PikeResearch
Cleantech Market Intelligence

Research Report

EXECUTIVE SUMMARY:
Wind Energy Outlook for North America
Wind Power Generation Capacity and Turbine Deployments: Market Analysis and Forecasts

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Published 3Q 2009

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Section 1

EXECUTIVE SUMMARY

In 2008, U.S. wind power generation capacity passed the 25 GW mark by adding over 8 GW from the year before, which represented the largest individual gain of any country in the world. This growth rate of 50% exceeded that of the year before (45%) indicating that the market is still relatively young and the economic crisis that began in 2008 has not slowed it down—at least not yet. In 2007, generation capacity from renewable sources made up only 4% of the world's electricity sources, but 16% of new electricity generation capacity additions were from renewables with wind power making up more than 80% of these gains by renewables.

The year 2009 will be a defining moment for wind power markets around the world. The global economic crisis that began in late 2008 has thrown the industry into confusion, along with most other global industries. Two competing market views exist, and representatives from each camp were interviewed for this report across the wind power value chain, such as components suppliers, turbine OEMs, wind developers, and power providers.

The optimist sees this moment as one of great opportunity and potential growth. The U.S. has enacted renewable energy targets and incentives including feed-in tariffs, renewable energy tax credits, and grants, all which attempt to level the economic playing field for renewable energy versus traditional fuels. The recession, rather than dampening public enthusiasm for renewable energy, has highlighted the need for government investments to compensate for lack of private capital. Other fundamental drivers of the wind power market are fairly recession-resistant. First, total demand for electricity is expected to keep increasing, and electricity prices should continue to increase in the long term (even taking into account wild swings in gas and oil prices such as experienced in 2008). Second, wind energy has several key advantages over other renewable energies such as solar or hydroelectric which accounts for why wind power made up more than 80% of new renewable power capacity additions in 2007. Wind power has a lower lifetime cost of kilowatt-hours (kWh) produced and requires less land conversion (in the case of solar) or water diversion (in the case of hydroelectric). Further, wind energy forecasting models are improving in accuracy at a rate unmatched by solar capture predictions. Finally, the wind power market is also benefiting from technological innovations that continue to bring down the overall price of installing and operating wind farms. Economies of scale are accelerating as turbine capacities grow and new condition monitoring and control systems continue to bring down operations and maintenance (O&M) costs as well as unplanned stoppages. Overall, there is still tremendous opportunity for companies that commercialize efficient, clean energy technologies as demand for more efficient, more secure, and cleaner sources of electricity will continue to grow.

The pessimists say that although the wind energy market is still doing relatively well in early 2009, the bottom won't hit until late 2009 or 2010 since there is a long lag time in shocks to the wind energy development process. The largest impediment to the growth of wind power during a recession is its economic disadvantage to power from traditional fuels. The current global economic crisis has generally dampened investor confidence and capital availability. As a result, funding for wind energy projects has become significantly tighter. Further, wind power growth is contingent on successfully overcoming current transmission constraints in congestion, reliability, and access. Existing transmission lines are not always located near wind resources, and it is infeasible to move a significant

