Winds of Change

A Manufacturing Blueprint for the Wind Industry

June 2010

AWEA

BLUEGREEN ALLIANCE

UNITED STEELWORKERS USW UNITY AND STRENGTH FOR WORKERS

WHO WE ARE

American Wind Energy Association (AWEA)

AWEA is the national trade association of America's wind industry, with more than 2,300 member companies, including global leaders in wind power and energy development, wind turbine manufacturing, component and service suppliers, and the world's largest wind power trade show. AWEA is the voice of wind energy in the U.S., promoting renewable energy to power a cleaner, stronger America. Look up information on wind energy at www.awea.org.

BlueGreen Alliance (BGA)

The BlueGreen Alliance is a national partnership of labor unions and environmental organizations working to expand the number and quality of jobs in the clean energy economy. Launched in 2006, the BlueGreen Alliance now unites eight major U.S. labor unions and two of America's largest environmental organizations – with more than eight and a half million members and supporters – in pursuit of good jobs, a clean environment and a green economy.

United Steelworkers (USW)

The USW is the largest industrial union in North America, representing 850,000 active workers employed in manufacturing, energy, public and the service sectors. It is the dominant union in metals, mining, pulp and paper, rubber, oil, chemicals, cement and glass, but also represents professional and technical workers, nurses, pharmacists, hospital and municipal employees. The USW is a founding organization of the BlueGreen Alliance and the Alliance for American Manufacturing. For more about the USW: www.usw.org.

TABLE OF CONTENTS

I.

INTRODUCTION

With the development of the clean energy economy, the U.S. is poised to revitalize the manufacturing sector and create new clean energy manufacturing jobs across the country. The wind energy industry, which currently employs 18,500 workers in the manufacturing sector, could support tens of thousands of additional jobs manufacturing wind turbines and components if the right policies are put in place. The past five years have seen remarkable growth for the American wind industry, but this has come in the absence of a long-term and stable market for wind energy or specific policies to support wind's manufacturing sector. Thus, while growth in wind energy manufacturing has been impressive, with more than seven-fold employment growth in five years, it could be far greater with strong policies aimed at creating a long-term, stable market and supporting the manufacturing sector's transition into the production of wind equipment.

In 2009, the U.S. wind industry installed over 10 gigawatts (GW) of new generating power and accounted for nearly two percent of American electricity. This followed four years of record-breaking growth. While these gains contributed to the rapid development of domestic supply chains for wind turbines and increased wind industry manufacturing employment, the market for new wind turbines is not stable and has recently stalled. In the first quarter of 2010 only 539 megawatts (MW) were installed, the lowest quarterly number in three years, and power contracts and turbine orders slowed to a trickle. The industry is beginning to experience another downturn after a decade with three boom-bust cycles. Unlike the permanent tax credits and insurance that exist for other energy sources, policy support for the wind industry continues to fluctuate, requiring tax credit extensions on a one to three-year basis. In this unstable environment, many manufacturers cannot justify the significant

investment required to open new facilities or retool existing facilities; by the time a new facility comes online, the market could disappear. Providing the incentives and tools to create jobs for American workers to manufacture wind turbine components makes sense not only for our workers, but also for the wind industry.

Modern wind turbines are giant structures with significant material and component needs. In a long-term market, the fundamentals of the industry favor the development of domestic supply chains. Even without strong policies in place, the wind industry has increased its domestic content since 2005, the first year in which a strong market for turbines existed, to approximately 50 percent in 2009. From 2005 to 2009 annual installations quadrupled, representing even greater growth in domestic manufacturing for wind. The first components for which domestic manufacturing developed were those that were large and costly to transport – first towers and then blades. Now the U.S. market is developing the capacity to assemble wind turbine nacelles domestically, with the number of assembling facilities expected to double in coming years. The components inside the nacelles, which are high-value and labor-intensive, can be manufactured in the U.S., but require capital investment. Setting long-term, national targets for renewables and providing incentives for manufacturers will provide the security and support needed for additional companies to expand into the wind industry and create new American jobs in the clean energy economy.

Employment in manufacturing for the wind industry has grown rapidly, from 2,500 jobs in 2004 to 18,500 in 2009. There are 14,000 additional manufacturing jobs in the pipeline for wind, but these and further jobs will only come online with policies dedicated to regrowing our manufacturing sector. With a national renewable electricity standard (RES) and necessary complementary policies and investments to support the existing manufacturing base, the industry can and will develop robust supply chains and create more American manufacturing jobs.

Expanding wind power generation in the U.S. with the concurrent development and utilization of domestically-located sources of supply will require a national commitment to U.S. manufacturing. To this end, the American Wind Energy Association and the United Steelworkers Union announced a Framework Agreement creating a Partnership for Progress. This Framework Agreement calls for a national public policy strategy coupled with results-oriented targets related to supply chain utilization. National policy commitments must be met with individual company actions to ensure that wind power generation achieves all our goals: energy security, stable and sustainable energy supplies, carbon reduction and economic security.

The pathway towards developing these new supply chains and creating clean energy manufacturing jobs consists of two fundamental steps: first, creating a long-term market to justify the investment required to enter the industry, and second, providing the support needed by the manufacturing sector to transition into the production of wind equipment. The central strategy for creating the market is passing comprehensive energy legislation that includes a strong national Renewable Electricity Standard (RES) with meaningful near-

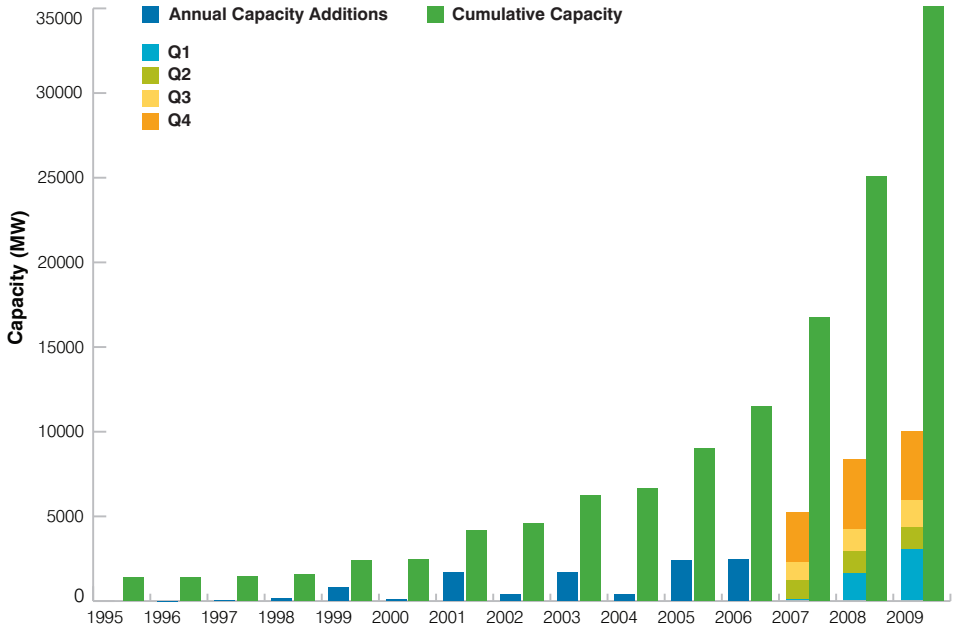
term targets. Like the passage of an RES in states like Pennsylvania, which was the crucial factor in Gamesa's decision to locate its wind turbine manufacturing facilities in the state, resulting in the employment of over one thousand steel workers, this would demonstrate that the U.S. is committed to the growth of the wind industry and immediately catalyze demand. Other policies to support the development of a robust wind energy market should include an extension of the American Reinvestment and Recovery Act's 1603 convertible tax credit and a long-term price signal on greenhouse gas emissions coupled with comprehensive and fully-funded policies to prevent carbon and job leakage in the energy-intensive, trade-exposed manufacturing sector. Support of the domestic market must also include expansion of the transmission grid infrastructure. To help grow the domestic supply chain for wind turbines and components, federal legislation should expand the oversubscribed Advanced Energy Manufacturing Tax Credit to provide incentives for additional manufacturers to retool and expand into the wind industry. Similarly, provisions already passed as part of the American Reinvestment and Recovery Act (ARRA) to provide loan guarantees to clean energy manufacturers must be implemented quickly. Legislation should also be passed to create and fund the Investments for Manufacturing Progress and Clean Technology (IMPACT) and Renewable Energy Market Access Program (REMAP) Acts, and to invest in the Green Jobs Act. Together, these provisions support the development of domestic supply chains and the "skilling up" of our manufacturing workforce. States also have a role to play in helping drive growth in clean energy manufacturing, and their actions can determine whether their manufacturers are successfully connected to wind energy supply chains.

