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Granularity Meets Strategy: 15-Minute Markets, Portfolio Bidding, and Electricity Price Formation

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Extended Abstract

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Abstract Summary

The transition from hourly to 15-minute time granularity in European day-ahead electricity markets represents a major reform aimed at improving the alignment between market outcomes and the physical operation of power systems. By allowing bids at a finer temporal resolution, the reform is expected to enhance allocative efficiency, facilitate the integration of variable renewable energy sources, and strengthen short-term price signals for flexibility. At the same time, the introduction of portfolio-based bidding, which allows operators to submit aggregated offers across multiple units, has reshaped bidding behavior and potentially altered the strategic environment.

This paper provides an empirical assessment of the short-run effects of these reforms, focusing on the Italian electricity market as a case study. Using high-frequency data for the period 2023–2026, we analyze changes in electricity price levels, volatility, and distribution before and after the introduction of 15-minute auctions.

Preliminary results show that the reform is associated with a significant increase in price variability, while evidence on average price levels is mixed and not robust across specifications. Importantly, the effects are highly heterogeneous across hours of the day. Prices tend to decrease during periods of high solar photovoltaic generation, suggesting improved responsiveness to abundant low-cost supply, while volatility and price spikes increase during ramping hours and periods of limited renewable availability.

These findings indicate that increased temporal granularity reshapes price dynamics rather than uniformly lowering prices. In systems with limited flexibility and strong reliance on gas-fired generation, finer time resolution may amplify short-term scarcity and increase the frequency of marginal clearing events. The interaction with portfolio bidding further influences price formation by enabling internal optimization and potentially enhancing strategic behavior. Overall, the results suggest that the efficiency gains from higher temporal granularity critically depend on the availability of flexible resources and complementary market conditions.

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Research Interests

• Auction theory and market design (JEL D44, C72)
• Electricity market regulation and integration (JEL L94, L51)
• Performance and efficiency of public enterprises (JEL D24, L92)
• Empirical and econometric analysis of energy markets