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Analysing the electric vehicle charging behaviour in Spain: Patterns and insights

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Abstract-

The growing adoption of electric vehicles (EVs) is a key component of Spain’s strategy for achieving sustainable transportation and energy systems. This paper analyses EV charging behaviour using individual smart meter data from over 20,000 Spanish EV users, offering insights into charging session timing, duration, energy consumption, and power load trends—including variations among regions and tariff structures-.
Our findings show that most charging sessions take place during the nighttime tariff period (1:00 AM to 7:00 AM), when electricity prices are lower, highlighting the effectiveness of time-of-use pricing in shifting demand to off-peak hours. However, this behaviour also leads to a coincident peak in electricity consumption, which could pose challenges as EV adoption increases and may require further attention to avoid grid stress.
Leveraging a large, representative dataset in the Spanish context, the results of this study provide valuable insights for policymakers and energy market stakeholders seeking to optimize EV integration and mitigate the potential impacts of widespread electrification.

Index Terms- Electric vehicles; Charging Behaviour; Tariffs; Disaggregation; Seasonality

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