

Managing intermittency in the electricity market [☆]

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Abstract

We analyze the integration of intermittent renewables-based technologies into an electricity mix comprising of conventional energy. Intermittency is modeled by a contingent electricity market and we introduce demand-side flexibility through the retailing structure. Retailers propose diversified electricity contracts at different prices allowing consumers to choose their optimal electricity consumption. These contracts are modeled by a set of state-contingent electricity delivery contracts. We show existence and uniqueness of a competitive equilibrium of the contingent wholesale and retail markets. We provide a welfare analysis and only obtain constraint efficiency due to a limited number of delivery contracts. Finally, we discuss the conditions under which changing the set of delivery contracts improves penetration of renewables and increases welfare. This provides useful policy insights for managing intermittency and achieving renewable capacity objectives.

Keywords: electricity market, renewables, intermittency, demand flexibility

JEL classification: Q41, Q42, D61, G13

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