

Wind Energy: Balancing the Demand

Faced with supply chain problems and insufficient government support, wind power operators continue to herald their industry's promise.

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In recent years, exponential demand for new U.S. wind energy-generating facilities has nearly doubled America's installed wind generation. By the end of 2007, our nation's total wind capacity stood at more than 16,000 megawatts (MW) - enough to power more than 4.5 million average American homes each year. And in 2007 alone, America's new wind capacity grew 45 percent over the previous year - a record 5,244 MW of new projects and more new generating capacity than any other single electricity resource contributed in the same year. At the same time, wind-related employment nearly doubled in the United States during 2007, totaling 20,000 jobs. At more than

power costs that compete with natural gas-fired power plants; and state legislatures that are competing to lure new jobs and wind power developments to their states. Despite these favorable conditions, the wind energy industry has been unable to meet America's true demand for new wind energy-generating facilities. The barriers include the following: availability of key materials, the ability to manufacture large key components and the accessibility of skilled factory workers.

With the proper policies and related investments in infrastructure and workforce development, the United States stands to become a powerhouse exporter of wind power equipment, a wind technol-

demand has taken place in the European Union (E.U.) countries. Wind power capacity there currently totals more than 50,000 MW, with projections that wind could provide at least 15 percent of the E.U.'s electricity by 2020 - amounting to an installed wind capacity of 180,000 MW and an estimated workforce of more than 200,000 people in wind power manufacturing, installation and maintenance jobs.

How is it, then, that European countries were able to secure the necessary parts and people while the United States fell short in its efforts on these fronts? After all, America has a bigger land mass and a larger, more high-quality wind resource than the E.U. countries. Indeed,



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\$9 billion in cumulative investment, wind also pumped new life into regional economies hard hit by the recent economic downturn. [1]

The rapid development of wind installations in the United States comes in response to record-breaking demand driven by a confluence of factors: overwhelming consumer demand for clean, renewable energy; skyrocketing oil prices;

ogy innovator and a wind-related job creation engine. Escalating demand for wind energy is spurred by wind's competitive cost against rising fossil fuel prices and mounting concerns over the environment, climate change and energy security.

Meanwhile, market trends and projections point to strong, continued demand for wind well into the future. Over the past decade, a similar surge in wind energy

the United States is already home to the world's largest wind farms, including the 735-MW Horse Hollow Wind Energy Center in Texas, which generates power for about 230,000 average homes each year. What's more, this country also has an extensive manufacturing base, a skilled labor pool and a pressing need to address energy and climate challenges.

So what's missing? In short, *robust national policy support* - a prerequisite for strong, long-term investment in the sector. Such support would enable the industry to secure long lead-time materials and sufficient ramp-up to train and employ workers to continue wind power's surging growth. Thus, the United States must rise to the occasion and assemble several key,

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interrelated puzzle pieces - policy, parts and people - if it's to tap the full potential of wind energy.

POLICY: LONG-TERM SUPPORT AND INVESTMENT

In the United States, the federal government has played a key role in funding research and development, commercialization and large-scale deployment of most of the energy sources we rely on today. The oil and natural gas industry has enjoyed permanent subsidies and tax credits that date back to 1916 when Congress created the first tax breaks for oil and gas production. The coal industry began receiving similar support in 1932 with the passage of the first depletion allowances that enabled mining companies to deduct the value of coal removed from a mine from their taxable revenue.

Still in effect today, these incentives were designed to spur exploration and extraction of oil, gas and coal, and have since evolved to include such diverse mechanisms as royalty relief for resources developed on public lands; accelerated depreciation for investments in projects like pipelines, drilling rigs and refineries; and ongoing support for technology R&D and commercialization, such as the Department of Energy's now defunct FutureGen program for coal research, its Deep Trek program for natural gas development and the VortexFlow SX tool for low-producing oil and gas wells.

