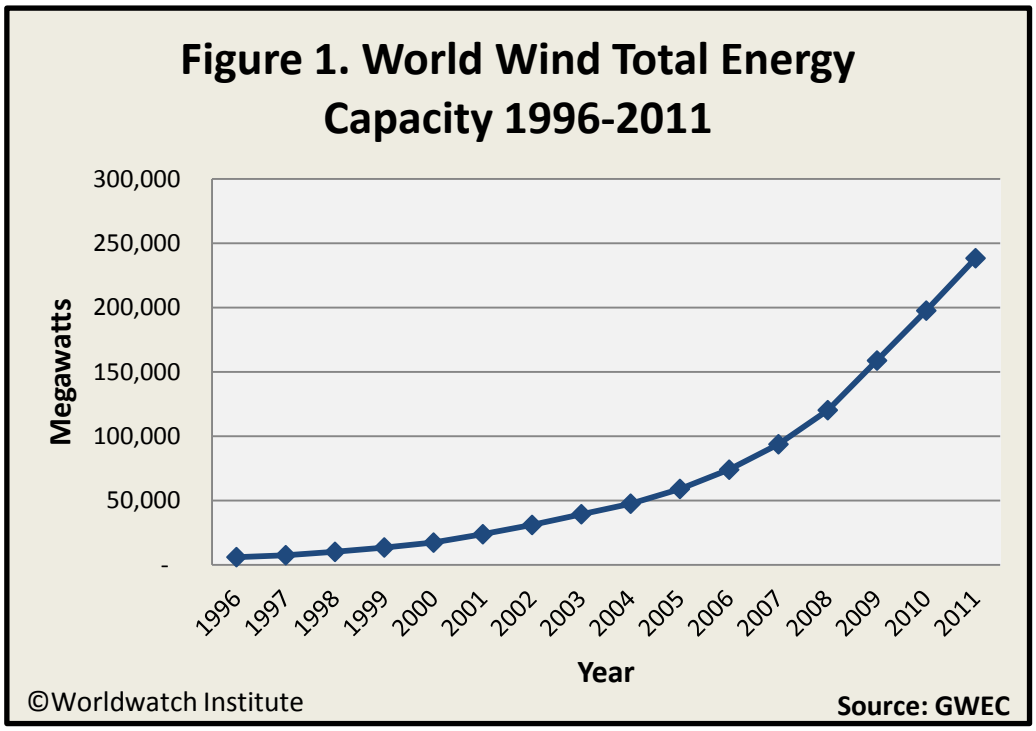
China Drives Global Wind Growth

Mark Konold and Samantha Bresler | May 30, 2012

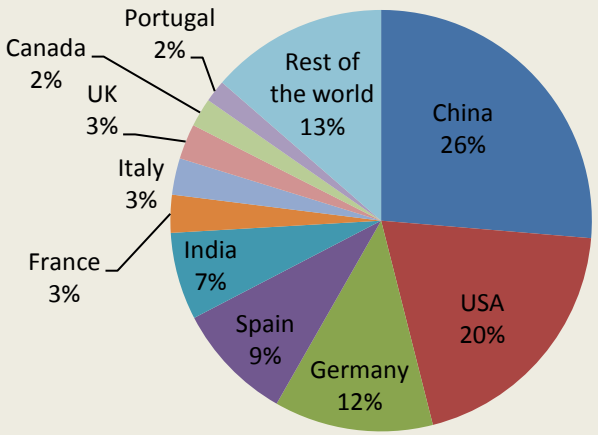
In 2011, global wind power capacity topped out at 238,000 megawatts (MW) after adding just over 41,000 MW.[1] (See Figure 1.) This means that the global capacity grew by 21 percent in 2011—lower than the 2010 rate of 24 percent and markedly lower than the 2009 rate of 31 percent.[2] Nonetheless, the world now has four times as much installed wind power capacity than in 2005, just seven years ago.[3]



China led the way with 43 percent of global capacity additions during 2011, followed by the United States at 17 percent, India with almost 7 percent, and Germany at 5 percent.[4] In terms of cumulative capacity, China has a commanding 26 percent of global installed capacity.[5] (See Figure 2.) It is followed by the United States, Germany, Spain, and India. A total of almost $75 billion was invested in wind energy installations in 2011, which was 22 percent less than invested in 2010.[6]

For the second year in a row China set the pace and propped up the industry, increasing its total capacity by 40 percent over 2010 levels.[7] China added just over 17,000 MW of new capacity, bringing its grand total to close to 63,000 MW.[8] There remains an important gap between total installed capacity and actual electricity available for use from wind power, however. Despite having the most installed wind capacity, China still struggles to use all the electricity its turbines generate.

