

# Technical and Market Integration of Wind Energy

## IPRO 344 - Fall 2006

### Objectives:

The purpose of IPRO 344 was to design a large scale wind turbine unit and to place one or more of these units at good wind resource locations in the state of Illinois. A secondary objective was to investigate and evaluate the technical and market integration issues of such power plant.

### Organization:

The IPRO 344 team was split into three groups for the semester. These included the Mechanical Design, Environmental, and Marketing teams. Other short term groups were created to work on the poster, the final report, sponsor presentation, IPRO presentations, and other specific research.

### Accomplishments:

The team made significant accomplishments throughout the semester. The Design Team was responsible for devising a single turbine which could harvest as much energy as possible at four locations: Pittsfield, Rochelle, Chicago (Offshore) and Bloomington. The team completed several three-dimensional designs which were tested using wind tunnel simulation software in order to determine which was most efficient, and a single design was chosen for all sites.

The Marketing Team assessed the financial feasibility of wind farms at each location. Using RETScreen International Clean Energy Project Analysis software, they utilized data from National Renewable Energy Laboratory (NREL), the National Oceanic and Atmospheric Administration (NOAA), and other reliable sources in order to calculate relevant financial results. By using these resources, they were able to perform a sensitivity analysis to obtain scenarios that would have positive economic indexes, such as the Net Present Value. The Marketing Team also investigated the impacts on the ComEd power market.

The Environmental Team explored the effects that a wind power plant would bring on the local and macro environment, and local community. Their primary achievement was in determining the amount of CO<sub>2</sub>, SO<sub>2</sub> and NO<sub>x</sub> emissions which would be displaced by wind energy in Illinois. The Environmental Team also investigated all required permits and respective documents to implement a wind energy project in Illinois.

### Future Work:

A study of the local power grid must be carried out in order to obtain more accurate costs for the transmission lines and substation. Underground Pumped Storage was considered in Illinois but it should be investigated with more detail, i.e. the state of the art pump hydro. Dr. Michael Polsky, the team sponsor, suggested that a national wind energy policy needs to be implemented in order to promote wind energy in all states. Team must to communicate the results of IPRO 344 to the general public.

### **Team Members**

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