For example, the 2005 energy bill passed by Congress provided more than \$2 billion in tax relief for the oil and gas industry to encourage investment in exploration and distribution infrastructure. [2] The same bill also provided an expansion of existing support for coal, which in 2003 had a 10-year value of more than \$3 billion. Similarly, the nuclear industry receives extensive support for R&D - the 2008 federal budget calls for more than \$500 million in support for nuclear research - as well as federal indemnity that helps lower its insurance premiums. [3]

Over the past 15 years, the wind power industry has also enjoyed federal support, with a small amount of funding for

R&D (the federal FY 2006 budget allotted \$38 million for wind research) and the bulk of federal support taking the form of the Production Tax Credit (PTC) for wind power generation. The PTC has helped make wind energy more cost-competitive with other federally subsidized energy sources; just as importantly, its relatively routine renewal by Congress has created conditions under which market participants have grown accustomed to its effect on wind power finance.

However, in contrast to its consistent policies for coal, natural gas and nuclear power, Congress has never granted long-term approval to the wind power PTC. For more than a decade, in fact, Congress has failed to extend the PTC for longer than two years. And in three different years, the credit was allowed to expire with substantial negative consequences for the industry. Each year that the PTC has expired, major suppliers have had to, in the words of one senior wind power executive, "shut down their factories, lay off their people and go home."

In 2000, 2002 and 2004, the expiration of the PTC sent wind development plummeting, with an almost complete collapse

to expire at the end of 2008, American Wind Energy Associates (AWEA) estimates that as many as 75,000 domestic jobs could be lost as the industry slows production of turbines and power consumers reduce demand for new wind power projects.

The last three years have seen tenuous progress, with Congress extending the PTC for one and then two years; however, the wind industry is understandably concerned about these short-term extensions. Of significant importance is the corresponding effect a long-term or permanent extension of the PTC would have on the U.S. manufacturing sector and related investment activity. For starters, it would put the industry on an even footing with its competitors in the fossil fuels and nuclear industries. More importantly, it would send a clear signal to the U.S. manufacturing community that wind power is a solid, long-term investment.

PARTS: UNLEASHING THE NEXT MANUFACTURING BOOM

To fully grasp the trickle-down effects of an uncertain PTC on the wind power and related manufacturing industries, one must understand the industrial scale of a

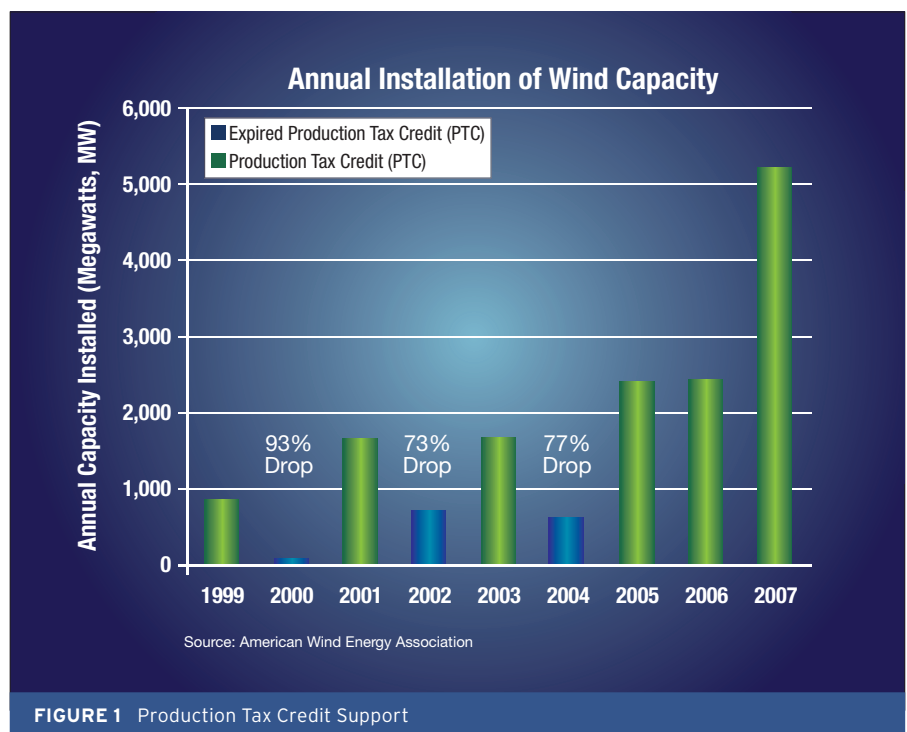


FIGURE 1 Production Tax Credit Support

wind turbines represent the largest rotating machinery in the world: a modern-day, 1.5-megawatt machine towers more than 300 feet above the ground with blades that outspan the wings of a 747 jetliner, and a typical utility-scale wind farm will include anywhere from 30 to 200 of these machines, planted in rows or staggered lines across the landscape.