Figure 2. Top 10 Total Capacity Generators by Country



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Source: GWEC

In 2011, China's cumulative wind capacity generated 69 terawatt-hours (TWh) of electricity, 1.5 percent of the country's total supply.[9] But just under 17 percent of that electricity never made it to the grid.[10] In fact, the provinces of Inner Mongolia and Gansu lost 23 and 25 percent of their generated capacity due to these technical difficulties.[11] China plans to have an electrical grid strong enough to fully integrate its total installed capacity by 2015.[12] During the next five years the State Grid Corporation of China plans to invest over $400 billion in power grid construction.[13] At the end of 2011, some 238 Smart Grid pilot projects had been implemented, with several addressing the lack of connection to wind power plants.[14]

In 2011, the United States added 6,800 MW of new capacity, bringing its total capacity to 46,919 MW.[15] Texas remained the country's leading state, with 10,377 MW of total capacity—up from 10,085 MW in 2010.[16] California and Illinois have the second and third largest capacities, with 921 MW and 693 MW respectively.[17] The United States generated just under 120TWh of electricity from wind power in 2011, a 27-percent increase from 2010.[18] However, this electricity accounted for less than 3 percent of total U.S. power generation in 2011.[19]

Wind power growth in the United States owes much to the federal government's Production Tax Credit (PTC), which helped finance approximately 4,000 MW of new capacity by reducing corporate income tax by 2.2¢ for every kilowatt-hour produced.[20] However, the PTC is due to expire at the end of 2012. If it is not extended, installations might falter and 37,000 jobs in the industry—out of a total of 75,000 currently—could be lost.[21]

The 27-member European Union (EU-27) installed 9,616 MW of wind power capacity in 2011, almost the same as in 2010.[22] Germany regained its lead position for installed wind power capacity there by adding 2,086 MW to its energy portfolio, reaching a total of 29,060 MW.[23] In 2011, wind-generated electricity provided 48 TWh of electricity, 7.8 percent of the country's electricity consumption.[24] The United Kingdom was responsible for 13 percent of the EU-27's installed wind capacity last year, adding 1,293 MW.[25]

Rounding out the top three was Spain, which had a slow year by its standards, adding only 1,050 MW compared with more than 3,500 MW added four years ago.[26] But Spain still has the second-largest installed wind power capacity in Europe, with a total of 21,674 MW.[27] Wind power provided Spain with 42 TWh of electricity, an impressive 15.7 percent of the country's total electricity consumption.[28]

Europe's sovereign debt crisis is pushing future growth projections of wind installation down and potentially affecting investment incentives.[29] The European Union continues to scale down its use of fuel oil and nuclear power and so must find another energy source to fill the impending shortfall. It is interesting to note that while growth in wind capacity remained constant, more coal power was installed than was decommissioned.[30]

India added 3,019 MW of new wind power, bringing its total to 16,084 MW by the end of 2011.[31] India has instituted a generation-based incentive (GBI) that is set to expire this year. By paying for capacity, the GBI allows 80 percent of a project's investment costs to be offset in the first year of operations and provides a tax exemption for earnings for 10 years.[32] According to a new study by Lawrence Berkeley National Laboratory, India has 20–30 times more onshore wind energy potential than previously estimated.[33]

Other parts of the world showed very modest growth in wind power installations. Brazil and Mexico led the way in Latin America with 581 and 354 MW, respectively.[34] Meanwhile, Africa and the Middle East combined had a total of just 31 MW of wind capacity installed in 2011.[35]

Wind installations also expanded offshore, particularly in Europe. In 2011, the EU saw the successful installation of 866 MW, raising its total offshore capacity to 3,810 MW.[36] As a percentage of total wind installations in 2011, however, offshore accounted for just 9 percent in 2011, compared with 9.2 percent in 2010.[37]