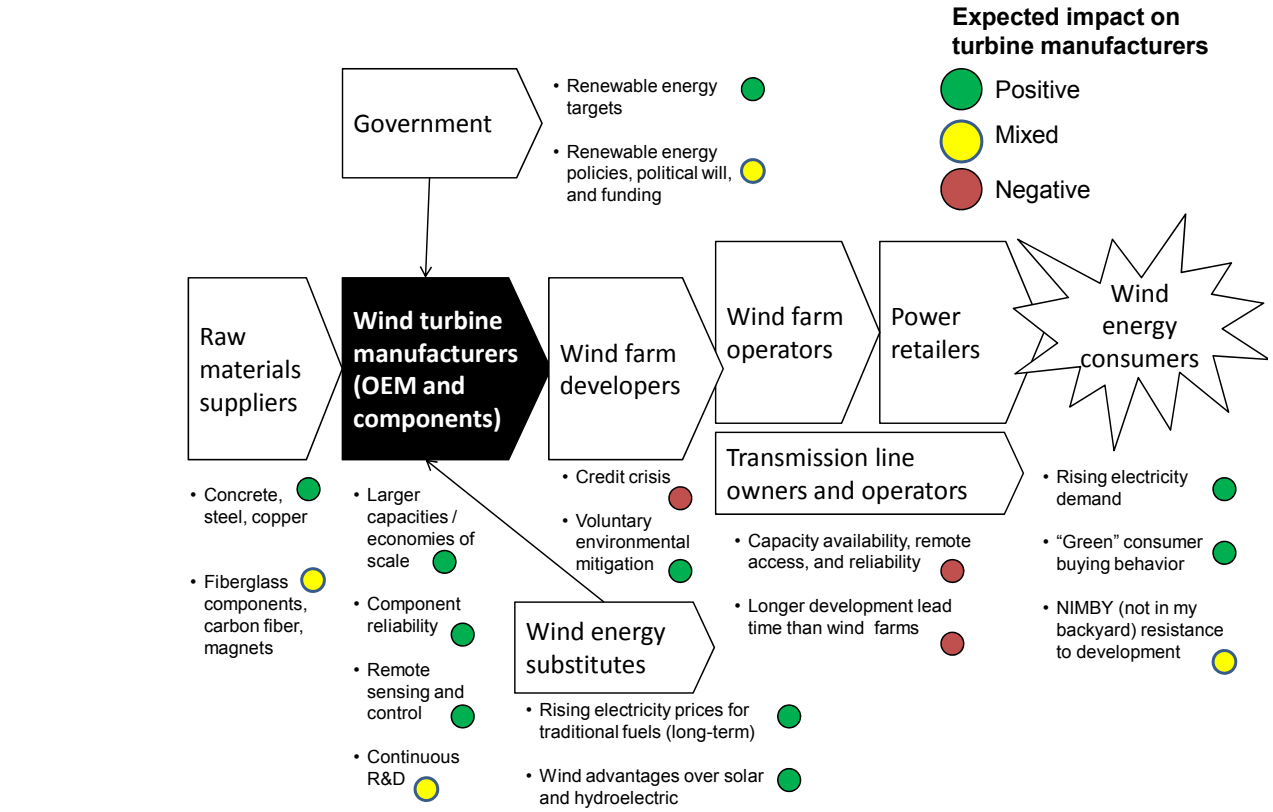
amount of electricity over long distances (for example, the U.S. is made of three fairly separate and congested regional grids covered by different regulatory bodies).

Shock waves from the global economic recession will affect wind industry players differently. Worst hit will be the small "mom-and-pop" developers that have invested personal funds in pre-development costs but can no longer access the funding required to pay for turbines or construction to complete their projects. One industry expert interviewed for this report estimated that there are 300 GW of wind development projects in the queue in the U.S. alone (defined as projects that have signed up to be in line for a connection to the grid). Even if the record-breaking 8 GW of new capacity that was installed in the U.S. in 2008 continues, there would still be almost 40 years of projects in the U.S. pipeline. This represents a significant opportunity for large developers with enough cash to pick up the best pre-development projects for bargain prices. Still, one major developer has said that it would not be placing any new turbine orders for delivery in 2011: "We have a lot of properties to develop but it's difficult to get credit financing, so we decided to scale back for 2009 and we have more turbines than we need."

If it's true that the demand for new turbines will stall or decline during the recession, established turbine manufacturers may not feel the effects until 2010 because they are still fulfilling orders made more than a year ago when turbine manufacturing lead times were longer. Construction of current developments has continued on pace since the start of the credit crisis in September 2008, with GE announcing that it would install 100 MW in the U.S. (Illinois) and Mitsubishi confirming it would deliver around 400 MW to Iberdrola Renewables in the U.S. through 2012. However, these will be fulfillments of orders placed before the recession began. New orders are not expected to continue to grow at the rate they have in recent years. Fortunately, many turbine manufacturers (OEM and components) have long-term service contracts that bring in stable annuity revenues that may somewhat compensate for declining new turbine orders. Replacing newly-aging fleets (the wind industry is about 30 years old) may help further stimulate demand for new, larger, more cost efficient wind turbines.

