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Joana Pinho, Joana Resende, Isabel Soares

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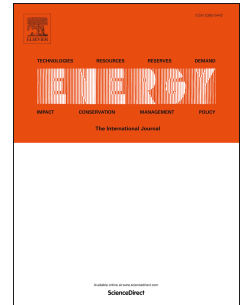
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Capacity investment in electricity markets under supply and demand uncertainty

Joana Pinho*, Joana Resende[▲] and Isabel Soares[▲]

*Católica Porto Business School and CEGE, Universidade Católica Portuguesa.

[▲]CEF.UP and Economics Department, University of Porto.

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Abstract

In the last decades, the weight of renewable energies sources (RES-E) in the electricity generation mix of most European countries has considerably increased, constituting an important contribution to the transition towards a low-carbon economy. Until very recently, RES-E were supported by favorable investment mechanisms specially designed to endorse investment in RES-E. More recently, as RES-E are becoming increasingly more competitive (especially wind and solar photovoltaic), RES-E are starting to be remunerated according to market mechanisms. This has generated a lively debate on the economic pros and cons of dispatching RES-E in the market. This paper contributes to this debate by developing a game theoretical model in the context of which we first analyze how the inclusion of RES-E in the electricity wholesale market affects equilibrium outcomes under demand and supply uncertainty. Then, we examine how the inclusion of RES-E in the electricity wholesale market impacts firms' incentives to invest in conventional energy sources, characterizing the optimal investment under demand and supply uncertainty. We find that, when RES-E capacity and asymmetry in firms' marginal production costs are sufficiently high, RES-E producers may strategically reduce the market price, in order to evict the less efficient conventional source in that period. Although, in the short-run, this strategy may actually favor energy consumers (since prices are lower), the expectations of inactivity periods (regardless of whether they arise for strategic or market reasons) may negatively affect investment in back-up capacity, possibly leading to an increase in future prices (since less back-up capacity is available). Finally, we provide an analytical characterization of optimal investment levels in conventional energy sources under demand and supply uncertainty.

Keywords: Electricity markets, Capacity investment; RES-E.

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