II.

HISTORY AND CURRENT STATUS OF THE U.S. WIND ENERGY INDUSTRY

Despite a weak economy, the U.S. wind energy industry broke all previous records in 2009, installing over 10,000 MW of new wind energy capacity. This incredible growth brought total installed capacity to over 35,000 MW, which is enough wind power capacity to power the equivalent of approximately 9.7 million American homes. The marked recent growth of the industry – a 39 percent average annual growth rate over the past five years – boosted the U.S. to the number one spot in 2008 for total wind energy installations, a position it maintained in 2009. The U.S. last held the title of global leader in the 1980s, when the country embraced new policies to bolster renewable forms of energy.

Figure 1. U.S. Annual and Cumulative Wind Power Capacity Growth



Year	Annual Capacity Additions (MW)	Cumulative Capacity (MW)
Through end 1995		1416
1996	1	1417
1997	17	1434
1998	140	1574
1999	819	2394
2000	67	2460
2001	1691	4151
2002	412	4563
2003	1670	6233
2004	397	6629
2005	2385	9014
2006	2462	11476
2007	5258	16725
2008	8366	25076
2009	10010	35086

The utility-scale wind energy market was born in the United States, and the U.S. was the global leader in the first half of the 1980s. Following the 1973 oil embargo, the Federal Wind Program was established for research, development and demonstration of wind energy projects. Two important policies were adopted in 1978, setting the stage for wind development: the Energy Tax Act of 1978 created a 15 percent Energy Investment Tax Credit (EITC) through 1985; and the Public Utilities Regulatory Policies Act of 1978 required utilities to purchase qualifying renewable energy. Combined, these policies led to rapid growth in the first half of the 1980s. In 1985, the wind industry installed 1,000 MW – a level that would not be matched again until 2001. By 1986, the U.S. was home to around 90 percent of global wind installations, mostly in California. Driven by the favorable policy environment, the U.S. became the early global leader in wind technology and installations.

In the following years, strong policies in Europe and the expiration of the EITC led to overseas growth and domestic stagnation, respectively. Between 1987 and 1997, the U.S. wind industry installed less than 50 MW of new wind projects per year; in 1998, the U.S. had 1,853 MW of wind compared to 6,453 MW in Europe. During this time, the technological expertise for wind turbine manufacturing developed in Europe, and many of the global leaders today are headquartered in European countries. The production tax credit (PTC) was enacted for the U.S. industry in 1992 but expired in mid-1999, and afterward was typically only extended for one year at a time, sometimes after a previous extension's expiration, creating an extremely uncertain environment for investment. Despite this instability, the U.S. wind industry began to pick up speed in the 2000s, driven by the many states that adopted renewable standards and goals during these years.

Between 2005 and 2009, the PTC was extended steadily, and the relative policy stability led to the U.S. eventually regaining its global lead in installations. The industry grew from around 6,700 MW at the end of 2004 to around 35,000 MW at the end of 2009 – a five-fold increase in just five years. The manufacturing sector for wind also grew rapidly during this time with many new manufacturing facilities coming online and existing suppliers diversifying into the wind industry.

Following the financial crisis, wind installations were expected to drop by 50 percent in 2009 – from 8,400 MW in 2008 to 4,000-5,000 MW in 2009.[1] However, due to provisions in the American Recovery and Reinvestment Act of 2009 (ARRA), the wind industry was able to install over 10,000 MW of new capacity. ARRA extended the PTC through 2012, and allowed developers to convert the PTC into a 30 percent Investment Tax Credit (ITC) that could be converted into an equivalent cash grant through 2010. By monetizing the primary financial incentive for the industry at a time when a tax credit was of little value to most investors due to lack of tax liability, ARRA provided a great boost to the industry and paved the way for a record-breaking year.

Despite this strong growth in installations, the unstable quality of the U.S. wind energy market made manufacturing investment risky; throughout the 2000s, the stop-and-go nature of the PTC, with a maximum window of 1.5 years, deterred manufacturers from fully

investing in the U.S. wind energy market. Currently, the policies enacted as part of ARRA will provide a market through 2012, but again, there is no guarantee of a PTC extension past that date. In order to attract additional manufacturing investment and ensure U.S. wind manufacturing facilities are running at full capacity, a broad policy response is needed that ensures a long-term market and stimulates investment in U.S. wind manufacturing and the hiring of U.S. workers to manufacture for the wind industry.

The U.S. is currently the global leader in cumulative wind energy installations, but without action this could change. An increasingly diverse set of countries is enhancing their renewable energy portfolios, and challenges to American wind energy leadership are growing. Nations around the world – including developing countries like China and India – have strong policies in place to promote wind and other renewable energy technologies. Driven by national targets and policies designed to bolster domestic wind turbine manufacturing, whether by domestic or foreign firms, China installed nearly 14 GW of wind power capacity in 2009.[2] The Chinese target for wind power is 100 GW by 2020 – around three times larger than the current U.S. installation level. While it still trails the U.S. in cumulative installations, the Chinese annual market is currently significantly larger than the U.S. annual market. Without an assertive domestic policy response by the U.S. that includes renewable energy targets, China will surpass the U.S. in annual installations in the next several years, creating thousands of Chinese jobs in manufacturing and other sectors. Countries like China have begun developing industrial policies and competitive strategies to become leaders in wind power generation and component manufacturing. By creating a long-term stable market, countries like China are taking advantage of the opportunities in the new clean energy economy.

III.

CURRENT STATUS OF U.S. WIND ENERGY MANUFACTURING

The wind industry has only truly existed in the U.S. as a major market for the past five years. Prior to 2005, only 6,700 MW had been installed cumulatively in the U.S. Since then, cumulative wind power capacity has increased five-fold. While the industry does not have a long-term market signal in place, the fundamentals of the industry have been strong for the past five years, and both domestic and foreign businesses have begun to invest in U.S.-based manufacturing for the wind industry.

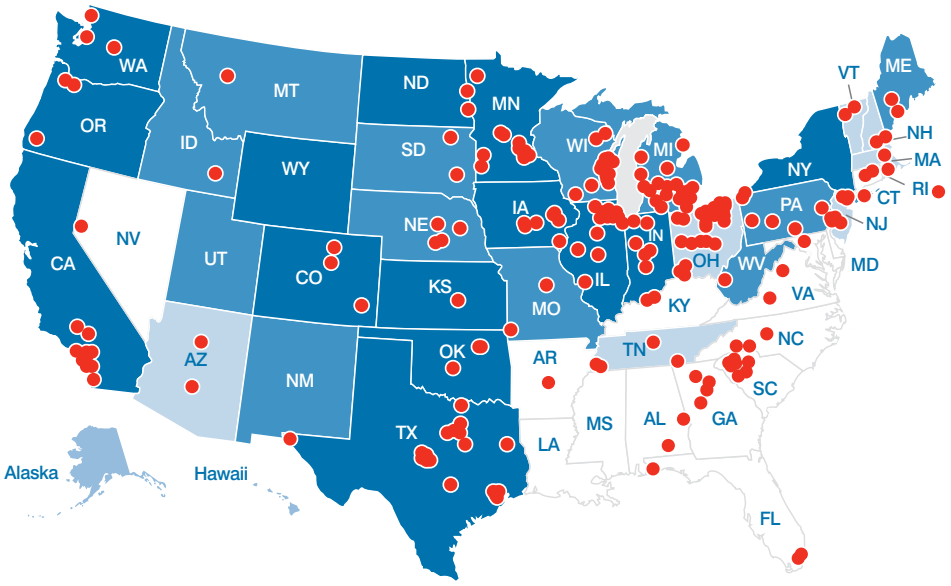


Figure 2. All Online Wind Manufacturing Facilities

The manufacturing sector for the wind industry has grown significantly in the past several years, adding, announcing or expanding over 100 facilities since 2007. Currently, well over 240 facilities across the U.S. supply to the wind industry, up from a few dozen in 2004, and this figure does not capture many additional facilities at the sub-supplier level.[3] Wind manufacturing facilities can be found in every region of the United States, and include major new wind-dedicated facilities as well as established businesses that have diversified into the wind energy industry.

