Final Technical Report G014253

Wind Farm Feasibility Assessment

Saint Francis University, Loretto, Pennsylvania

Prepared by
Richard Curry and Erik Foley

DOE Project Officer – Keith Bennett
Golden Field Office, (303) 275-4700

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Abstract

Saint Francis University has assessed the Swallow Farm property located in Shade Township, Somerset County, Pennsylvania as a potential wind power development site. Saint Francis worked with McLean Energy Partners to have a 50-meter meteorological tower installed on the property in April 2004 and continues to conduct a meteorological assessment of the site. Results suggest a mean average wind speed at 80 meters of 17 mph with a net capacity factor of 31 - 33%. Approximate electricity generation capacity of the project is 10 megawatts. Also, the University used matching funds provided by the federal government to contract with ABR, Inc. to conduct radar studies of nocturnal migration of birds and bats during the migrations seasons in the Spring and Fall of 2005 with a mean nocturnal flight altitude of 402 meters with less than 5% of targets at altitudes of less than 125 meters. The mean nocturnal passage rate was 166 targets/km/h in the fall and 145 targets/km/h in the spring. Lastly, University faculty and students conducted a nesting bird study May - July 2006. Seventy-three (73) species of birds were observed with 65 determined to be breeding or potentially breeding species; this figure represents approximately 30% of the 214 breeding bird species in Pennsylvania. No officially protected avian species were determined to be nesting at Swallow Farm.

Project Report

Thanks to the support of the Department of Energy, Saint Francis University has completed the assessment of the Swallow Farm property located in Shade Township, Somerset County, PA as a potential wind power development site. The farm is privately owned by the family and had been previously strip-mined in order to extract coal. A wind easement was executed between the Swallow Farm and Saint Francis University in order to conduct feasibility studies and provide the mechanism for future development of the farm as a wind farm, if the site proved to be feasible.

This report is organized around the project's original Statement of Objectives. Following the original Statement of Purpose, each objective is presented as a major heading with the associated results or status following.

Statement of Purpose (from the original Statement of Objectives)

To continue and complete a wind resource assessment of several sites located in central Pennsylvania in order to:

- *meet the energy needs of Saint Francis University in the most environmentally benign manner by a reliance on renewable energy and energy efficiency and conservation;*
- *establish and provide the same benefits for a coalition of not-for-profit, public, and private sector energy consumers interested in purchasing renewable energy and improving energy efficiency; and*
- *utilize the resources of the University to develop a program of education, training and outreach that will promote the development of renewable energy in rural Pennsylvania.*

Program Objectives

1.To assess the wind resource in the region and evaluate the economic and practical feasibility of potential development options for the development of a wind power generating facility to serve Saint Francis University and the other members of the aforementioned renewable energy coalition.

2.Develop an economic model and assess financial feasibility of constructing a wind energy facility on one or more of the monitored sites.

3.Complete the development cycle including negotiating transmission and power purchase agreements, develop site plans, secure appropriate permits, solicit bids for construction and equipment purchases, and assess options for financing and ownership/operation of the facility.

Using matching funds from cash and in-kind contributions and grant money from the Commonwealth of Pennsylvania, Saint Francis had a 50 meter meteorological tower installed on the property in April 2004 and continues to conduct a meteorological assessment of the site at a level of 94% data availability. Mean average wind speed at 80

meters is 17 mph with a capacity factor of 31%. Data analysis by a professional meteorologist indicates that the site is suitable for wind energy production development at the commercial level. See Table below for detailed met data figures.

Month	Mean Wind Speed (mph) 40 m 9/1/03 8/31/04	50 m 4/1/04 6/30/06	80 m(projected) 9/1/03 6/30/06
January	21.1	18.0	20.8
February	18.6	18.4	19.8
March	17.1	19.0	19.6
April	16.8	16.8	18.2
May	14.5	14.5	15.7
June	12.2	12.5	13.3
July	12.3	12.3	13.0
August	10.7	12.0	12.7
September	14.7	12.9	14.2
October	15.2	14.4	15.8
November	18.5	18.5	19.9
December	20.2	20.3	21.5
Annual Mean Wind Speed	16.5	15.3	17.0

During the time frame in which these assessments were made, the wind power development environment changed significantly. The primary driver of wind power development in the United States, is the production tax credit, a subsidy that enables renewable energy sources such as wind to compete with the production of energy from fossil fuels. This program expired due to congressional failure to renew the program and as a result the subsidy was not available for nearly one year. Although the assessment of wind and potential environmental impacts and permitting of sites for development continued, construction of facilities was stopped and turbine manufacturers stopped the production process. Consequently, a backlog of projects developed and the availability of turbines was substantially diminished.