The sheer size and scope of a utility-scale wind farm demands a sophisticated and established network of heavy equipment and parts manufacturers can fulfill orders in a timely fashion. Representing a familiar process for anyone who's worked in a steel mill, forgery, gear-works or similar industrial facility, the manufacture of each turbine requires massive, rolled steel tubes for the tower; a variety of bearings and related components for lubricity in the drive shaft and hub; cast

Other manufacturers have also seen the opportunity that wind development presents and have taken similar steps. For example, Beard Co. Ltd, a Shreveport, La.-based metal fabrication and machined parts manufacturer, supplies towers to the Midwest, Texas and Florida wind markets, as does DMI Industries from facilities in Fargo, N.D., and Tulsa, Okla.

But the successful conversion of existing manufacturing facilities to make parts for the wind industry belies an underlying challenge: investment in new manufacturing capacity to serve the wind industry is hindered by the lack of a clear policy framework. Even at wind's current growth rates and with the resulting pent-up domestic demand for parts, the U.S. manufacturing sector is understandably reticent to invest in new production capacity.

manufacturers that could be claiming a larger chunk of the underdeveloped U.S. wind market. As the largest consumer of electricity on earth, the United States also represents the biggest untapped market for wind power. At the end of 2007, with multiple successive years of 30 to 40 percent growth, wind power claimed just 1 percent of the U.S. electricity market. The raw potential for wind power in the United States is three times our total domestic consumption, according to the U.S. Energy Information Administration; if supply chain issues weren't a problem, wind power could feasibly grow to supply as much as 20 to 30 percent of our \$330 billion annual domestic electricity market. At 20 percent of domestic energy supply, the United States would need 300,000 MW of installed wind power capacity - an amount that would take 20 to 30 years



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steel for housings and superstructure; steel forgings for shafts and gears; gear-boxes for torque transmission; molded fiberglass, carbon fiber or hybrid blades; and electronic components for controls, monitoring and other functions.

U.S. manufacturers have extensive experience making all of these components for other end-use applications, and many have even succeeded in becoming suppliers to the wind industry. For example, Ameron International - a Pasadena, Calif.-based maker of industrial steel pipes, poles and related coatings - converted an aging heavy-steel fabrication plant in Fontana, Calif., to make wind towers. At 80 meters tall, 4.8 meters in diameter and weighing in at 200 tons, a wind tower requires large production facilities that have high up-front capital costs. By converting an existing facility, Ameron was able to capture a key and rapidly growing segment of the U.S. wind market in high-wind Western states while maintaining its position in other markets for its steel products.

The cause for this reticence is depicted graphically in Figure 1. With the stop-and-go nature of the PTC regarding U.S. wind development, and the consistent demand for their products in other end-use sectors, American manufacturers have strong disincentives to invest in new capital projects targeting the wind industry. It can take two to six years to build a new factory and 15 or more years to recapture the investment. The one- to two-year investment cycle of the U.S. wind industry is therefore only attractive to players who are comfortable with the risk and can manage wind as a marginal customer rather than an anchor tenant. This means that over the long haul, the United States could be legislating itself out of the "renewables" space, which arguably has a potential of several trillion dollars of global infrastructure.

The result in the marketplace: the United States ends up *importing* many of the large manufactured parts that go into a modern wind turbine - translating to a missed opportunity for domestic

of sustained manufacturing and development to achieve. But that would require growth well above our current pace of 4,000 to 5,000 MW annually - growth that simply isn't possible given current supply constraints.