Pike Research's perspective on the wind energy industry is that it will continue to grow, but not at the pace that was expected prior to 2009. U.S. installed capacity may reach more than 80 GW by 2015. To get there, turbine manufacturers must leverage opportunities and deal with pressures from all sides. On the generally positive side, government policies are favorable in terms of renewable energy targets (but questionable in terms of political will and funding). Raw materials should be widely available, with the possible exception of some specialty inputs such as fiberglass components, carbon fiber and permanent magnets. Wind turbine manufacturers are improving industry profitability by tapping into economies of scale in building larger turbines, improving component reliability, introducing remote sensing and control systems, and continuing to invest in R&D. Wind power has some important advantages over traditional and other renewable sources. Consumers continue to be interested in renewable energy and demand for electricity will continue to rise. The more troubled spots of the industry that are putting negative pressures on turbine manufacturing are wind developers (due to financing problems) and transmission line congestion, lack of reliability, and lack of remote access. Overall, Pike Research expects the turbine sales in the U.S. to grow by a compound annual growth rate (CAGR) of 9.7% to reach an annual production volume of almost 8,000 turbines (with an average capacity of greater than 1 MW) by 2015.

Figure 1.1 Industry Outlook for Turbine Manufacturing



(Source: Pike Research)

Table 1.1 Summary of Opportunities and Challenges for Wind Power and Turbine Manufacturing

Source	Opportunity	Challenge
Government policies	Renewable energy targets that support state Renewable Portfolio Standards (RPS) and goals.	The details behind actually reaching those goals.
		The recession may cause some states to abandon or fail to enforce their renewable energy targets and policies.
		Failure to deal with electricity transmission constraints might critically hamper future wind farm development.
Consumer demand	Consumers have a high interest in increasing use of renewable power and view wind power positively and in comparison to other renewables.	The U.S. is still overcoming historical public opposition to offshore wind development in the U.S. Some landowners have concerns about visual impacts and property values.
	Wind developers such as Horizon Energy have begun to work with conservation groups to mitigate for environmental impacts of wind farms.	Some consumers are complaining that wind is not exactly green since wind farm production causes significant environmental impacts over a large area from road and transmission line construction as well as turbine erection.
Developer demand	Developers are still keeping commitments on turbines already ordered (20–30% deposit at risk).	Developers already feeling the effects of the credit crisis as tax equity investors become hard to find
	Large developers are buying pre-development projects from small developers at low prices, improving returns on investment for buyers and new investors.	In populated coastal areas such as the East coast, more wind development must go offshore to find enough space. This increases the costs of wind development, though also increases average output.
		It is thought that the highest potential wind sites are already developed (or too remote to develop). Therefore as time goes on, average capacity factors across the world may constantly decline.
		The cost of installing new transmission lines to reach remote wind farms continues to be a significant factor in selecting sites, which may drive down capacity factors further.
Substitutes	An expectation of continually rising fossil fuel prices fuels interest in renewables (even taking into account wild recent swings).	The 4x rise and subsequent fall of fossil fuel prices in 2008 has slowed interest in quickly substituting renewables for traditional power.
	Wind power is more cost efficient than solar or hydro power over the lifetime of a production facility.	All traditional power sources —coal, gas and nuclear—are significantly less expensive than solar. On a lifetime basis, waste incineration and biomass provide lower cost energy than wind power.

Source	Opportunity	Challenge
	U.S. wind industry is investing in research and development to help better predict wind speeds by location, which should help make wind power more predictable than solar power as well as reduce costs.	Wind farms still require the existence of "hot spinning reserves" of back-up traditional power sources such as gas-fired plants that can ramp up quickly when wind generation abruptly falls off due to wind intermittency. Thus building new wind farms may require also adding new gas-fired plants.
	Wind farms require less total land conversion from agriculture than concentrated solar developments	Wind power is subject to more transmission line constraints than solar since the sites with the best wind potential are often remote and far from existing transmission, whereas sunshine is less correlated with remoteness from transmission lines.
Turbine manufacturers	Turbines are increasing exponentially in capacities, which is driving down the average cost of wind power production due to significant economies of scale	Turbines often still need to be specifically designed to match particular power grid characteristics of different countries. This drives up design and manufacturing costs by requiring specialized facilities for different export markets.
	New developments in telescoping (self-erecting) tower technology may drastically lower transportation costs and open more high-wind sites to development potential	Larger turbines add logistical costs and complexities that need to be overcome with new transportation and assembly technologies.
	New remote sensing technologies should increase component reliability and reduce unexpected downtime	
	Design innovations such as a two-blade rotor and direct drive turbines (no gearbox) may significantly reduce production, transportation, and operations and maintenance costs.	
	As the industry hits the 30-year maturity mark, older turbines will increasingly need replacement, driving up demand for turbines above what will be used for new installations.	Turbine prices are falling with reduced demand due to the economic crisis that began in late 2008. It is unclear when prices will stabilize or grow again.
Raw materials	Many raw materials needed in the production of wind turbines are in ample supply, such as concrete, steel, and copper.	Other raw materials would be in short supply if many countries actually ramped up wind development at the pace required to meet national goals. These include fiberglass, carbon fiber, permanent magnets.