When the production tax credit was restored by Congress, the backlog of projects coupled with the scarcity of turbines greatly changed the economic feasibility of developing projects of the size anticipated by Saint Francis. The laws of supply and demand simply rendered the development of smaller sites as stand alone projects infeasible. The rule of thumb of development costs for installing a wind project rose from approximately one

million dollars per megawatt (MW) to a rate that is more than half again as much. For projects the size as one proposed by Saint Fancis University at the Swallow Farm (approximately 10 MW), turbines are not available. In addition, consolidation is taking place within the industry and smaller development firms are being acquired by multi-billion firms that are primarily international players.

In that context, Saint Francis, after reviewing the options of developing the site as a stand alone project, has elected to try to have the site developed as part of a larger project and reinvest the sale revenue into the development of an on campus demonstration turbine and purchase either renewable energy or renewable energy credits from the market. Fortunately, several large projects are proposed for development in the immediate vicinity, including a site that is directly across the highway from the Swallow Farm. Negotiations are underway to transfer the development rights that Saint Francis has in the Swallow Farm to one of the multi-billion dollar companies that are developing large scale wind projects. It is anticipated that development of the Swallow Farm would not occur until 2008 and that assumes that the production tax credit will be extended beyond the current deadline of December, 31 2007.

4.Conduct energy load/use audits to determine potential use levels of institutional members of the renewable energy consortium and to determine the potential for cost savings through energy conservation.

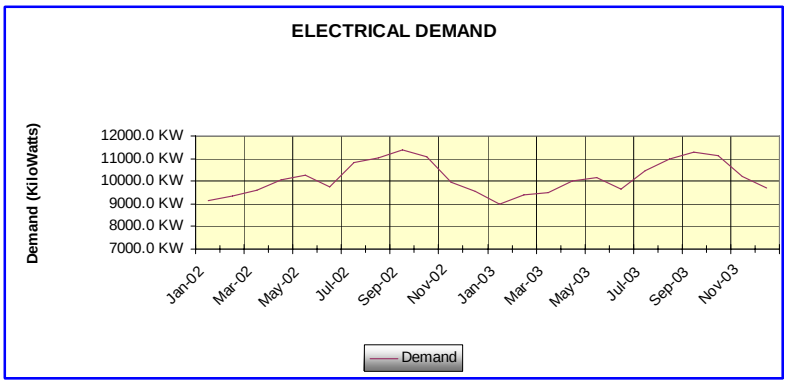
With assistance from the Commonwealth of Pennsylvania through the Energy Harvest Grant Program an electrical usage profile and a facility energy assessment was developed by L. Robert Kimball & Associates (Ebensburg, Pennsylvania) for each member of the Renewable Energy Coalition. The members studied were Altoona Hospital, Cambria County Prison, Degol Organization, Laurel Crest Rehabilitation and Special Care Center, Miners medical Center, Mount Aloysius College Saint Francis University and State Correctional Institute – Cresson.

The wind energy generation plant would be sized to adequately supply a maximum demand load, and therefore this study found that the maximum load plus an expansion factor of 25 percent, or 13.0 Megawatts would be required as a minimum plant size.

The study focused on each coalition member facility:

a. Determine an electrical usage profile;
b. Provide a facility energy assessment of the mechanical and electrical main distribution systems;

From the above items, a Master Profile of electrical usage was be developed for the entire coalition (see graph on the right).



5. Initiate and conduct environmental assessments of those sites.

Since the habitat had been significantly altered by the strip mining operations a major focus of the environmental assessment of the site was on the amount of bird and bat migration associated with the site. Accordingly, Saint Francis University using matching funds provided by the federal government, contracted with ABR, Inc to conduct radar studies of nocturnal migration of birds and bats during the migrations seasons in the Spring and Fall of 2005 whose results demonstrated a mean nocturnal flight altitude of 402 meters with less than 5% of targets at altitudes of less than 125 meters. During the fall, the mean nocturnal passage rate was 166 targets/km/h and 145 targets/km/h in the spring. This passage rate of birds and bats over the Swallow Farm site was in the middle of the range of those found at other sites studied within the region. Copies of these studies are available from Renewable Energy Center at Saint Francis University, Erik Foley, Director.

University faculty and students conducted a nesting bird study May - July 2006. Seventy-three (73) species of birds were observed with 65 determined to be breeding or potentially breeding species; this figure represents approximately 30% of the 214 breeding bird species in Pennsylvania. No officially protected avian species were determined to be nesting at Swallow Farm. Continued agricultural use of the site and construction of wind turbines would have an impact on the ground nesting species. The installation of wind turbines based on studies conducted at other projects around the country suggest that the impact is most likely to be temporal. The current agricultural practices are expected to continue to have an annual impact.

This last point fulfilled our goal to "utilize the resources of the University to develop a program of education, training and outreach that will promote the development of renewable energy in rural Pennsylvania." Also launched during the end of the project period was a Renewable Energy Center at the University whose mission is to continue the work made possible by this grant involving students and faculty in the promotion of renewable energy in Pennsylvania.