487

On European Day-Ahead Electricity Price Forecasting: A Pan-European Benchmarking Study

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Extended Abstract

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Abstract Summary

This study benchmarks day-ahead electricity price forecasts across all 31 European bidding zones, the first systematic pan-European analysis at this scale. XGBoost models with SHAP feature importance analysis are used to evaluate forecasting performance from January 2025 through March 2026, covering both hourly and 15-minute trading products.

Substantial geographic heterogeneity in forecast accuracy is found. Markets with high renewable penetration and strong interconnection—Denmark, Finland, and Germany-Luxembourg—are most predictable (rMAE 0.566–0.612), while hydropower-dominated Nordic zones and isolated Switzerland are difficult to forecast (rMAE 1.361–1.651). Weather features dominate price prediction across all zones (68.7% of importance), consistent with the merit order effect of renewables. Auxiliary predictions of load and generation improve accuracy by 15.6% on average, with largest contributions in high-renewable regions.

Cross-border integration reveals an important geographic asymmetry: peripheral markets like Portugal, Bulgaria, and Hungary benefit substantially from neighboring zone fundamentals (, while core central European markets derive minimal value, indicating that interconnection amplifies information spillovers most where markets sit at system boundaries.

The October 2025 transition from hourly to 15-minute products does not produce systematic forecast deterioration. Zone-level difficulty rankings remain strongly preserved across resolutions, suggesting market structure and fundamental drivers remain stable regardless of trading granularity.

These findings have practical implications for market participants: weather-centric forecasting approaches suit most European markets, while hydropower-dependent zones require explicit reservoir modeling.