

The RES-Induced Switching Effect Across Fossil Fuels: An Analysis of Day-Ahead and Balancing Prices

Angelica Gianfreda¹, Lucia Parisio², and Matteo Pelagatti³

Executive summary

In this paper we present evidence of an evolving dynamic relationship linking electricity with fuel prices. The analysis is performed using Northern-Italian day-ahead market prices and, for the first time to our knowledge, balancing market prices.

The analysis of real time sessions is particularly relevant in years when the high RES penetration has reshaped competitive conditions in the electricity markets. In day-ahead sessions, RES compete with conventional generation sources and the priority of dispatch granted to RES units decreases the residual demand left to conventional units. In this manner, a “merit order effect” may cause a change in the marginal technology and a decrease in price level. While many applied research has been devoted to the evaluation of the size of this effect, there is no applied work studying the impact on the dynamics of linking electricity prices with their market fundamentals, namely fuel costs.

Balancing market sessions provide ancillary services by units with the necessary degree of flexibility, in order to maintain an appropriate level of system security, given the increasing penetration of intermittent and unpredictable RES sources, like solar-PV and wind. In balancing market session, conventional units enjoy a very high market power since RES are not allowed to participate. We apply cointegration analysis on two different sample characterized by low (2006-08) and high (2013-15) RES penetration.

The findings support our intuition that the traditional relationship between electricity and fuels prices in day-ahead markets has substantially changed in the second sample. In particular, we show that the role and the influence of fuels in the day-ahead sessions have been reduced. We find that coal-fired power generation has increased its influence on electricity prices at the expense of gas, which has historically been the leading variable of electricity price dynamics. In the balancing session, we provide empirical evidence that fossil fuels explain around 20% of the variance of electricity prices in a one-year time horizon. However, we show that in the second sample there is a common trend between balancing prices paid to thermal units and gas prices.

Keywords Renewable Sources, Electricity, Coal, Oil, Gas, Cointegration.

1 Corresponding author. Faculty of Economics and Management, Free University of Bozen-Bolzano, Piazza Università 1, 39100 Bozen, Italy. angelica.gianfreda@unibz.it

2 Department of Economics, Management and Statistics, University of Milano-Bicocca, Piazza Ateneo Nuovo 1, 20126 Milan, Italy.

3 Department of Economics, Management and Statistics, University of Milano-Bicocca, Via Bicocca degli Arcimboldi 8, 20126 Milan, Italy.