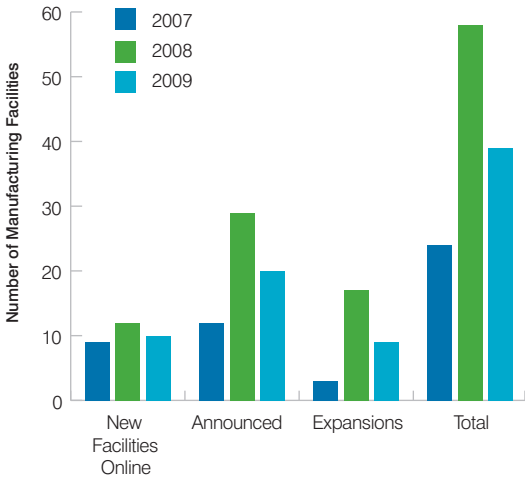


Figure 3. Wind Manufacturing Facility Activity

The first components for which domestic supply bases developed were those that are large and expensive to transport, namely, towers and blades. After only five years of a strong domestic market, the majority of the blades and towers used in U.S. projects are produced domestically.[4]

Following the development of domestic markets for towers and blades, turbine manufacturers began to establish nacelle assembly facilities in the U.S. This market segment is in the middle of developing its domestic manufacturing base, and the top market players, who account for 96 percent of the 2009 market, all have either online or announced facilities or both.

Nacelle internals, which are smaller yet highly complex, high-value components, are the last area for which domestic manufacturing capability is developing. The first major gearbox and generator facilities for the wind industry came online in 2009, and more are on the way. Domestic supply for nacelle components is growing, but it cannot currently meet domestic demand. For some components, there are currently no domestic suppliers. With a supportive policy framework in place, the U.S. can develop this supply base.

	Online in 2004	Online in 2009	Announced	Total Expected Online in Coming Years
Towers	6	20	8	28
Blades	4	9	3	12
Nacelle Assembly	3	8	8	16
Total	30-40[5]	Over 240	40	Over 280
Manufacturing Jobs	2,500[5]	18,500	14,000	32,500

Figure 4. Online and Announced Facilities and Total Manufacturing Jobs

Taking into account this significant domestic manufacturing development, domestic content has increased significantly over the past several years. In 2005, the wind industry installed around 2,400 MW. This was the first major year for installations, and the U.S. had not yet built out the wind supply chain. At the end of 2004 and beginning of 2005, domestic content in wind turbines, by value, was around 25 percent. This number primarily represents towers,

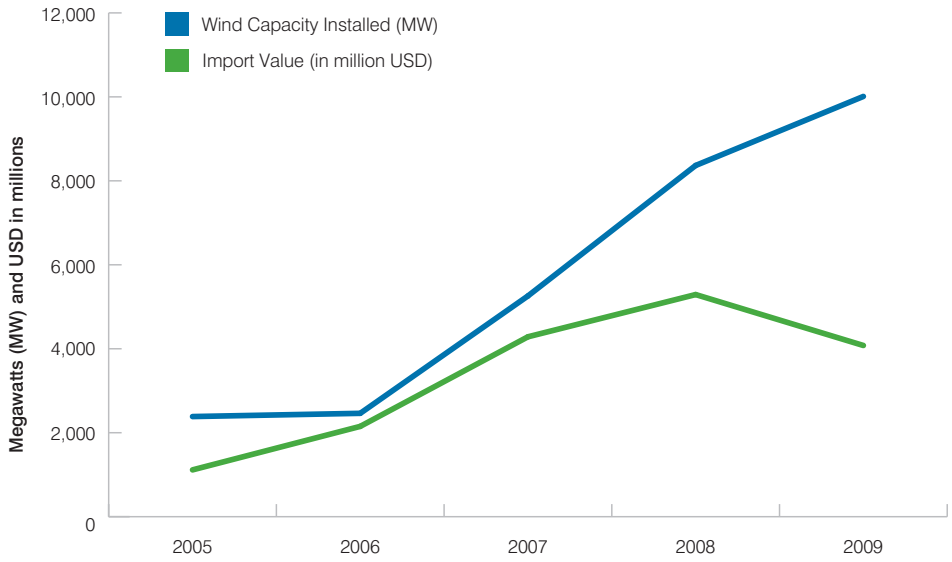


Figure 5. Wind Installations vs. Wind Imports
(Source: International Trade Commision Import Data and AWEA)

for which some domestic manufacturing had developed by 2005, and some domestic blade manufacturing. In 2009, the wind industry installed over 10,000 MW and domestic content was approximately 50 percent. As seen in Figure 5, trade data from the International Trade Commission shows that the import value for the wind industry has declined relative to the growth in wind capacity installations.[6]

While the growth in domestic content is impressive, it is not an endpoint. The trend towards increasing domestic content is expected to continue, especially with the growth of nacelle assembly facilities that drive the nacelle internals supply chain. In addition, with a long-term market, manufacturing that locates in the U.S. is unlikely to move overseas. According to a report from trade experts at the World Resources Institute and the Peterson Institute for International Economics who examined the industry, shifting turbine manufacturing to low-cost countries is unlikely to achieve significant cost reduction, and a shift to imports is unlikely if stable support policies are in place, because of high transport costs and other fundamentals of the wind industry.[7]

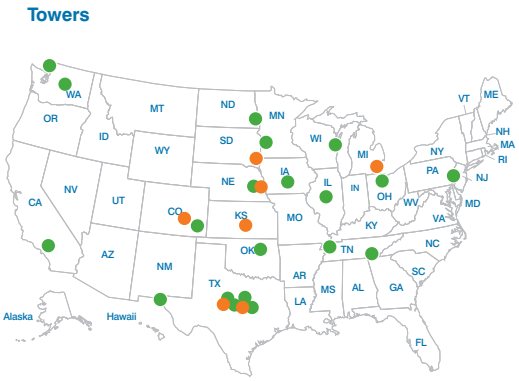


Figure 6: Location of Online and Announced Tower Manufacturing Facilities

Towers

Given their large size and relative simplicity of their manufacture, wind turbine towers were the first parts for which a strong domestic market developed. There are currently 20 U.S. facilities that manufacture utility-scale turbine towers, of which 14 came online in the past five years. An additional eight tower manufacturing facilities are announced. A robust market drives tower manufacturing; Texas, the U.S. market leader for installed capacity, is home to 25 percent of the online and announced manufacturing for towers.

Currently, the majority of towers installed at U.S. wind projects are produced in the U.S., based on current sourcing by turbine manufacturers and import data from the International Trade Commission. While the U.S. does import some towers, the value of imported towers in 2009 fell to 65 percent of 2008 imported tower value, even while the U.S. market for installations grew 20 percent over 2008 levels. This is indicative of the strong U.S. domestic supply for towers.

