

**Manufacturing Working Group – Policy Task Force**

**Policy and Manufacturing:  
Demand-Side Policies Will Fuel Growth in the Wind  
Manufacturing Sector**

**EXECUTIVE SUMMARY**

Since the rebirth of the American wind industry in 1999, 20,000 manufacturing jobs have been created in the wind sector. This growth has occurred despite the lack of stable, long-term policy support and the sporadic nature of the Production Tax Credit (PTC). The instability of the PTC, which caused drops in demand in 2000, 2002 and 2004 of 75 percent or more, caused significant delay or deferral in US wind manufacturing investment. The majority (75%) of the current manufacturing jobs in the wind industry have been created since 2005 due to consistent PTC availability and the ARRA provisions during that period. Original equipment manufacturers (OEMs) have significantly increased their domestic presence over this span, and a supporting supply chain has also begun to develop. Notably, this expansion often benefits metal-working and other industries that have been experiencing decline.

Based on the experience in the European Union (EU), where long-term policies supporting renewable energy are in place, the potential exists to expand the jobs supported by the US supply chain by a factor of three to four, potentially adding tens of thousands of additional manufacturing jobs. A prerequisite for this growth, however, is implementation of long-term, stable demand-side policies – such as renewable energy standards, clean energy standards, PTC, transmission guidelines, etc. – related to driving renewable energy investment over a minimum period of 5 years, though preferably longer. Such clarity will allow for demand stabilization and increased predictability in the renewable energy market, thus driving companies across the supply chain to invest, armed with a supporting business case and increased confidence. As occurred in the EU, OEMs will subsequently complete the localization of the supply chain, and benefit from reduced transport costs and risks, duty avoidance, currency risk and shortened supply

channels. This will boost the level of domestic wind manufacturing, creating American jobs and investment across the country.

Timing is of the essence. The existing, renewable support policies expire in December, 2012. The industry is already reacting to this deadline with uncertainty, as is the supporting supply-side manufacturing base. Failure to act and provide the essential clarity in longer term policies will:

1. Cause existing investment to underperform and turn manufacturing job creation into layoffs: The gains since 2005 have a direct relationship to the relative stability of the PTC and ARRA policies since that time. The current domestic investment from OEMs, tower and blade manufacturers, and large component manufacturers can support a market outlook of more than 10 GW in demand. In a stable market, this is sufficient to spur investment broadly across the supply chain. Inconsistent or deficient policy clarity is expected to more than halve that demand (to less than 5 GW), which will negatively affect decisions in the manufacturing base.
2. Lose the advantages created over the past five years of relatively stable support: The US has made investments in wind, through existing policies, that have lowered the cost of wind and made it competitive with other new forms of generation. There are countless benefits to wind energy in addition to job creation and investment; no emissions, near-zero water use and rural economic development, among others. The policy support provided since 2005 has spurred 33.5 GW of wind development in the US and significantly reduced the levelized cost of energy (LCOE) for wind. However, this trend will not continue in the absence of policy support.

This policy task force, on behalf of the Manufacturing Working Group of AWEA, representing 75 member companies supporting over 5,000 manufacturing employees across the US, we call for enactment of clear, long-term and renewable-inclusive

energy policies at the federal level. It is our collective view that the key to wind energy manufacturing job creation in the US is strong demand-side policies; in the absence of stable, long-term demand for wind generation, no manufacturing-only policy will be sufficient to fully grow the US wind manufacturing sector. Consistent and predictable demand will drive business cases and manufacturing investment more than a stand-alone supply-side program and will better support long term industry growth, supply chain domestication and ultimately, maximum job creation in America.

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## **I. CURRENT STATUS OF US WIND ENERGY MANUFACTURING**

- Wind industry supported 20,000 direct and indirect manufacturing jobs in 2010 at more than 400 facilities
- OEMs have made significant investments in the US market; 92% of 2010 installations from OEMs with online or announced US nacelle assembly facilities
- Tier-one suppliers of towers and blades are well-developed in the US market
- Turbine content has grown to around 50% domestic content, with an increasing trend pending the right policies
- Ability of manufacturers to ramp up and employ fully is stymied by lack of long-term outlook – stifling job growth and new investment

The growth in installations over the past decade has a direct impact on overall wind manufacturing – over 400 facilities currently supply to the wind industry today, compared to a few dozen in 2004. This has led to increase in wind energy manufacturing employment from around 2,500 in 2004 to 20,000 in 2010. Wind manufacturing is now found in every region of the US, and includes facilities from the largest OEM and tier one players to existing businesses that have diversified into the wind energy supply chain. Investment in facilities to manufacture for the wind industry in the US has already exceed \$1.5 billion with much more possible.

