



Analysing the Impact of Local Electricity Transactions with EV Penetration on the Electrical Grid

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Summary

This article explores how the growth of electric vehicles and the ability for people to buy and sell electricity locally (like neighbors selling excess of solar power in a local electricity market) affects our power grid — the system that delivers electricity from producers to consumers. As it is expected that more people use electric vehicles and charge them at home, it will change when and how much electricity is used at the distribution level. This research uses computer simulations to understand these changes and their potential impacts. It looks at things like energy costs and whether these changes can help reduce our electricity bills or solve other power grid issues. The study provides insight into how the growing use of electric vehicles and local electricity trading can be managed to benefit everyone — from everyday people to the entire electricity network.

Highlights

- A mathematical model for optimization of energy bids in local markets is proposed and formulated. The model include the consideration of PV generation, EVs' penetration, and network validation by a distribution system operator.
- Since the transacted energy in the local market occurs at the low voltage level impacting the distribution network, the network status is validated implementing a power flow calculation after clearing the local market.
- A thoroughly framework is provided to solve the problem using evolutionary computation.
- The proposed framework is validated in a scenario considering 55 end-users and six combined heat and power (CHPs) generators trading energy in the IEEE European Low Voltage Test Feeder system.



Info

The TradeRES project will develop and test innovative electricity market designs that can meet society's needs of a (near) 100% renewable power system. The market design will be tested in a sophisticated simulation environment in which real-world characteristics such as actors' limited foresight into the future and risk aversion are included.



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