once it is built, has typically been extended in only one- and two-year increments. This stands in sharp contrast to the permanent entitlements that fossil-fuel industries have received for 90 years or more. Stable policy is needed for the wind industry to begin to live up to its potential, attracting massive new investment and creating thousands of new jobs.

Nevertheless, with federal policy uncertainty still holding back the US wind power industry, other stable policy drivers remain in place. 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 legislation that increases the state's renewable electricity standard from an already strong 20% to an historic 33% by 2020.

The industry closed out the year with numbers that suggest a strong 2012, with 8,300 MW of wind power under construction at the end of 2011. In the meantime, with wind power now established as a mainstream energy source - adding 35% of all of America's new electric generating capacity between 2007 and 2010 - the US wind power industry is well positioned to benefit from a more stable policy environment.

With input from the American Wind Energy Association (AWEA)

1 www.20percentwind.org
2 NREL 2010: Eastern Wind Integration and Transmission Study http://www.nrel.gov/wind/systemsintegration/ewits.html

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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Join GWEC today!
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Text edited by Lauha Fried, Shruti Shukla & Steve Sawyer
Layout Bitter Grafik & Illustration
Cover photo Camocim wind farm, Ceará, Brazil © *Suzlon*

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