(Source: Pike Research)

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SCOPE OF STUDY

Pike Research has prepared this report to provide participants in the wind power market, including turbine manufacturers (OEMs and components suppliers), raw materials suppliers, EPC providers, wind power developers, other balance of station manufacturers, and power providers and purchasers with a study of the North American market for wind turbines and the expected growth of global wind power generation capacity. Its major objective is to identify and evaluate the opportunities and challenges facing the industry and to forecast likely future growth. The report also provides a review of major demand drivers as well as key industry players within the competitive landscape.

The report's purpose is not to provide an exhaustive technical assessment of the technologies and markets covered, but rather a strategic examination from an overall tactical business perspective. Pike Research strives to identify and examine new market segments to aid readers in the development of their business models. The forecast period extends through 2015.

SOURCES AND METHODOLOGY

Pike Research's industry analysts utilize a variety of research sources in preparing Research Reports. The key component of Pike Research's analysis is primary research gained from phone and in-person interviews with industry leaders including executives, engineers, and marketing professionals. Analysts are diligent in ensuring that they speak with representatives from every part of the value chain, including but not limited to technology companies, utilities and other service providers, industry associations, government agencies, and the investment community.

Additional analysis includes secondary research conducted by Pike Research's analysts and the firm's staff of research assistants. Where applicable, all secondary research sources are appropriately cited within this report.

These primary and secondary research sources, combined with the analyst's industry expertise, are synthesized into the qualitative and quantitative analysis presented in Pike Research's reports. Great care is taken in making sure that all analysis is well-supported by facts, but where the facts are unknown and assumptions must be made, analysts document their assumptions and are prepared to explain their methodology, both within the body of a report and in direct conversations with clients.

Pike Research is an independent market research firm whose goal is to present an objective, unbiased view of market opportunities within its coverage areas. The firm is not beholden to any special interests and is thus able to offer clear, actionable advice to help clients succeed in the industry, unfettered by technology hype, political agendas, or emotional factors that are inherent in cleantech markets.

NOTES

CAGR refers to compound average annual growth rate, using the formula:

CAGR = (End Year Value ÷ Start Year Value)$^{(1/steps)}$ – 1.

CAGRs presented in the tables are for the entire time frame in the title. Where data for fewer years are given, the CAGR is for the range presented. Where relevant, CAGRs for shorter time frames may be given as well.

Figures are based on the best estimates available at the time of calculation. Annual revenues, shipments, and sales are based on end-of-year figures unless otherwise noted. All values are expressed in year 2009 U.S. dollars unless otherwise noted. Percentages may not add up to 100 due to rounding.

ACKNOWLEDGEMENTS

Pike Research wishes to acknowledge the generous contributions of industry experts who gave their time and expertise by sharing their perspectives and experiences. These contributors include but are not limited to: Jeff Brown (Nordic Windpower), Jason Fredette (American Superconductor Corp.), Clint Harris (Renewable Resource Consultants LLC), Joel Johnson (Berrendo Wind), Bill Mahoney (University Corporation for Atmospheric Research), Mark Trinnel (British Petroleum Alternative Energy), and Brian Walshe (ION Consulting). In addition, several other key contributors wished to remain anonymous, including representatives from major turbine and component manufacturers and global wind power developers, and Pike Research is grateful for their assistance as well.

Published 3Q 2009

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