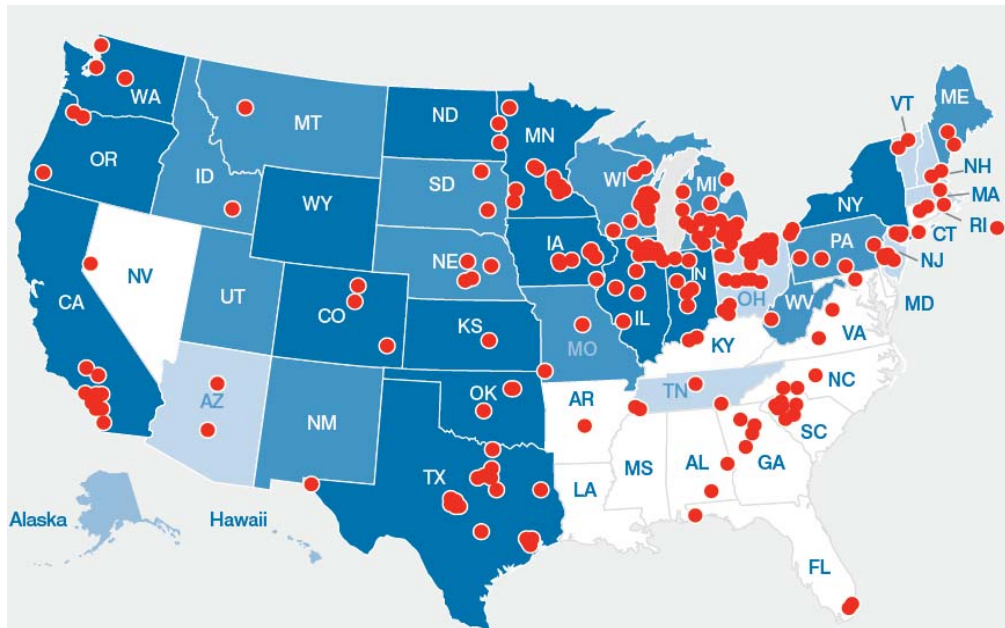


Figure 1. Map of all US Manufacturing Facilities in the Wind Industry (2010)

There are twelve online OEM nacelle assembly facilities and an additional eight announced facilities. OEMs with online nacelle assembly facilities in the US accounted for 85 percent of the 2010 market (by MW). When considering OEM's with announced facilities as well, this figure increases to 92 percent of the 2010 market. Several of those major facilities – including Siemens, Vestas and Nordex – came online in 2010. Since nacelle assembly requires large investment, domestic assembly has been one of the last areas to develop US supply in the absence of long-term market signals. Domestic assembly of nacelles creates demand for many nacelle internal components.

Tier-one suppliers have also increased their domestic footprint. Due to their large size and costly transportation, towers were one of the first areas to develop domestic supply. There are currently 22 online facilities that supply towers and an additional 8 announced tower facilities. Blades have also developed a strong US supply base, with 11 currently online blade facilities and 5 more announced. Domestic supply for major drive train components, such as gearboxes and generators, is largely undeveloped as yet due to the significant new investments needed and the ongoing uncertainty in the long term demand.

<b>TOTAL OPERATING FACILITIES</b>				
	Online 2004	Online 2010	Announced	Total Expected Online in Coming Years
Towers	6	22	8	30
Blades	4	11	5	17
Nacelle Assembly	3	12	8	20
Total	30 - 40	Over400	40	Over 450
Manufacturing Jobs	2,500	20,000	18,000	38,000

