

# INVESTING IN RENEWABLE ENERGY



## Distribution Grid Turbines in Southwestern Minnesota

### Project description:

Project Resources Corporation (PRC) developed 5.4 MW of wind energy in Southwestern Minnesota and utilized a new landowner investment model to finance the project. PRC had several objectives for the project. First, they introduced the Suzlon S88 1.8 MW turbine model to the United States. A second objective created an investment model that would allow community members to become shareholders with reduced exposure to energy project development risks. The third objective was to interconnect the turbines to the local distribution grid. While PRC encountered challenges to primary goals, they concluded positive results were achieved and some expectations were exceeded.

### Methodology:

- 1) Designs for three 1.8 MW turbines were prepared.
- 2) Between 2002 and 2005, specific turbine sites were chosen, meteorological analysis was conducted and construction permits obtained.
- 3) The economic viability of interconnecting utility-scale turbines to the existing distribution network was explored to make more efficient use of the electrical grid. Several dozen substations were identified and evaluated for interconnecting projects of less than 10MW based on the locations of the substations, transformer size and other criteria.
- 4) Financing for the projects was finalized in 2005.
- 5) Three S88 turbine units were delivered in November of 2005 and the turbines were operating by March 2006.



**Grantee:** Project Resources Corporation

**Additional Team Members:** Suzlon Energy Ltd., Chicago, Ill

**Project Dates:** 2001-2005

**RDF Funding Cycle:** 1

**Project Funding:** \$900,000

**Project ID:** AW-03

**RDF Mission:** To increase renewable energy market penetration, assist renewable energy projects and companies, and support emerging renewable energy technology through research and development.

**Contact:** Renewable Development Fund

Xcel Energy

414 Nicollet Mall, 7th Floor

Minneapolis, MN 55401

1-800-354-3060

rdfstaff@xcelenergy.com

Web site: [www.xcelenergy.com/rdf](http://www.xcelenergy.com/rdf)

### Benefits:

- **Increased renewable energy capacity**—The three turbines installed for this project added 5.4 MW of wind energy generation in Minnesota.
- **Promotes expansion of the industry**—The Suzlon turbine is supported by Suzlon corporation's operation base in Pipestone, Minn. and serves as a demonstration model for potential customers in the Midwest region. A new Suzlon facility in Pipestone will employ an estimated 300 people at full production.
- **Increased market penetration**—The introduction of new financing mechanisms, particularly ones that offer opportunities for farmers and landowners to participate, broadens wind energy project potential in the state.

### Lessons learned:

- **Interconnection to the distribution system**—This project showed that interconnection to the distribution system may not be the most economical approach to adding large amounts of wind power.
- **Installing prototype turbines**—Despite some technical problems with component assembly and operating reliability during the first few months, prototype Suzlon S88 turbines were successfully installed.
- **Offering a new investment model**—The project goal to include landowners as investors was received with mixed results. Some investors had limited knowledge of federal tax law and some were unacquainted with energy investment structures. There were also differing expectations regarding the risk to be carried by community investors.

### Outcome:

- **Issues with capacity**—The distribution system was not designed to accommodate generation capacity at the scale of utility-sized wind turbines. The necessary upgrades to substations increased system design complexity and project expense. It would be more efficient for small projects to interconnect directly with transmission lines that include 34.5 kilovolt (kV) or lower voltage bus infrastructures.
- **Technical support**—This project showed that availability of quality, ongoing technical support is critical for overcoming installation and operational challenges.
- **Landowner participation**—The project showed that the proposed financing model works, but that more education and collaboration within the wind energy and investment community could expand and improve the available finance options.

### Executive summary:

A significant feature of the project was the use of the prototype Suzlon S88 turbine that includes a soft voltage control to prevent harmonics. Another feature of the project was the crafting of an ownership structure to allow farmers to invest in wind projects. An interesting finding of the project was the influence that the design capabilities of various distribution substations will have on the ability of distributive generation to interconnect with the grid. Many rural substations are not designed for significant increases in load capacity and would require significant upgrades to add distributed capacity.



414 Nicollet Mall, 7th floor  
 Minneapolis, MN 55401  
 1-800-354-3060  
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