Of course, that's just the U.S. market. Global wind development is set to more than triple by 2015, with cumulative installed capacity expected to rise from approximately 91 gigawatts (GW) by the end of 2007 to more than 290 GW by the end of 2015, according to forecasts by Emerging Energy Research (EER). Annual MW added for global wind power is expected to increase more than 50 percent, from approximately 17.5 GW in 2007 to more than 30 GW in 2015, according to EER's forecasts. [4]

By offering the wind power industry the same long-term tax benefits enjoyed by other energy sources, Congress could trigger a wave of capital investment in new manufacturing capacity and turn the United States from a net importer of wind power equipment to a net exporter. But

extending the PTC is not the final step: as much as any other component, a robust wind manufacturing sector needs skilled and dedicated people.

PEOPLE: RECLAIMING OUR MANUFACTURING ROOTS

In 2003, the National Association of Manufacturers released a study outlining many of the challenges facing our domestic manufacturing base. "Keeping America Competitive - How a Talent Shortage Threatens U.S. Manufacturing" highlights the loss of skilled manufacturing workers to foreign competitors, the problem of an aging workforce and a shift to a more urban, high tech economy and culture.

In particular, the study notes a number of "image" problems for the manufacturing industry. To wit: Among a geographically, ethnically and socio-economically diverse set of respondents - ranging from students, parents and teachers to policy analysts, public officials, union leaders, and manufacturing employees and executives - the sector's image was found to be heavily loaded with negative connotations (and universally tied to the old "assembly line" stereotype) and perceived to be in a state of decline.

When asked to describe the images associated with a career in manufacturing, student respondents offered phrases such as "serving a life sentence," being "on a chain gang" or a "slave to the line," and even being a "robot." Even more telling, most adult respondents said that people "just have no idea" of manufacturing's contribution to the American economy.

The effect of this "sector fatigue" can be seen across the Rust Belt in the

aging factories, retiring workforce and depressed communities being heavily impacted by America's turn away from manufacturing. Wind power may be uniquely positioned to help reverse this trend. A growing number of America's young people are concerned about environmental issues, such as pollution and global warming, and want to play a role in solving these problems. With the lure of good-paying jobs in an industry committed to environmental quality and poised for tremendous growth, wind power may provide an answer to manufacturers looking to lure and retain top talent.

We've already seen that you don't need a large wind power resource in your state to enjoy the economic benefits of wind's surging growth: whether it's rolled steel from Louisiana and Oklahoma, gear boxes and cables from Wisconsin and New Hampshire, electronic components from Massachusetts and Vermont, or substations and blades from Ohio and Florida, the wind industry's needs for manufactured parts - and the skilled labor that makes them - is massive, distributed and growing by the day.

UNLEASHING THE POWER OF EVOLUTION

The wind power industry offers a unique opportunity for revitalizing America's manufacturing sector, creating vibrant job growth in currently depressed regions and tapping new export markets for American-made parts. For utilities and energy consumers, wind power provides a hedge against volatile energy costs and harvests one of our most abundant natural resources for energy security.

The time for wind power is now. As mankind has evolved, so too have our primary sources of energy: from the burning of wood and animal dung to whale oil and coal; to petroleum, natural gas and nuclear fuels; and (now) to wind turbines. The shift to wind power represents a natural evolution and progression that will provide both the United States and the world with critical economic, environmental and technological solutions. As energy technologies continue to evolve and mature, wind power will soon be joined by solar power, ocean current power and even hydrogen as cost-competitive solutions to our pressing energy challenges. ■

ENDNOTES

1. "American Wind Energy Association 2007 Market Report" (January 2008). www.awea.org/Market_Report_Jan08.pdf
2. Energy Policy Act of 2005, Section 1323-1329. www.citizen.org/documents/energyconferencebill0705.pdf
3. Aileen Roder, "An Overview of Senate Energy Bill Subsidies to the Fossil Fuel Industry" (2003), Taxpayers for Common Sense website. www.taxpayer.net/greenscissors/LearnMore/senatefossilfuelsubsidies.htm
4. "Report: Global Wind Power Base Expected to Triple by 2015" (November 2007), North American Windpower. www.nawindpower.com/naw/e107_plugins/content/content_it.php?content.1478

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