The United Kingdom remains the region's powerhouse, with over 2,000 MW of offshore capacity online.[38] (See Table 1.) Some 58 percent of the total capacity addition in the United Kingdom in 2011 was offshore.[39] Germany, which only has 200 MW of offshore capacity online right now, recently expanded its target to 25 gigawatts (GW) of offshore capacity by 2030.[40] Denmark and Norway are also stepping up their offshore portfolios. With 868 MW of offshore capacity installed, Denmark recently raised its wind target, as a percentage of its total future electricity mix from 44 to 52 percent by 2020.[41] And in Norway, the Havsul wind farm is expected to bring 350 MW of capacity online, the first step in realizing the country's plan for 11 GW total.[42]

In early 2012, China's largest offshore wind project, Rudong, was connected to the grid, adding 99.3 MW to the 32 MW from offshore that is already online.[43] Rudong's 131.3 MW capacity now surpasses China's other offshore wind farm, Donghai Bridge, which has a capacity of 102 MW.[44] The United States continues to lag behind Europe and China in offshore wind installations. The U.S. Department of Energy is to make $180 million available over the next six years to support up to four innovative wind farms off the coast of the country or in the Great Lakes.[45] In 2011, the United States outlined a plan to achieve 54 GW of offshore wind deployment at a cost of 7–9¢ per kilowatt-hour by 2030, with an interim target of 10 GW at 13¢ per kilowatt-hour by 2020.[46]

There appears to be a tendency toward larger-sized individual wind projects, both on and offshore, when considering additional infrastructure costs such as grid connection, substations, and permits.[47] In the first half of 2011, prices fell to $1.2 million per MW mainly because of supply chain efficiency improvements and economies of scale.[48] Competition from Chinese manufacturers and their excess capacity to build machines and flood the market also played a role.[49] In addition, the capacity factor of wind turbines

(the percentage of actual output to nameplate capacity) continues to rise as better technology continues to come on to the market, further driving down turbine cost. The combination of these factors is expected to bring down the cost of wind energy by 12 percent by 2016 and to make onshore wind power truly cost-competitive with coal, gas, and nuclear power.[50]

Table 1. Select EU Countries' Offshore Plans

Country	Currently Online (MW)	Planned (MW)
Denmark	857	1,200
France	0	6,000
Germany	200	21,493
Great Britain	2,094	42,114
Netherlands	247	3,953
Norway	2	11,042
Spain	0	6,804

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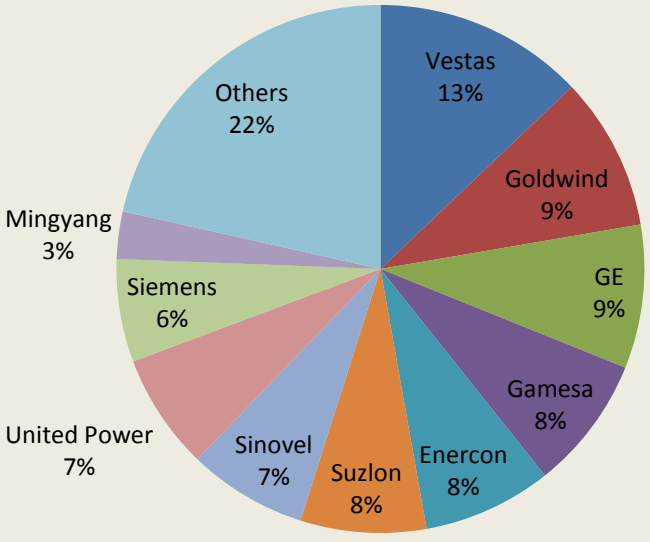
In sales, Vestas remains the world leader, with close to 13 percent of the world market, although that share is dwindling.[51] (See Figure 3.) In an effort to challenge Siemens for offshore market share supremacy, Vestas launched its V164 last year, a 7 MW turbine designed solely for offshore wind.[52] Chinese manufacturer Sinovel dropped from second place to seventh and was replaced in the number two spot by another Chinese manufacturer, Goldwind.[53] American producer GE remained in third place but saw a drop from last year's 9.6 percent of the market.[54]

Figure 3. Percent Market Share in 2011



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Notes

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[6] Sally Bakewell, "Clean Energy Investment Rises to $260 Billion, Boosted by Solar," *Bloomberg*, 12 January 2012.
[7] GWEC, op. cit note 1.
[8] Ibid.
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[47] REN21, *Renewables 2011 Global Status Report* (Paris: 2011), p. 21.
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