

# **The Economic Optimization of Wind Turbine Design**

## **Abstract**

This study developed a model which optimizes the wind turbine design to maximize the economic value of the wind turbine. This was accomplished by considering not only the total annual power produced but also the economic value of the electrical power which varies hourly over the year. Power produced during peak demand has the highest economic value. It is therefore necessary to consider the time-of-day power is produced. The optimal turbine design is heavily dependent on the wind conditions in which it is installed. When wind conditions are analyzed on a time-of-day basis, it can be seen that the average wind conditions during peak demand often differs significantly from the wind conditions averaged over an annual period. As a result, the optimal wind turbine design based on wind conditions averaged over an annual period is not necessarily the optimal economic design. In this optimization, an economic weighting scheme is derived from the commercial time-of-day rate of the utility company which corresponds to the specific wind site being considered.