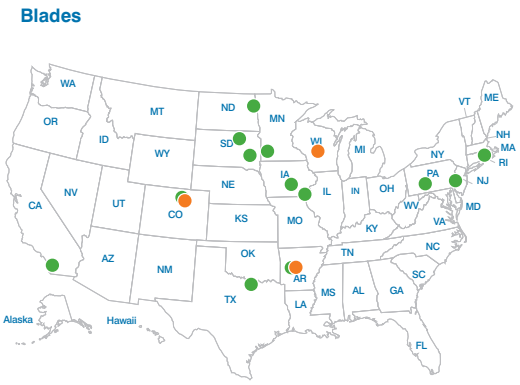


Figure 7: Location of Online and Announced Blade Manufacturing Facilities

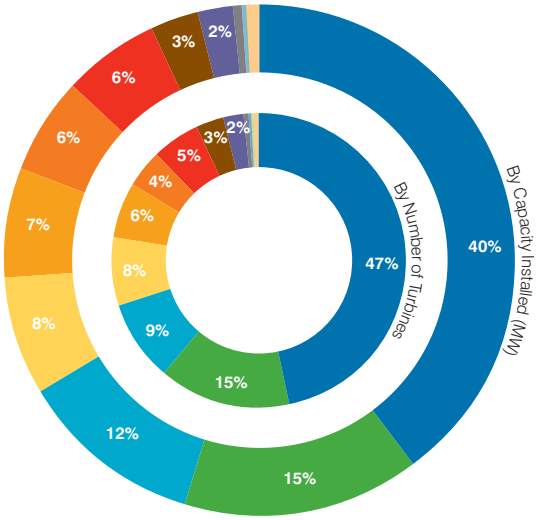
Blades

The second largest components in wind turbines, the blades, were the second area for which domestic manufacturing developed. There are currently 13 online blade manufacturing facilities, of which nine came online in the past five years. An additional three blade manufacturing facilities are announced.

Currently, a large percentage of blades used in U.S. projects are produced in the U.S., based on current sourcing by turbine manufacturers and import data from the International Trade Commission. While the U.S. does import some blades, the value of imported blades in 2009 fell to 71 percent of 2008 imported blade value, even while the U.S. market for installations grew 20 percent over 2008 levels. This is indicative of the strong U.S. domestic supply for blades.

OEMs and Nacelle Assembly

In 2009, nine turbine manufacturers had more than one percent market share in U.S. wind installations. In this definition, a turbine manufacturer is the original equipment manufacturer (OEM) for the wind industry. These OEMs design and assemble the wind turbines, either producing or procuring all of the components. Accordingly, some OEMs produce their own blades or towers, while others source these components from suppliers.



Company	# of Turbines	MW Capacity
GE Energy	2663	3995
Vestas	830	1488
Siemens	505	1162
Mitsubishi	428	751
Suzlon*	344	702
Clipper	242	605
Gamesa	300	600
REpower*	165	330
Acciona Windpower	136	204
Nordex	25	63
AAER	4	6
DeWind	3	6
Goldwind	3	5
Northern Power Systems	32	3
Fuhrlander	2	3
unknown	20	74
Total (Utility-Scale)	5702	9996

Figure 8: Manufacturer's Percentage of 2009 Installations in U.S.

In the U.S., the majority of nacelles are assembled domestically at eight domestic facilities, though there is still assembly abroad. As noted in Figure 4, eight additional nacelle assembly facilities are currently announced including some of the largest turbine manufacturers.

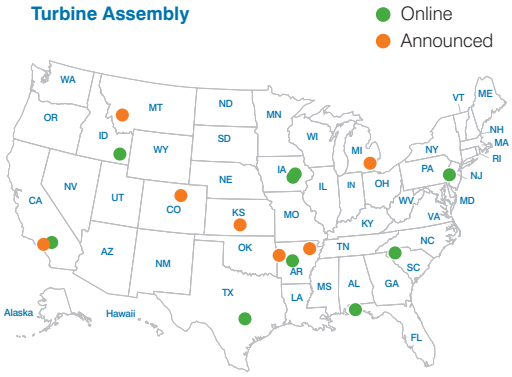


Figure 9: Location of Online and Announced Nacelle Assembly Facilities

Of the top ten OEMs in 2009, nine have current or announced U.S. manufacturing facilities for nacelle assembly, towers or blades – the only turbine manufacturer without a facility entered the market in 2008 and had three percent market share in 2009, so is still very much a developing player. Nine of the top ten OEMs with some online or announced manufacturing facilities include Acciona, Clipper, GE, Gamesa, Mitsubishi, Nordex, Siemens, Suzlon and Vestas. With the exception of GE, all of the new facilities came online within the last five years.

Nacelle Internals[8]

After domestic supply for towers, blades and nacelle assembly, the last major area for the U.S. wind industry to develop a domestic manufacturing capability is nacelle internals. The doubling of domestic nacelle assembly facilities that will occur in the coming year as noted in Figure 4 will be a driver for this investment. Nacelle internals are very complex, high-value components inside the wind turbine nacelle. These parts are the last area for which domestic manufacturing is developing because of the high investment cost to manufacture them and the relative ease of shipping them. Regardless, the incredible growth of the U.S. wind industry has created interest in manufacturing these parts domestically. For three major

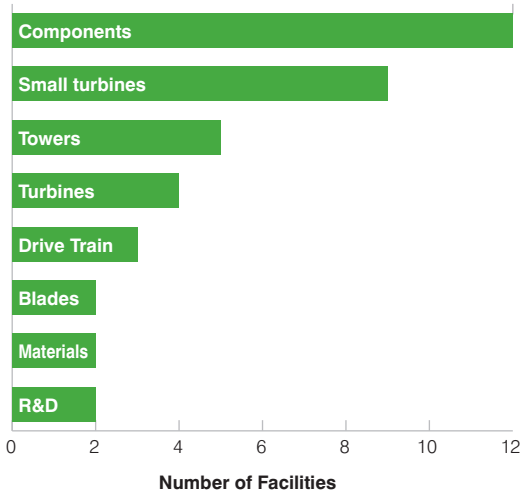


Figure 10: 2009 Facilities by Type

components – gearboxes, generators and drives – the first dedicated U.S. facility came online in 2009. This trend is further demonstrated in the breakdown of new and announced facilities in 2009 (at left). While growth in previous years saw expansions for large components, such as towers and blades, the facility breakdown for 2009 indicates a growing supply chain for smaller components. Sub-components, such as bearings, electrical components and hydraulic systems, were the largest growth segment in 2009. With long-term demand and support for manufacturers, more of these facilities will come online, driving additional investment at the sub-component manufacturing level. In the coming years, there is a particular need for the U.S. to develop new foundry capacity. Castings required in utility-scale wind turbine applications are on an enormous scale and few existing foundries can fabricate castings at the production levels needed. Large castings, including the mainframe, hub, rotor shaft and other large components, can weigh over 30 tons. In order to continue to grow domestic content in wind turbines, investment in new and existing foundries is needed to ensure that a domestic supply of these vital components is available.

Offshore Wind Turbines

While the U.S. does not currently have any installed offshore wind power capacity, the expected development of this market will drive additional supply chain needs for the wind industry. The first American offshore project, Cape Wind, was recently approved by the Department of the Interior, demonstrating progress of the American market. The size and material needs of the offshore industry – which uses turbines much larger than those typically installed onshore – will further drive the need for local sourcing due to the high cost of transportation. As the offshore segment develops, there will be additional opportunities for suppliers, especially in Great Lakes and coastal states, to enter the wind industry.

IV.