Figure 2. Total Wind Manufacturing Operating Facilities and Employment

For strong, regional markets throughout the world, the dominant model for turbine manufacturing is the development of regional supply chains to support increasingly local turbine and tier-one manufacturing. For the turbine OEMs, the drive to increase domestic content is to decrease costs and increase competitiveness. Domestic supply chains are better able to meet the needs of OEMs to lower transportation costs, decrease currency risk and increase just-in-time availability. Given that the majority of US wind imports come from high-cost countries where the technical ability was developed, and the global nature of the commodities market, developing a domestic US supply base has been a reasonable strategy for the OEMs, even in the absence of strong market indicators. New opportunities for the American supply base will be primarily driven by the drive towards increasing domestic content. Domestic content in wind turbines installed in the US grew from 25 percent in 2005 to around 50 percent in 2009, even while the market quadrupled in size. However, 50 percent is not an end target but simply a benchmark; the trend towards growing domestic content is expected to continue in coming years with many OEMs setting aggressive domestic content targets. Many major OEMs in the US have made public statements about their domestic content goals and indicate a strong desire for domestic content in the 80-90 percent range.

However, the ability of OEMs and tier-one suppliers to open new facilities and bring them to full manufacturing capacity is dependent on the marketplace. Long-term market outlook is crucial to wind industry investment, and without a strong market, the US risks losing new industry opportunities. The development of the US supply chain for the wind industry to date has been based on expectations that the US would create demand for turbines through decisive, federal-level energy policy. As Congress has repeatedly failed

to pass a strong demand-side policy for wind energy, the 400 manufacturing facilities in the US that manufacture materials and components for the wind market have had to ramp up and down, to hire and fire workers, and have suffered without a long-term outlook for their products. To take advantage of full wind manufacturing employment we must have a policy that creates stable, significant demand for wind projects.

## **II. IMPACTS OF A LONG-TERM DEMAND-SIDE POLICY**

- Passage of a long-term, stable policy would provide outlook necessary to justify investment (including transmission) and ramp up manufacturing employment
- 18,000 jobs and \$1.2 billion in investment in new facilities are currently waiting in the pipeline for the right market signals
- US manufacturing jobs multiplier is weak compared to Europe – with right policy, US could support 3-4 times as many manufacturing jobs
- In a 15 GW year, this difference would be nearly 100,000 additional manufacturing jobs

Following the passage of a stable, long-term policy with meaningful near-term targets, the US will immediately begin to see a positive impact in the manufacturing sector. As of April 2011, there are 18,000 known manufacturing jobs in the near-term pipeline. These are jobs at online US-based manufacturing facilities that are running at partial capacity as well as jobs at announced, but not yet operational, US-based manufacturing facilities.

With the passage of meaningful targets and the creation of long-term demand, these jobs would come online within a matter of 1-2 years. While some of those jobs are at existing facilities that are waiting to ramp up, others are at the more than 40 additional facilities that have been announced in 25 states all across the US. The announced investment at these facilities totals more than \$1.2 billion, nearly doubling the domestic investment base for wind manufacturing. Providing a long-term market signal will help ensure that wind companies bring all of these facilities online in the near-term, creating investment in rural areas and major cities alike.

In addition to jobs that are already in the pipeline, the creation of stable, long-term policy would provide the impetus to continue building out the US wind supply chain and creating new jobs. While employment in the US wind manufacturing sector has grown more than ten-fold over the past decade, based on manufacturing success in stable foreign markets the potential is still much greater.

