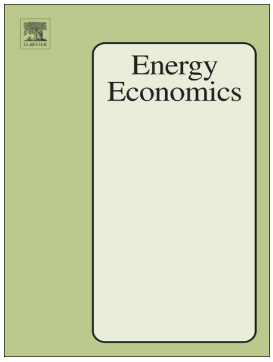

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Wind Power Bidding Strategy in the Short-term Electricity Market

Shaomao Li[a,*], Chan.S Park[a]

[a] *Department of Industrial and Systems Engineering, Auburn University, Auburn, AL 36830, USA*

Abstract

This paper presents an analytical trading electricity model for wind power producers (WPPs) in the short-term electricity market in the U.S. This model addresses four specific uncertainties: real-time (RT) wind power generation, day-ahead (DA) locational marginal prices (LMPs), RT LMPs, and deviation penalty rates. The model is designed to find the optimal bidding strategy to maximize the expected revenue under these uncertainties. In addition, this paper shows advanced forecasting techniques could be used with the proposed bidding strategy to help WPPs trade energy in short-term markets. A case study is presented to illustrate the effectiveness of this proposed bidding strategy and advanced forecasting techniques using a set of real data taken from a wind farm in the PJM electricity market.

Keywords: wind power, bidding strategy, forecasting model, short-term market, analytical method

1. Introduction

Use of wind energy has rapidly expanded around the world. Wind power is expected to continue its fast growth in many countries, including the U.S. and China. However, the uncertainty and variability of wind power give rise to several challenges of power systems and the electricity market.

From WPPs' point of view, it is essential to participate in the electricity market and gain as much revenue as possible. In general, WPPs in the U.S. prefer to commit to power purchasing agreements (PPAs) to sell the generated wind power, as these arrangements bring in stable cash flow for a relatively long term, typically over 10 years. Besides PPAs, WPPs can also participate in two other short-term markets, the day-ahead (DA) market and the real-time (RT) market. The DA market operates like a forward market, and the RT market is often referred to as a balancing market. When generation companies

*Corresponding author
Email address: szl0007@auburn.edu (Shaomao Li)