MANUFACTURING EMPLOYMENT

The increase in domestic manufacturing capacity has also generated growth in the number of Americans employed in the manufacture of wind turbines. In 2004, before the rapid growth of the wind industry, AWEA estimates that around 2,500 workers were employed in the industry. At the end of 2009, around 18,500 workers were employed in the wind manufacturing sector – more than a 7-fold increase in just six years. However, the manufacturing sector for the wind industry did lose some jobs in 2009; overall, around 1,500 net manufacturing jobs were lost despite the growth in installations. This job loss reflects the uncertainty of the wind market during the financial crisis, as well as use of inventory due to overproduction in 2008. While this job loss is expected to be temporary, it demonstrates the impact of uncertain markets and policies on the wind industry. In the absence of long-term market signals and supportive policies, periods of turmoil, such as that caused by the financial crisis, may lead to the difficult decision to lower production levels and lay off workers. The lack of a long-term market may further increase a facility's

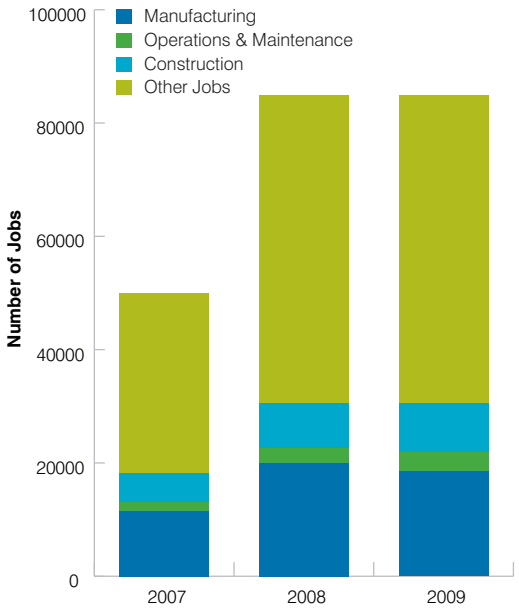


Figure 11. Total Wind Industry Employment[9]

down time, since the decision to invest in ramping up production and bringing back workers is riskier without a stable market. By providing the wind industry with a long-term signal and other supportive policies, the U.S. can better avoid these employment fluctuations and grow new manufacturing jobs at a faster pace while also reducing reliance on imported components.

There are thousands of wind energy manufacturing jobs in the pipeline, and providing clear market signals and support to manufacturers interested in the industry can accelerate the rate at which these jobs come online. When known announced facilities come online and existing facilities are running at capacity, more than 14,000 additional jobs will be created in the wind manufacturing sector, bringing total employment to over 30,000. Overall, the industry employed around 85,000 workers in 2009 directly and indirectly across all sectors.

V.

FACTORS DRIVING DOMESTIC WIND ENERGY MANUFACTURING

There are many factors that can drive increases in domestic content. As shown in this document, for large and growing wind energy markets, the dominant model for existing turbine manufacturers is direct investment in new facilities to serve the domestic market and identification of new domestic suppliers for products that are not vertically integrated. The U.S. wind turbine market has rapidly diversified as the market has grown, increasing from five turbine manufacturers with U.S. market share in 2005 to fifteen in 2009. This means the market is increasingly competitive. To meet the competition, turbine manufacturers develop domestic supply chains to reduce transportation costs, decrease currency risk, and increase just-in-time turbine availability, product quality and service.

In addition to reducing transportation costs by locating large, major suppliers in the markets they serve, turbine manufacturers also seek domestic content to avoid currency fluctuations. Consistent pricing for components is critical to the manufacturers' ability to project profit margins, thus sourcing domestically is competitively advantageous. Unlike other industries, most current imports for the wind industry come from Europe rather than low-cost countries, because Europe is home to many of the market leaders. For this reason, establishing domestic manufacturing and developing a domestic supply chain is competitive in terms of labor cost while also serving the purpose of reducing the high currency risk of importing from Europe. For an industry like the wind industry, local supply is also competitive because of the highly globalized nature of the commodities market.

Competitiveness is also significantly influenced, especially in the past two years, by market availability of turbines. Just-in-time manufacturing has become important for manufacturers seeking a competitive advantage in the U.S. market. Domestic supply chains are better able to meet the timing needs of manufacturers supplying turbines; importing from European regional hubs increases transport time and makes it harder for turbine manufacturers to respond quickly to increased production needs.

Another driver is the emergence of new, domestic manufacturers; as markets reach a certain size, domestic turbine manufacturers may emerge. An example of market emergence in the U.S. is Clipper Windpower, a U.S.-based wind turbine manufacturer that opened its manufacturing facility in 2006. In 2007, Clipper entered the market and captured around one percent of U.S. market share. In 2008 and 2009, Clipper captured around six percent of U.S. market share, and in 2009, it produced its first turbines for export, to Mexico.

The presence of turbine manufacturers, be it through foreign investment or domestic emergence, is important because they drive the supply chain. Utility-scale wind turbines are massive machines with significant component and material needs. Wind turbines installed today typically have around 8,000 individual components. Turbines currently available in the U.S. market may vary from 200 to 400 short tons in weight, with steel accounting for around 90 percent of total weight. Wind turbines also use significant amounts of fiberglass, copper, concrete, aluminum, adhesive and other materials.

Capacity Range:	1-3 MW
Tower Height Range:	45-105 Meters
Rotor Diameter Range:	57-101 Meters
Blade Length Range:	26.8-49 Meters

Component	% Weight	% Steel
Rotor		
Hub	6.0%	100%
Blades	7.2%	2%
Nacelle		
Gearbox	10.1%	96%
Generator	3.4%	65%
Frame	6.6%	85%
Tower	66.7%	98%

Figure 12. Sizes and Material Use for Utility-scale Turbines Installed in 2009

Components and subsystems that are similar to those used in wind turbines are manufactured in the U.S. today for other sectors such as aerospace, defense, energy and mining. However, the size and scope of components used for the wind industry are often larger than for other sectors. Manufacturers may need to invest in retooling their facilities for the industry, and there is risk in entering a new industry; manufacturers interested in entering the wind industry must develop specific knowledge of industry expectations, material specifications and inspection methods in order to enter the wind sector, which has high quality requirements.

However, given the needs of utility-scale turbine manufacturers and the desire to develop domestic supply chains, there are significant opportunities for existing manufacturers to enter the wind industry supply chain. For example, there are only a handful of foundries and forges capable of supplying castings of the quantity, quality and cost needed for the wind industry to

remain competitive. A hub for a large utility-scale turbine may weigh 20 to 30 tons; for many domestic firms this is simply beyond current equipment and technical ability. Developing a strong, dedicated domestic supply base for the initial process with castings also opens doors for the value-added processes, such as machining, of which there are also few domestic firms supplying to the wind industry. The growth of assembly facilities in the wind power sector must be coupled with growth in the manufacturing of the needed components.

VI.

ROLE OF STATES IN BUILDING DOMESTIC MANUFACTURING CAPACITY

As highlighted in previous sections, the U.S. wind industry has been successful in creating a domestic supply base for blades and towers, and is developing the capacity to assemble most nacelles domestically. The challenge now is the creation of a robust domestic supply chain to provide components for the assembly of nacelles. These nacelle internals constitute most of the components found in wind turbines and for some components, as noted above, there are currently no domestic suppliers.

Recognizing this challenge as an economic development opportunity, states are increasingly playing an important role in developing domestic capacity for wind turbine components. Their approaches have been varied. Twenty-nine states and Washtington D.C. have utilized the single most important policy tool available to them and passed state Renewable Portfolio Standards to try to attract wind farms and manufacturing facilities to their communities. States have also turned to offering a variety of incentives, including financial inducements, to recruit manufacturing facilities.

But more is needed. America's small manufacturers can become the supplier base for nacelle internals, but only if the barriers they face to entering the wind industry are recognized and addressed. Small manufacturers often do not have the resources to explore and understand the needs of new markets, and often lack the financial means to make retooling investments. In addition, these companies frequently need support in making their case to turbine manufacturers – the wind industry original equipment manufacturers (OEMs) – and in gaining vendor certification.

A number of states have begun to address these needs by providing technical assistance to help companies retool their operations and become suppliers to the wind energy OEMs. This type of assistance can take many forms: helping companies understand the market opportunities that wind power offers; educating firms about the types of components and specifications that OEMs are seeking; helping firms to market their expertise to OEMs and high-level suppliers; and providing hands-on assistance to help with the process of transitioning to a new industry.

Following are examples of three states that are at different stages of helping to create domestic wind industry supply chain capabilities for their existing manufacturers.

Michigan

Michigan has invested heavily in attempting to develop a wind energy manufacturing economy. State leaders recognize the opportunity it presents to revitalize the state's manufacturing base, devastated by the downsizing of the automotive industry. According to definitive analysis by the Renewable Energy Policy Project (REPP), which assumes growing demand for wind energy consistent with meeting an RES of 25 percent by 2025, Michigan has the capacity to create 24,350 wind manufacturing job-years, the sixth highest state total in the country, and significant employment in other sectors of the economy.