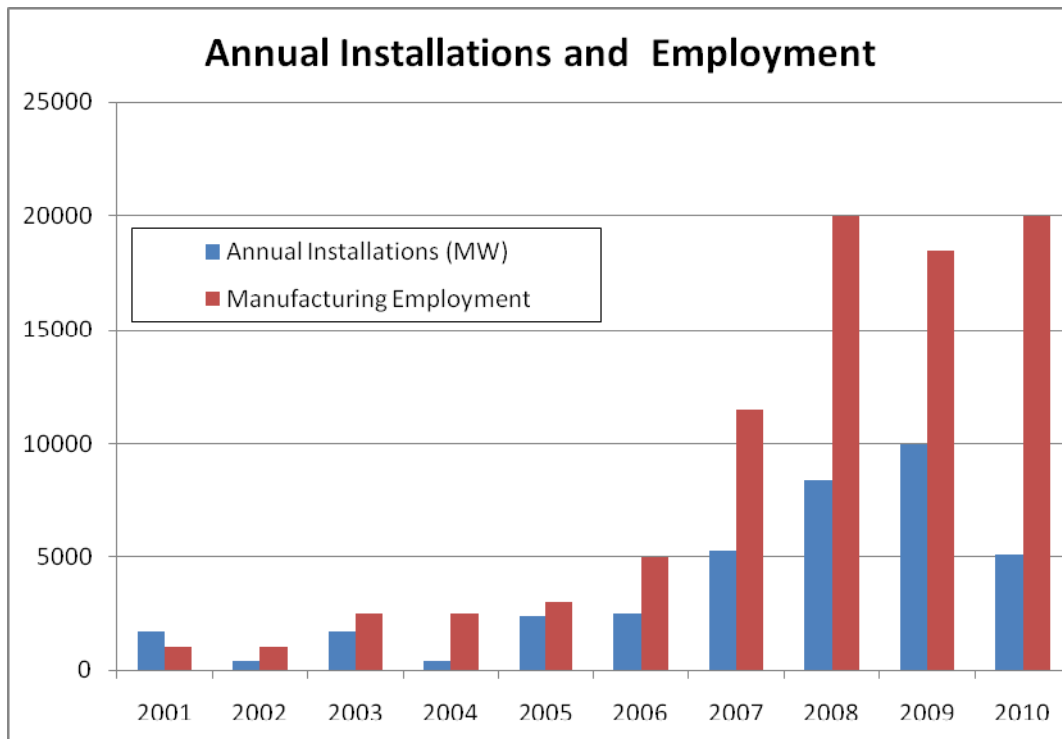


Figure 3. US Annual Installations and Manufacturing Employment

Generally, manufacturing employment levels have increased as the annual market for new wind installations has grown. Due to a variety of factors, such as varying order to delivery timeframes and forward-looking employment levels, annual manufacturing employment is not completely correlated with annual installation levels. For this reason, looking at employment and installations over a period of time may be a more accurate way to gauge correlation. Over the first half of the decade, from 2001 to 2005, manufacturing employment is estimated to have averaged around 2,000 jobs per year while installations averaged around 1,300 MW per year. During the second half of the decade, manufacturing employment averaged 15,000 jobs while installations averaged

around 6,200 MW per year. For the second half of the decade, the multiplier for direct and indirect manufacturing jobs was around 2.4 jobs per MW. Taking into account lead times for manufacturing, the true multiplier we currently see is probably between 2-2.5 jobs per MW.

Compared to Europe, which has a largely domestic supply chain – estimated at around 90 percent domestic content - and considerable exports, the US multiplier is extremely weak. According to the European Wind Energy Association (EWEA), Europe enjoys a multiplier of 12.5 manufacturing jobs per MW. While the US may lack the ability to export to the same extent as Europe, creating largely domestic supply chains for major components, sub-components and materials should increase the domestic manufacturing job multiplier significantly. Assuming the European 12.5 multiplier represents 150% of Europe's current use of turbines, i.e. 50% of turbines produced are exported; this indicates an 8.33 jobs per MW multiplier for turbine production for domestic use, some 3-4 times the current US multiplier.

One reason for this difference is the higher multiplier for nacelle components versus towers or even blades and nacelle assembly. Towers, which are primarily manufactured in the US for the US market, are a high-value component that have high material costs due to their size, but are relatively low intensity for employment. In the early 2000s, when the US' primary wind output was towers, the US multiplier was around 1.5 manufacturing jobs per MW. As the US began to produce blades and assemble nacelles, the multiplier grew to around 2-2.5 jobs per MW. In Europe, where the majority of the high-value, high job intensity components are manufactured within the EU, the multiplier is above 8 jobs per MW. Nacelle internals are relatively labor intensive, but require significant up-front investment. Since transportation costs for these smaller components are lower than for major components, such as towers and blades, investment in manufacturing these components is less likely in an unstable market since suppliers can continue to import them. A stable, long-term market would create surety of demand for these components and the investment business case – creating return on investment from the savings in transportation and duties – becomes valid. Lower net costs for

turbines and domestic job creation are the ultimate results in this process. The path to higher domestic content and increased manufacturing jobs (Table 2) requires such business cases to be developed at an increasingly broad scale.

