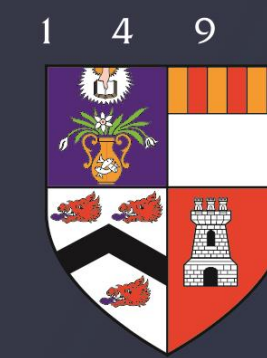


The Effect of Wind Generation on Electricity Spot Prices and Volatility in the UK

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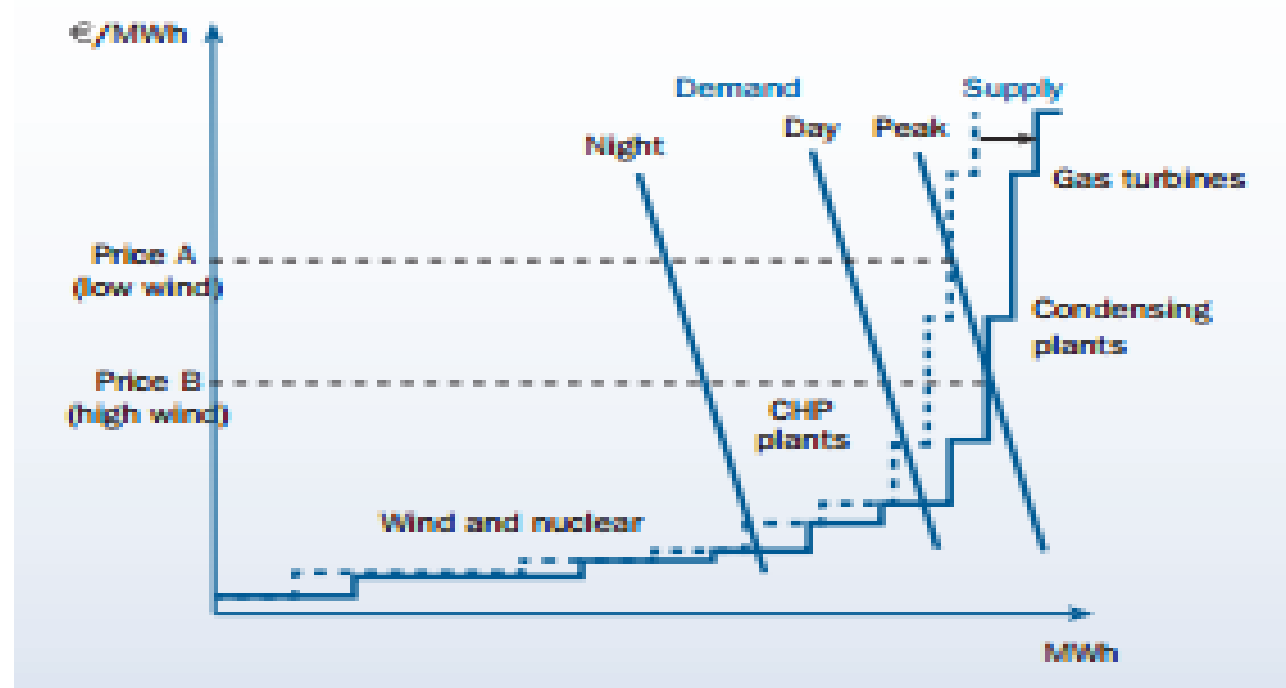


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Motivation

A number of targets were set by the European Union known as the “20-20-20” in order to reduce the effects of climate change and increase renewable energy consumption and production efficiency.

15.5% of total electricity generated in the UK came from renewable sources in 2013 and this number has been increasing each year. According to economic theory such growth has an effect on electricity prices.



Source: EWEA Economics of Wind

Methodology

A multivariate linear regression analysis was used to estimate how changes in wind generation affect electricity prices after eliminating the

effects of other significant electricity price determinants that are included in the regression.

Wind, coal, natural gas, hydropower and nuclear generation levels as well as electricity demand, price of natural gas, lagged electricity spot price and three binary indicators are the independent variables used.

GARCH model is used to estimate the effects wind generation has on the volatility of electricity spot price.

Results

Regression Analysis

During the period of 2009 - 2012	
Wind generation	Not significant
During the period of 2012- 2015	
An increase of 1GWh in wind generation	Reduces electricity spot price by £0.03.
During the period of 2009 - June 2015	
An increase of 1GWh in wind generation	Reduces electricity spot price by £0.03.
An increase of 1% in wind penetration	Reduces electricity spot prices by £28.95.

GARCH model

During the period of 2009 - June 2015	
An increase of 1GWh in wind generation	Reduces the volatility of electricity spot price.
An increase of 1% in wind penetration	Reduces the volatility of electricity spot price.
ARCH term	Influence volatility
GARCH term	Influence volatility
Shock persistence	Dies out at a low rate

Conclusion

Increasing wind generation and wind penetration levels in the future years will reduce electricity spot prices.

As wind generation increases, the levels of electricity spot price volatility should decrease.

Due to high levels of shock persistence in price volatility governments should only employ policies that have gradual effects in order to achieve “20-20-20” goals most efficiently.