

# Flying Cloud

## 44 MW Wind Power Plant



- **Overview**

The Flying Cloud Wind Power Plant is a 44 MW wind energy development owned by PPM Energy, a unit of ScottishPower. The project is located near the towns of Spirit Lake and Lake Park in Dickinson County, Northwestern Iowa and is expected to generate enough energy to supply approximately 20,000 average American homes. The project was developed by Clipper Windpower and is being operated by GE Energy. It was constructed by M.A. Mortenson Company.

Power generated by Flying Cloud's 29 GE wind turbines is delivered under a 15-year purchase agreement to Interstate Power & Light Company, a wholly-owned subsidiary of Alliant Energy Corporation, an energy-services provider that serves more than three million customers worldwide.

- **Location**

10 miles west of the town of Spirit Lake and two miles west of Lake Park in Dickinson County, Northwestern Iowa, the project encompasses approximately 2,600 acres of leased land from 14 local landowners. The land continues to be used for farming.

- **Owner: PPM Energy, Inc.**

With a portfolio of more than 830 MW of wind power currently in operation in seven states, PPM has a goal of bringing 2,000 MW of new wind power to market by 2010. PPM balances its supply portfolio with sales to wholesale customers, placing almost all of its output in long-term contracts. Major customers include the cities of Seattle, Sacramento, Pasadena, Anaheim as well as investor-owned utilities such as Alliant Energy and Xcel Energy and the federal Bonneville Power Administration. PPM also has about 800 MW of clean gas resources under its control to give customers a wide range of options for adding environmentally responsible energy to their portfolios. The American Wind Energy Association honored PPM with its "Market Maker of the Year" award for aggressively finding markets for wind power.

- **Developer: Clipper Windpower**

Clipper Windpower was founded by James G.P. Dehlsen, who between 1981 and 1997 developed Zond Corporation, now a GE-owned company, into the preeminent wind power company in the US and one of the largest globally. While working for Zond, Mr. Dehlsen and other Clipper personnel developed, constructed and operated the Storm Lake I and Storm Lake II projects in Iowa, and the Lake Benton I and Lake Benton II projects in Minnesota. Zond also designed and manufactured 3 generations of turbines now under operation with GE. The company has projects under development throughout the US, as well as Canada, South America and the United Kingdom amounting to a portfolio of over 4,000 MW of project sites. Clipper's mission is to accelerate the global transition to a cleaner energy future by making wind-generated electricity the best economic value for new power supply. To this end, Clipper's two corporate divisions develop both new technology and power projects.

- **Customer: Interstate Power & Light Company**

Interstate Power and Light Company, a wholly-owned subsidiary of Alliant Energy, is an energy-services provider that serves more than three million customers worldwide. Providing its regulated customers in the Midwest with electricity and natural gas service remains the company's primary focus. Alliant Energy is a Fortune 1000 company traded on the New York Stock Exchange under the symbol LNT.

- **Technology Supplier and Operator: GE Energy**

GE Energy is one of the world's leading wind power companies. The company designs and manufactures wind turbines with rated outputs ranging from 1,500 kW to 3,600 kW, and offers customer services ranging from project development support to operation and maintenance. Worldwide, the company has developed and/or sold over 6,600 wind turbines with a rated capacity exceeding 4,700 megawatts. The "wind" division of GE employs approximately 1,700 people worldwide, with design/manufacturing/assembly facilities located in China, Germany, India, Spain and the USA. For more information about GE Energy, visit their website at [www.gewindenergy.com](http://www.gewindenergy.com).

## • Technology

**Manufacturer:** GE Energy

**Wind Turbine Type:** GE 1.5 MW. GE's 1.5 MW Series turbine is the largest wind turbine assembled in the United States, was the first of its size class to be manufactured for the global wind power market and has the longest track-record of any MW class wind turbine. The GE 1.5 MW unit utilizes a variable speed, constant frequency design and a custom designed airfoil resulting in enhanced reliability and durability due to reduced mechanical loads, higher energy capture and lower noise signature than conventional fixed speed turbines due to improved aerodynamics. Interconnect costs are reduced due to selectable power factor and voltage control compared with conventional turbines with induction generators and fixed capacitors. For more information on the 1.5 wind turbine, please visit GE Energy's website at [www.gewindenergy.com](http://www.gewindenergy.com).

**Rated Output:** 1.5 MW (1,500 kW)

**Turbine Height** (from the bottom of the tower to the tip of the highest blade): 375 ft (approximately 115 m, or about as tall as a 37-story building)

**Turbine Weight, including rotor and nacelle:** approximately 250 tons (500,000 lbs)

**Foundation:** Each wind turbine foundation consists of a concrete octagonal footing 47 ft. in diameter and 7 ft. deep  
Footprint: 47 ft. in diameter, spaced 1 – 2,000 feet apart  
Concrete: 215 cubic yards - 430 tons per foundation (12,470 tons to complete all 29 Foundations, or 696 full truckloads)  
Reinforcing Steel (Rebar): 42,000 lbs per foundation (610 tons for entire project)

**Tower:** Tubular steel  
Height: 252 feet (80 meters)  
Weight: 154 tons (308,000 lbs.)

**Blades:** Composite fiberglass  
Length: 112 ft (34 m)  
Weight: 42,325 lbs. (total for all 3 blades)  
Rotor Diameter: 231 ft (70.5 meters) - 10% longer than the wingspan of a jumbo jet (a Boeing 747-400 has a wingspan of 210 ft. (64 meters).  
Revolutions per Minute: 11-20 (one revolution every 2 to 3 seconds).  
Swept Area: 41,995 sq. feet per turbine or 1.7 times the sail area of a flying clipper ship.

### **Construction:**

The following was the schedule:

May 2003 - Road construction began.

June 2003 - Wind turbine foundations and electrical collection system began. Roads completed.

July 2003 - O & M building began. Foundations completed. Substation construction began.

August 2003 - O&M building completed. Turbine installation began.

October 2003 - Electrical collection system complete. Commissioning began.

November 2003 - Turbine installation completed.

December 2003 - Commercial operation.

## • Benefits

**Households Served:** The 29 turbine installation will provide enough renewable electricity to serve approximately 20,000 average American homes each year, according to the American Wind Energy Association.

**Number of Landowners:** 14

**Project Acreage:** 2,600 - Less than 2% of the project's land area is used by the actual footprint of the turbine, leaving the rest of the land available for other purposes, including farming.

**Jobs Created:**

Construction Jobs: 114

Ongoing O&M Jobs: 4

## • Wind Energy

Wind energy was the world's fastest growing energy source over the last decade with an annual average growth rate of 35.7% over the past five years. Globally, installed wind capacity increased to 32,000 megawatts during 2002. Today, Denmark and many regions of Germany and Spain meet 10 and 25 percent of their electricity needs from wind energy. Forecasts for wind power continue to be favorable with more than 83,000 total installed megawatts predicted worldwide by 2007.