**ABSTRACT**

The primary focus of this study is to determine the power production potential of Ball State’s Cooper farm site located north-west of Muncie, IN. The annual potential electrical energy that can be harnessed from the wind in the vicinity of Ball State is here calculated and compared to Ball State’s total electrical consumption for one year.

**Background**

The American College and University Presidents Climate Commitment which was signed by President Jo Ann M. Gora in 2006, specifies that the campus must eliminate its net greenhouse gases in a reasonable amount of time. By investing in wind energy on campus, we could reduce the amount of electricity consumed by the University and further our goal of eliminating greenhouse emissions.

**Time constraints on Cooper Farm data**

In order to calculate the power production of the site, wind data needed to be compiled over the course of one or more years before it could be analyzed. Currently, the only data for the site is now just under one year. Because of this, a comparable site was picked with similar terrain conditions and a larger data set. The Delaware County Johnson Air Field has 30+ years of weather data. This data was used to gage the potential of the Cooper farm site.

**Wind turbine power curves**

To accurately predict the electrical power that can be produced from a site, a suitable wind turbine must be selected. On comparison of various turbines, the Vestas V112 turbine rose to the top for best option to produce electrical power at the site. Below are the power curves for a few larger and more popular wind turbines.

**Johnson Air Field compared to Cooper Farm**

Two frequency distributions were created, one for the collected wind speed data from Cooper Farm and one for the Johnson Air Field wind speed data during the same time period. The frequency distributions were compared to determine if the two sites collected similar wind speeds during the same time period.

**Johnson Air Field wind frequency from 2008-2012**

Possibly due to some onsite obstructions of the measuring equipment the Johnson Air Field frequency is slightly higher at faster wind speeds than Cooper Farm during the sampling time period. If the data is interpreted to mean the limit of Cooper Farm's power production is less than or equal to Johnson Air Field, then an analysis of the Johnson Air Field data will produce the maximum potential for wind energy at the Cooper Farm site.

**Equations**

- Hours per year at each wind speed = (% at each velocity/100) × 8760 hours
- Power produced per wind speed = Power curve × Hours per year at each wind speed
- Total kWh of electric power annually = Sum of power produced per wind speed
- Percentage of Ball State’s total consumption = (power produced/power consumed) × 100
- Annual savings = Power produced × $0.05/kWh

**Results**

Due to the numerous factors involved in purchasing and constructing a wind turbine, the total expenditure of such a project is not defined at this time. Upon contact and consultation with a manufacturing company an quote could be acquired. However, a reasonable estimate is a payback time of approximately 15 years.