



## AWEA Wind Power Value Chain

AWEA has established a Transportation and Logistics Working Group (TLWG) to identify the key transportation challenges facing the industry and work toward solutions to ensure wind energy growth continues on the path to 20% by 2030. Member companies involved in manufacturing, transportation and logistics are represented. If you are an AWEA member and are interested in participating, please contact:

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## Wind Industry Transportation Opportunities & Challenges

Moving wind turbine components from the factory floor to the project site is not easy. It involves handling sensitive and valuable components that can weigh several tons and extend well over a hundred feet in length. The rapid growth of the wind energy industry has contributed to transportation and logistics challenges facing manufacturers and developers. It is also creating business opportunities for those with expertise in these areas, including logistics providers, truck trailer and rail car manufacturers, railroads and train crews, trucking companies and drivers, port operators, and barge and ocean vessel owners and crews, among others.

### Market Growth and Opportunities

A single turbine can require up to eight hauls (one nacelle, one hub, three blades and three tower sections). For an entire project of 150 megawatts (MW), transportation requirements have been as much as 689 truckloads, 140 railcars, and eight ships to the United States<sup>1</sup>. And, many projects today are much larger than 150 MW (the largest operating project in the U.S. is currently 736 MW, and projects of more than 4,000 MWs are in the early stages of development).

In 2008 alone, the industry installed some 8,300 megawatts, which equated to over 5,000 turbines, resulting in approximately 40,000 transportation hauls<sup>2</sup>.

In May 2008, the U.S. Department of Energy released a report on the feasibility of achieving 20% of U.S. electricity from wind energy alone by 2030. The DOE concluded that this level is achievable. Ramping up to that level would require the installation of 7,000 turbines a year by 2018. That means somewhere around 50,000 annual shipments of turbine components.

There are significant opportunities for logistics and transportation providers to serve the wind energy industry. All modes of transport (road, rail, and water) can be used to deliver wind turbine components from the factory to the project site. The economics of using a particular mode depend on the specific factory and project location. Multiple modes are often used for a single project.

### Dimensions of Turbine Components

In order to serve the wind energy industry a company must be able to transport oversized/overweight cargo or manufacture equipment capable of doing so.

<sup>1</sup> "Transportation Management in the Wind Industry: Problems and Solutions Facing the Shipment of Oversized Products in the Supply Chain." Terry Tremwell and Suzanne Ozment, University of Arkansas Supply Chain Management Research Center, October 15, 2007.

<sup>2</sup> The actual number could be higher or lower depending on the mode of transport, the ability to ship multiple blades on a single trailer or rail car, and the fact that a single component often is subject to multiple modes of transport such as rail, then truck.

The following are some rough guidelines on the physical dimensions of wind turbine components:

#### *Towers*

Tower sections for the common 250-foot (80-meter) wind turbine tower in the United States can weigh more than 150,000 lbs (70 tons), be 120 feet long (36 meters) and have a diameter of 15 feet (4.5 meters). The next generation of 330-foot (105-meter) towers will be 18 feet (5.4 meters) in diameter at the base.

#### *Nacelles*

Nacelles commonly weigh 50-70 tons and can weigh 90 tons or more.

#### *Blades*

For commercial scale projects, blades run from around 110 feet (33 meters) to 145 feet (44 meters). Blade lengths may continue to grow in the future, particularly for offshore wind projects. The largest blades are just over 200 feet long (60 meters-plus) for a 5-MW turbine.

### **Challenges**

While the market opportunities for transportation and logistics providers are growing, there are challenges that, if left unaddressed, will create obstacles to achieving the wind energy industry's full potential. Companies that can address these challenges will be particularly sought after.

Among the key transportation and logistics challenges impacting all modes of transport are:

- Height, weight, width, and length limitations
- The growing size and weight of wind turbine blades, towers and nacelles, which may exceed the physical capacity of existing equipment;
- The limited number of truck trailers and rail cars capable of transporting turbine components; and
- The growing transportation and logistics costs contributing to price pressures in wind energy development (such costs can add 10-25% to the cost of a turbine);

In addition, individual modes of transport face their own unique challenges.

For trucking, challenges include a variety of state and local permitting rules for oversized/overweight loads; driver shortages and training; tight carrier capacity and non-optimized loads/scheduling; rising fuel costs; and hours of service constraints.

Rail, while economical for long-distance transport, rarely has ready access to final project sites, which necessitates truck hauling for the final leg. In addition, other challenges include dimension limitations that are particularly problematic for hauling lower tower sections and, in some cases, blades, by rail; the need for well-equipped railheads for transferring components to trucks; and tight carrier capacity and non-optimized loads.

For water, the key challenge is the time it takes for ocean travel. Also, with respect to domestic water transport, water access to final project locations is limited to non-existent, necessitating coordination with other modes of transport. Storage and crane capacity at ports can be an issue. Finally, as offshore wind projects begin construction in the U.S., the limited number of vessels and crews for this work will become an issue.