The state, through its Michigan Economic Development Corporation, has not only offered grants, loans and tax incentives to attract wind energy investment to Michigan, but, even more importantly, has made a significant effort to help transition its automotive supplier base to new industries. In the last three years, more than 35 firms have sprung up or retooled their factories to supply parts to the commercial wind industry.

This effort is being led by NextEnergy, a state created public-private partnership, which leads a strategic consortium of suppliers, government agencies and nonprofit groups to promote the growth of alternative energy component manufacturing in Michigan. Key partners in the wind power effort include the Michigan Public Service Commission, the Michigan Department of Energy, Labor & Economic Growth, the Michigan Manufacturing Technology Center (MMTC), and Western Michigan University. In 2008-09, NextEnergy regularly held sessions during which potential suppliers identified by MMTC had opportunities to interact with OEMs and high-level suppliers in the wind and solar arenas.

NextEnergy also convenes Michigan's Wind Manufacturing Working Group, which currently has more than 150 members, and works to connect multi-national wind turbine manufacturing companies with the supply chain already established in the state. Workshops are held to help suppliers understand the industry, their potential niche within it, and what they need to do to win contracts.

In addition, matchmaking events bring in wind energy OEMs and high-level suppliers to outline their needs, and interviews are set up with suppliers to meet those needs. The Working Group indicates that it is even available to develop an entire supply chain for OEMs, providing a service that can cut up to 18 months out of the sourcing schedule.

Ohio

Like Michigan, Ohio, another traditional manufacturing state, is positioning itself to be a significant player in supplying components to the wind power industry. According to REPP's analysis, Ohio has the capacity to create 29,820 wind manufacturing job-years, the third-highest state total in the country.

With thousands of companies already in its advanced energy supply chain, Ohio has become a leading U.S. component supplier for wind turbine OEMs. The state is actively organizing and promoting its wind supply chain, which includes companies that make bearings, fasteners, control systems, composites, gearboxes, brakes, generators, metal coatings, gears, hydraulics, sensors and electronics needed to manufacture the components found in a typical utility-size wind turbine.

The Ohio Department of Development offers companies a broad range of financial incentives to enter the wind energy market. In addition, the Ohio Energy Office has sponsored a collaborative project led by the GLWN and Ohio's Edison Technology Centers – which provide product and process innovation services to technology-based businesses – that has identified 500 companies that can retool and retrofit facilities and business strategies to serve the growing demand for wind power components, of which over 140 are already serving the industry. An extensive mapping process is ongoing which continually identifies companies in the state's evolving wind supply chain.

Ohio also has a well-established economic development infrastructure and technical expertise to help suppliers wishing to enter the wind power market, which is provided through several organizations.

The GLWN, which began as a regional organization in the Cleveland area, has expanded to a national scope as a supply chain advisory group and network of manufacturers whose mission is to increase the domestic content of North America's wind turbines. Among their goals are to link wind industry OEMs and component suppliers to help them to expand their businesses, as well as to help Ohio manufacturers evaluate market opportunities in the wind sector and connect them with potential customers.

To help with other manufacturing shop floor issues and with assistance in retooling their operations, small manufacturers can call on two organizations: MAGNET, headquartered in Cleveland, and TechSolve in Cincinnati.

Kansas

Kansas is ranked second nationally for wind energy potential and has more than 1,000 megawatts of wind generating capacity, which places the state in the top 15 nationally. The state believes its location in the heart of the nation's wind corridor is ideal for wind turbine manufacturing, and is ramping up its efforts to develop a strong supplier base.

Following Siemens Energy's announcement in May 2009 that it would build its first U.S. nacelle assembly facility in the state, Kansas Wind Industry, representing a coalition of organizations (including the Kansas Department of Commerce, the Advanced Manufacturing Institute at Kansas State University, the Climate and Energy Project, the American Wind Energy Association, and the BlueGreen Alliance), initiated a state-wide supply chain survey.

The survey solicited data from manufacturers in the wind industry supply chain and those looking to enter the market. It captured information such as capabilities, barriers to entry and workforce issues. The survey's results were released in February 2010. They will allow the Kansas Department of Commerce and the Advanced Manufacturing Institute (AMI) at Kansas State University (KSU) to compile a resource directory of supply chain companies and organizations in the state that can serve as a guide for state leaders and policymakers as they work to advance the state's wind energy industry.

To accelerate this process, the Ohio-based GLWN has named the AMI as its first-in-the-nation Center of Excellence to expand the Network's supply chain development efforts across the state of Kansas.

AMI is part of KSU's College of Engineering and provides engineering and business services to manufacturers and entrepreneurs. AMI's staff will work directly with GLWN staff to: provide site assessments for manufacturers wishing to enter the wind industry supply chain; make recommendations on possible components to be supplied; and assess manufacturers' overall production systems. The Mid-America Manufacturing Technology Center (MAMTC) provides complementary technical assistance more focused on lean-manufacturing techniques to manufacturers in the state.

Additionally, the partnership will enable companies that have met suitable criteria to participate in the GLWN Wind Alert System, which informs potential suppliers when an OEM or high-level supplier is sourcing a specific component that they are capable of producing.

Suggested Best Practices

While traditional economic development has focused on providing various forms of financial and other incentives to attract new facilities, many states are moving away from this expensive tool. A growing trend, as the state profiles above show, is to focus on maintaining, retooling and diversifying states' existing manufacturing base to support emerging industries.

In one form or another, many states are recognizing the need to educate their existing base of suppliers on the opportunities available in the wind power and other clean energy industries and then to provide them with the assistance required to enter these markets.

To complement the state initiatives, the U.S. Department of Commerce's Manufacturing Extension Partnership (MEP), a network of manufacturing assistance centers located in each state, offers technical support. The centers are staffed with manufacturing specialists

who are able to provide one-on-one technical assistance services to small manufacturers to help them take advantage of opportunities in the wind energy economy and diversify their markets. Several of the organizations named above are MEP centers, including the Michigan Manufacturing Technology Center, MAGNET and TechSolve (Ohio), and Mid-America Manufacturing Technology Center (Kansas).

The BlueGreen Alliance is also offering these types of services nationally through its Clean Energy Manufacturing Center. The Center, established in the fall of 2009, is designed to serve as a "one-stop shop" for public officials looking to develop clean energy strategies for their communities, as well as small manufacturers seeking to participate in supply chains in clean energy industry sectors, including wind.

VII.

KEY NATIONAL POLICES NEEDED TO INCREASE DOMESTIC WIND MANUFACTURING

While the U.S. wind industry has increased domestic content significantly over the past five years, much more can be done to ensure that turbines and turbine components are produced in the U.S. Promoting economic growth and renewable energy power generation should go hand-in-hand. Expanding wind energy must be coupled with further development and utilization of domestic supply chains. The American Wind Energy Association, the BlueGreen Alliance and United Steelworkers agree that Congress should adopt comprehensive climate and clean energy jobs legislation that includes the following policies as the key drivers needed to increase domestic wind and renewable energy manufacturing.

National Renewable Electricity Standard (RES)

Establish a National RES of 25 Percent by 2025 – Thirty-six countries, including China and all the European Union member states, already have an RES, while in the U.S. legislation is currently pending. According to a January 2010 study by independent consulting firm Navigant Consulting, a national RES would support 274,000 additional jobs nationwide over the status quo. More than half of the direct jobs created would be in manufacturing and close to a quarter in construction. The RES would signal for the first time a long-term national commitment to expanding the use of renewable energy in the U.S. Under a national RES, large utilities in every state would be required to obtain a certain percentage of their electricity from renewable sources by a certain date or purchase tradable credits for renewable electricity produced elsewhere. This vital incentive would drive new and greater investment in domestic wind, solar, and other kinds of renewable energy manufacturing.

Twenty-nine states and Washington, D.C. already have RES policies, which have effectively spurred market transformation and the economic development of wind and other renewable energy sources in those states. A national RES policy would streamline this uneven patchwork of state RES programs and provide a clear signal globally that the United States would be a stable home for renewable energy manufacturing.

