***MARKET POWER AND POLICY IN DEREGULATED ELECTRICITY MARKET WITH PENETRATION OF RENEWABLE ENERGY IN CHINA***

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## Overview

In the last decades, renewable energy as a sustainable and environmentally friendly energy has achieved a great development. A large of number researchers have proved that as the penetration rate of intermittent renewable energy into the energy market rises electricity prices fall. Recently, more and more wind and photovoltaic power is abandoned in China, especially in the northwest area where wind and light resource are abundant. In 2015, electricity quantity of abandoned wind power is more than 33.9 billion kWh. Average service time of 2015 drops to 1728 hours, less than 1893 of 2014. For a long time, renewable generation firms struggle with policies. There are two main methodology to research the impacts of wind power uncertainty on market behavior of an oligopoly. One of them is mathematical model. (Green R. ,Vasilako N.,2010. Paul Twomey, Karsten Neuhoff, 2010. Ori Ben-Mashe, oFir D. Rubin, 2015) Another one is agent-based model, which is a simulation model. (Veit DJ. et al., 2009. Morteza Rahimiyan, 2014. Oliver Browne et al., 2015. Reza Arjmand, Morteza Rahimiyan, 2016.) This paper discusses whether policy has effect on electricity price as the wind power penetration rises and how the government formulate policies to make the better use of renewable energy resource.

The paper is organized as follows: The introduction, the first section gives a brief overview about deregulated electricity market and renewable energy in China. The second section addresses the mathematical model under monopoly and we can get the price of wind power and find what factors influence the price. In section three we describe the monopoly model under policy and the results. After that, in the section four we present the duopoly model with forward contracting and the results. The final section policy implications are derived.

## Methodology

Mathematical model is applied here to derive a relationship among the players’ strategic behaviors.

Game theory.

## Results

First, we can obtain that the price of wind power is lower than the average price in spot market. The difference results from the intermittent nature of wind power output. Demand elastic and carbon emission level have an impact on this difference.

Second, as carbon emission of conventional generators rise, the impact on wind power price is decreasing.

Third, the more wind power output, the lower market price. The market price depends on the ratio of renewable energy purchased by conventional GFs.

## Conclusion

As carbon emission of conventional generators rise, the impact on wind power price is decreasing. The level of carbon emission is lower, the impact is higher. It proves that conventional GFs compensate their costs at the expense of wind power. Wind generators benefit less than conventional generators.

Generally, the more wind power output, the lower market price. Here we proved policy can change this phenomenon. The market price depends on the ratio of renewable energy purchased by conventional GFs.

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