

Rethinking the electricity market design: remuneration mechanisms to reach high RES shares. Results from a Spanish case study

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Abstract— Electricity systems experience a period of transition towards decarbonisation and face multiple uncertainties. Variable renewable energy resources undergo a rapid cost decline while policy makers push for stricter decarbonisation targets to limit global warming and to comply with international commitments such as the 2015 Paris Agreement. In this context, a better understanding on how today's electricity market design has to be modified to comply with high shares of variable RES generation is required. This work demonstrates the need to extend the current electricity market design by additional remuneration mechanisms to reach imposed quotas of renewable generation and provide investment incentives for new firm capacity. A Spanish case study presented in this paper explores the electricity system transition between 2025 and 2040. An electricity system resource expansion model (SPLORDER) is used to study different policies and estimate the evolution of investments and costs over the transition period. Results indicate that the interactions between energy market prices, additional capacity and RES remuneration mechanisms are particularly sensible to policy decisions, demand growth and technological developments. Conclusions indicate that such remuneration mechanisms must account for the uncertainty of future electricity market developments and additional hedging alternatives are required to ensure the cost recovery of new generation technologies.

Index Terms— Decarbonisation targets; Remuneration mechanisms; Variable renewables; Energy-only markets; Electricity system model; Electricity system transition

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