A national RES should call for 25 percent of the nation's electricity to come from renewable energy by 2025. A meaningful near-term target is essential to ensure steady, continued deployment of renewables. Early targets proposed in the bill that passed the U.S. Senate Energy and Natural Resources Committee last year do not account for the record growth in 2009 due to the American Recovery and Reinvestment Act and current renewable levels of 3.6 percent of generation, already exceeding the 2011 target of 3 percent in the current RES proposal. The target should be set to continue renewable energy deployment levels at the rate of recent years, around 10,000 MW per year. The 10 percent by 2012 objective called for in the Obama-Biden New Energy for America plan would accomplish this steady development. The target levels should increase incrementally in the years that follow. As overall unemployment continues to hover around 10 percent in the U.S. – and manufacturing unemployment at about 12 percent – jobs created by an RES will be critical to securing a sustainable path to economic recovery.

A Long-Term Price Signal on Carbon

Pass Comprehensive Climate and Energy Legislation That Puts a Cap on Green House Gas (GHG) Emissions – Unchecked, global warming will have devastating consequences for our economy and environment. To prevent the worst impacts of global warming, according to the Intergovernmental Panel on Climate Change, GHG emissions must be reduced 80 percent from 1990 levels by 2050. Comprehensive climate and energy legislation – including a comprehensive and fully-funded suite of policies to combat carbon and job leakage – can achieve those levels of reduction. At the same time, such legislation can provide a signal to expand the wind industry. Environmental and economic goals can be achieved simultaneously when the true price for fossil fuel-based energy sources is paid. The long-term price signal on carbon that will result from a declining cap on GHG emissions would also spur significant investment in renewable energy and correspondingly increase demand for clean energy manufacturing. Legislation to regulate carbon should not provide excessive incentives to energy sources that have other non-carbon-related environmental impacts.

The Recovery Act's Convertible Tax Credit (1603 Program)

Extend and Strengthen the 1603 Program – Last year's growth in the U.S. wind industry was significantly aided by incentives included in the American Recovery and Reinvestment Act (ARRA). Included in ARRA was a provision that converted the production tax credit – the traditional incentive for wind developers – into an investment tax credit that could alternatively be taken in the form of a cash grant payment, usable during an economic downturn. In 2009, payments were made to at least 37 projects, which resulted in the installation of almost 3,000 MW in new wind capacity. Without the Recovery Act's

convertible tax credit (often referred to as 1603, its section within ARRA) the wind industry would have seen a significant drop in project development. Unfortunately, the convertible tax credit only applies to projects on which construction begins by the end of 2010. In order to keep the wind industry growing during the nation's continuing economic downturn, eligibility for 1603 should be extended to allow all projects that are completed by the end of 2012 to qualify, regardless of the date construction commences. The Renewable Energy Expansion Act of 2010, introduced by Congressman Earl Blumenauer (OR-3), would extend the Recovery Act incentive through 2012, using an alternative mechanism which would have similar market impacts. Whichever mechanism is used, in order to remain effective, the program should remain automatic – receipt of the grant payment, as with the credit, is subject to meeting the program's eligibility requirements under the tax code – as opposed to discretionary. The certainty provided by the automatic program allows projects to leverage private sector financing more effectively and immediately.

An extension of 1603 should also be accompanied by verification of its impact on creating and retaining jobs in the U.S. – a goal consistent with the American Renewable Energy Jobs Act introduced by Senator Charles Schumer (NY) – in a manner that still allows for an automatic qualification process. That is also the commitment made by the American Wind Energy Association as part of its Partnership for Progress with the Steelworkers. To that end, the program's extension should be accompanied by new provisions that:

- Require the Secretary of Energy to establish goals for the creation and retention of domestic jobs through the program, and to communicate those goals to applicants.
- Require reporting of actual direct and indirect jobs that will be created and retained in the U.S. by the program, including jobs with manufacturing suppliers of component parts for the program. Such data should be collected for all turbines deployed in the U.S. on a confidential basis, and reported on an aggregate basis to protect commercially sensitive supply chain relationships.
- Require the Administration to submit an analysis of that data to Congress – including an analysis of trends in the number of U.S. jobs created and retained by the program and a comparison of jobs results with its jobs goals.

Advanced Energy Manufacturing Tax Credit (MTC)

Extend and Strengthen the Advanced Energy Manufacturing Tax Credit – An extension of the oversubscribed Advanced Energy Manufacturing Tax Credit (also known as "48c" for its place in the tax code) will help secure American leadership in clean energy manufacturing and leverage significant private sector investment. The American Reinvestment and Recovery Act of 2009 (ARRA) authorized the Department of Treasury to award $2.3 billion in tax credits for qualified investment in advanced energy projects. The MTC provides a 30 percent credit for investments in new, expanded, or re-equipped advanced energy manufacturing projects. In January 2010, 183 projects in 43 states were awarded an MTC. Additionally, qualified applicants exceeded available tax credits by a factor

of three to one. MTC recipients included manufacturers from wind, solar, battery, biomass, smart grid, automotive, and geothermal sectors. Successful applicants for the projects announced under the MTC have said that they will create more than 17,000 jobs in some of the fastest growing sectors of our economy.

This job creation will be an important step, but it's not enough, given the scale of manufacturing unemployment, in the industrial heartland particularly, and the pent up demand from manufacturers for financing, represented by the oversubscription to the ARRA grant round. In order to realize the full potential of growing jobs in the clean energy supply chain, we support the Obama Administration's $5 billion request for FY2011 for the MTC and jobs and energy bill proposals that include allocations to the MTC. In addition, we propose a consideration of longer-term expansions of the program as well to continue growing U.S. manufacturing.

To ensure maximum domestic job creation, the following incentives and accountability provisions should be added to the MTC:

- In determining which projects to certify, add a selection criterion instructing the Secretary of the Treasury, in consultation with the Secretary of Energy, to give the highest priority to projects that manufacture – rather than simply assemble – the property, and the component parts of that property, as proposed in the Security in Energy and Manufacturing (SEAM) Act of 2010 introduced by Congressman Phil Hare (IL-17);

- Alternatively, strengthen the selection criterion regarding the creation of domestic jobs (both direct and indirect) by defining the criterion to mean the creation of direct jobs in the U.S. producing the property manufactured at the manufacturing facility described in the MTC and the creation of indirect jobs in the manufacturing supply chain for such property in the U.S., as proposed in the SEAM Act of 2010 (Senator Sherrod Brown (D-OH);

- Include a criterion targeting specific market segments where the U.S. does not have sufficient production capacity currently, but a strong capability. For example, foundries to produce large castings such as wind turbine hubs, mainframes, rotor shafts and other large castings; and

- The Secretary of Energy should be required to establish goals for the creation and retention of domestic jobs, collect data on direct and indirect domestic job creation that results from the MTC, and submit an analysis of that data to Congress.

Loan Guarantees for Commercial Manufacturing of Clean Energy

Utilize Loan Guarantee Programs for Commercial Manufacturing of Clean Energy: As manufacturers look to enter the wind industry market from other sectors, investments are needed to retool facilities with new equipment and amenities to manufacture the various

components of a wind turbine. The loan guarantee opportunity is important because long-term, lower-cost debt is particularly beneficial to manufacturers, but difficult to secure in the current economic environment. Loan guarantees can help encourage banks to provide capital to manufacturing companies entering the wind industry, or expanding their role in the wind industry, by providing access to capital at rates that will provide a reasonable return on investment.

The American Reinvestment and Recovery Act (ARRA) included loan guarantees for commercial clean energy generation and manufacturing through a new Section 1705 of the Department of Energy's Title XVII Loan Guarantee Program. Solicitations for commercial renewable power generation and electric power transmission projects were released in July and October of 2009. However, the solicitation for the commercial manufacturing of clean energy has yet to be released at the writing of this report. Also, $2 billion of the original $6 billion in funding dedicated by ARRA to credit subsidies in support of loan guarantees through Section 1705 of the program was rerouted to the "Cash for Clunkers" program and has not yet been restored.