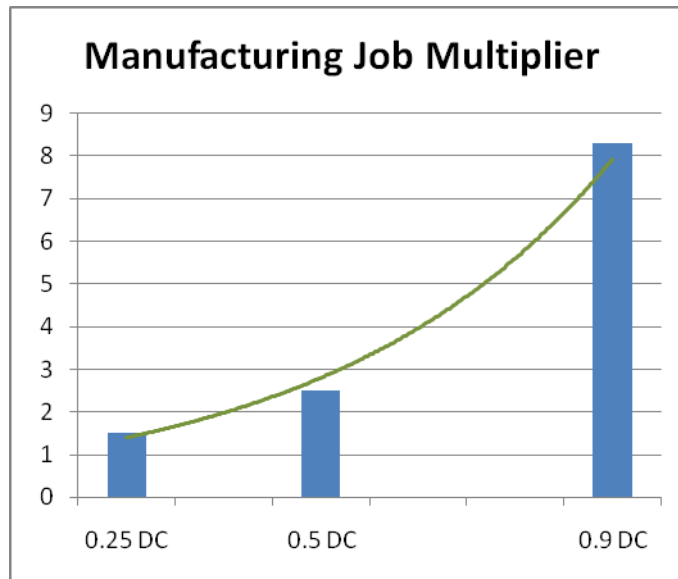


Figure 4. Manufacturing Job Multiplier by Domestic Content

Taking the example of 2009, when the US installed 10 GW of wind capacity without a long-term outlook and the associated build out in manufacturing, the US would currently be expected to support between 20,000 and 25,000 manufacturing jobs. However, if the US were to install 10 GW in a future year – when an RES had been in place for several years and there was a long-term outlook – the market may achieve a multiplier closer to the European multiplier, supporting over 80,000 manufacturing jobs. These additional 60,000 jobs could be supported across the US, revitalizing areas that have been hard hit by the loss of manufacturing. A strong RES could create demand far greater than 10 GW, and the jobs created could be much greater. In a 15 GW year, for example, the difference between the status quo and an RES scenario could be nearly 100,000 additional jobs. While a strong single-year policy and market scenario can create a situation in which 10 GW are built, wind manufacturing will not be prepared for such a situation and without a long-term signal the US will not take full advantage of potential job creation in the

manufacturing sector.

### **III. CASE STUDY: European Union**

Wind power has had strong support in Europe for the past decade. In 2001, the European Commission issued the “Directive on the Promotion of Electricity from Renewable Energy Sources”, requiring all EU member nations to develop renewable energy frameworks and set national targets. At the end of 2010, the new Renewable Energy Directive, with a renewable energy target of 20% by 2020, entered into force. In addition to strong targets, the Directive supports a feed-in tariff and a green certificate program, among other mechanisms, to support the development of renewable energy. Other positive aspects of the Directive include transmission and distribution grid development and guaranteed access to transmission for renewable energy. The final national action plans, detailing plans through 2020 to meet national targets, were submitted in 2010.

- Strong national targets for all EU member nations
- Feed-in tariff and other support mechanisms
- Transmission and grid upgrades and priority access

This strong, comprehensive and early support for the wind industry has made Europe a leader in installations and manufacturing. At the end of 2010, the EU had 84 GW of total capacity installed, significantly more than other regional markets. The EU installed 9.3 GW of new wind capacity in 2010, second only to China for total installations. According to the Global Wind Energy Council (GWEC) report on global outlook, the reference case for the EU will continue to see around 10 GW of new installation per year, while moderate and advanced scenarios could see between 15-20 GW of wind installation per year.

The strong historical support for the wind industry and the stable, long-term outlook has provided investors with an ideal environment to build EU-based wind energy manufacturing. According to the European Wind Energy Association, the majority of jobs in the wind sector in the EU are in the manufacturing sector. The wind energy

manufacturing sector in Europe currently represents over 100,000 direct and indirect jobs, versus 20,000 in the US in 2010.

#### **IV. CONCLUSION**

The members of the Manufacturing Working Group stand prepared to support the efforts of the AWEA Legislative Committee to pass a federal level RES or other long-term demand side policies. This group recognizes that the demand-side policies are the key to creating new wind manufacturing jobs and investment in the US. AWEA and the Manufacturing Working Group share the goal of growing US domestic content in wind turbines, and creating thousands of new American jobs in the wind manufacturing sector. The best policy to do this is one that creates stable, long-term demand, and provides a clear outlook to manufacturers.

#### **Citations**

AWEA, "AWEA US Wind Industry Annual Market Report Year Ending 2010"

European Wind Energy Association, "Wind at Work: Wind energy and job creation in the EU"

Global Wind Energy Council, "Global Wind Energy Outlook 2010"

Global Wind Energy Council, "Global Wind Capacity Increases by 22% in 2010"