We propose releasing the commercial manufacturing loan guarantee solicitation as soon as possible, restoring the $2 billion in funding intended to support loan guarantees for commercial generation and manufacturing clean energy projects, and extending the current deadline of September 30, 2011, for project commencement through 2012, given that the program solicitation has not yet been released. We also propose continuing to utilize loan guarantees in the future as a tool to encourage investments at manufacturing facilities, whether in the existing Title XVII program or the proposed Clean Energy Deployment Administration.

Investments for Manufacturing Progress and Clean Technology (IMPACT) Act

Pass the IMPACT Act – The Investments for Manufacturing Progress and Clean Technology (IMPACT) Act will be critical to growing the domestic clean energy manufacturing sector. The IMPACT Act would speed the domestic growth of these industries and ensure that policies that grow our clean energy economy also create good, high-quality manufacturing jobs here in the United States. IMPACT would create a $30 billion state-level revolving loan fund to help small and medium-sized manufacturers retool for clean energy markets and adopt innovative energy-efficient manufacturing. It will also add $1.5 billion to the existing Manufacturing Extension Partnership program to help include specific support for clean energy retooling.

Renewable Energy Market Access Program (REMAP)

Pass REMAP – U.S. support for the export of American-made renewable energy goods into international markets has been inadequate. There are thirty-six countries that have a national RES, and these are stable and strong markets for renewables that American companies can tap with targeted assistance. The Renewable Energy Market Access Program (REMAP) would encourage trade associations and state-regional trade groups to enter into cooperative

agreements with the Department of Commerce to provide market and trade assistance to small and medium-sized companies in the renewable energy sector to export their goods to existing and new markets abroad. The agreements would offer cost-sharing opportunities for innovative marketing and promotional activities and opportunities for services provided through the Department of Commerce. The REMAP would be a focused effort to help American renewable energy companies learn how to best access foreign markets. In addition, the Department of Commerce, in cooperation with the Export-Import Bank and other appropriate government agencies, should prepare an action plan to enhance the opportunity for firms producing domestically to export their products to other markets. The report should be developed and made publicly available within six months.

The Green Jobs Act

Fund the Green Jobs Act at $125 Million Annually – In order to expand America's clean energy manufacturing sector, we must have a workforce that can out-compete the rest of the world on the basis of skills and productivity. Despite the unacceptably high level of current unemployment in the manufacturing sector, the country's manufacturing workforce is approaching a demographic cliff: nearly 1.6 million American manufacturing workers are getting close to retirement age. Furthermore, over half (57 percent) of the country's working adults lack basic skills or an educational credential beyond high school. In the face of this skills crisis, federal investment has been woefully inadequate. Since 2002, funding for Department of Labor (DOL) education and training programs has been cut by more than $2 billion (in 2008 dollars). Moreover, the U.S. spends only .04 percent of its GDP on job training, and currently ranks 21st out of 25 OECD (Organization for Economic Cooperation and Development) countries internationally.

The Green Jobs Act helps to close this skills and funding gap. It establishes a competitive grant program at DOL that provides quality training for jobs created by renewable energy and energy efficiency industry sectors, including clean energy manufacturing, and leverages significant private sector money in doing so. DOL recently awarded $500 million of ARRA funds for projects that train workers for industries defined in the Green Jobs Act. Qualifying applications exceeded available awards by a factor of almost 5 to 1, showing the demand for clean energy job training. The Green Jobs Act should be fully funded at its authorized level of $125 million annually. And, private sector efforts, such as those called for in the AWEA-USW Framework Agreement, will help ensure that manufacturers have the skilled workers necessary to succeed.

The Transmission Grid Infrastructure

Build a Transmission Grid Infrastructure That Meets the Demand of a Clean Energy Economy – The United States is home to vast quantities of clean energy resources – wind, solar, geothermal and hydropower. Yet it lacks a modern interstate transmission grid to deliver carbon-free electricity to customers in highly populated areas of the country. A more robust grid is needed to improve electric reliability, make the grid more efficient, and provide consumers with access to lower cost power; investing in our grid is a powerful job creation tool. If we are going to generate 25 percent of our electricity from renewable resources by

2025, a cohesive effort from local, state, and federal officials and significant new investment in our transmission infrastructure will be required. And, private sector efforts, such as those called for in the AWEA-USW Framework Agreement, will help ensure that manufacturers have the skilled workers necessary to succeed.

The benefits of improving the American transmission grid are numerous, and this is an investment that needs to be made regardless of increasing renewable energy penetration. For many transmission projects, the cost savings from providing residential consumers and businesses with access to lower cost power alone are more than enough to pay for the cost of the transmission investment.[10] Building a modern transmission grid will also create jobs and economic development.[11]

Policy barriers – not technical or economic barriers – are the chief factors impeding the construction of new transmission. AWEA, the BlueGreen Alliance and USW believe the following changes should be implemented to make better use, and enable the expansion, of our transmission infrastructure.

- **Interconnection-Wide Transmission Planning**
  The first step in building clean energy transmission is to develop a comprehensive plan. This requires both the Western Interconnection and the Eastern Interconnection to develop regional transmission plans that identify where new or expanded transmission capacity is necessary to connect renewable energy resources to the grid and, ultimately, to load centers.

- **Interconnection-Wide Transmission Cost Allocation and Certainty for Cost Recovery**
  Facilities identified in the interconnection-wide plan as necessary for the development of clean energy transmission should be eligible for broad, regional cost allocation. Specifically, FERC should allocate, based on electricity usage, the capital and operating costs of these transmission lines across all load-serving entities on an interconnection-wide basis. In regulatory terms, the "determination of need" would be made in the regional plan approved by FERC.

- **Federal Siting**
  In addition to regional planning and cost allocation, substantial reform of the transmission siting process is required to meet national renewable energy goals. The most effective model is the siting authority that was given to FERC over interstate natural gas pipelines. For clean energy transmission, the extra-high-voltage facilities defined in the regional plans would be subject to FERC approval and permitting. Separate siting approval at the state level would not be required. FERC would act as the lead agency for purposes of coordinating all applicable federal authorizations and environmental reviews with other affected agencies.

VIII.

CONCLUSION

The American wind industry has made impressive strides towards increasing domestic content in installed wind turbines and has brought thousands of jobs online in manufacturing. However, the wind manufacturing sector is still developing, with the opportunity to bring tens of thousands of additional jobs online. In order to justify investment in opening new facilities and expanding or retooling existing facilities, Congress must take action to ensure a long-term, stable wind energy market. Coupled with other policies to support the U.S. manufacturing sector, these actions would enable the wind industry to develop robust supply chains and employ thousands of Americans in good, clean energy jobs.

Endnotes

1 AWEA, Internal discussion with industry in late 2008 and early 2009

2 Global Wind Energy Council (GWEC). Global Wind Report 2009. www.gwec.net

3 AWEA, data gathered from public information sources and directly from companies with manufacturing facilities

4 AWEA analysis of industry information and International Trade Commission import data of blades and towers

5 AWEA has estimated facilities and employment level for 2004 based on available data. Levels for 2004 are best estimates.

6 International Trade Commission (ITC) import data of wind-related Harmonized Tariff Schedule (HTS) codes

7 *It Should Be A Breeze: Harnessing the Potential of Open Trade and Investment Flows in the Wind Energy Industry*, Jacob Funk Kirkegaard, Peterson Institute for International Economics; Thilo Hanemann, Rhodium Group; and Lutz Weischer, World Resources Institute, December, 2009.

8 Nacelle Internals also includes rotor hubs and nose cones, which are castings and composite coverings similar to components used for the nacelle.

9 AWEA U.S. Wind Industry Annual Market Report, Year Ending 2009. www.awea.org/reports

10 AWEA Green Power Transmission and Consumer Savings Factsheet, http://www.awea.org/pubs/factsheets/Transmission_and_Consumer_Savings.pdf

11 SPP Priority Reports Phase II Report, February 1, 2010. http://www.spp.org/publications/Priority%20Projects%20Phase%20II%20Report.pdf