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Transition to peak-load-based tariffs can be disruptive for different groups of consumers

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Transition to peak-load-based tariffs can be disruptive for different groups of consumers

New network tariffs designed to recover grid operating costs can introduce up to a 500% increase in charges for some households. A transition from volumetric to peak-load-based tariffs will require targeted policy measures such as clear price signals, information about household electricity consumption, and temporary compensation or mitigation mechanisms.

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POLICY BRIEF BASED ON V. Azarova *et al. Nature Energy* https://doi.org/10.1038/s41560-018-0105-4 (2018).

The Policy Problem

Growing self-generation and storage are expected to cause significant changes in residential electricity usage patterns and hence household bills. However, the costs of operating the electricity grid must still be recovered from ratepayers. Commonly applied volumetric network tariffs may result in an imbalance between different socio-economic groups of households and their respective contributions to recovering these operating costs. The introduction of smart meters offers new tariff models to finance electricity grids, such as a change from volumetric grid tariffs to charging customers for the load peaks they induce. However, it is important to know whether certain tariffs ultimately shift the burden of grid maintenance towards lower-income households. A better understanding of the impact of new tariffs on households across a range of socio-economic backgrounds can help to design tariffs that recover the costs needed for the sustainable operation of the grid in a socially equitable manner.

The Findings

We modelled the effects of 11 network tariff scenarios on household budgets using real load profiles from 765 households collected between April 2010 and March 2011 in Austria. We found that, for tariffs emphasizing peak charges, the predictability of annual network costs for households is potentially low, because the costs are driven by only a small number of peak consumption values. Moreover, the impact of peak charges on household budgets can be disruptive. More specifically, we found up to a 500% increase in network charges for some households under the extreme tariff scheme tested. Although the potential size of the effects is dramatic, one might expect that households would adapt to the new tariff schemes after a while. We were unable to test such a response as we only used historic data where no alternative tariffs with price signals were applied.

The Study

Our study explored the impact of applying peak-load-based tariffs on the budgets of households that had mainly been charged based on consumed volumes before. We recruited households from Upper Austria, who gave us permission to collect their 15-minute electricity load profiles from their smart meter between April 2010 and March 2011. They also provided socio-economic information and details of their electric appliances. We used this data to estimate the change in household network expenditures for 11 different combinations of energy, peak and fixed charges that try to recover network charges in different ways.

Recommendations For Policy

- New tariffs designed to support continued network charges in the face of increased electricity self-consumption should include cost transparency and set the right consumer incentives.

- The low predictability of tariffs based on peak charges and their potentially high financial impact may result in an increased number of consumer complaints. Procedures will need to be introduced to handle this.

- Impact of alternative tariffs on household budgets is largely dependent on the household's economic status. Mitigation mechanisms to deal with hardship cases at least during transition phase are required.

- Tariffs that combine measured peak-demand and volumetric components can help manage increased self-consumption and re-balance the distribution of network costs across customers irrespective of their socio-economic status.

Further Reading

European Commission (2015). Study on tariff design for distribution systems. Report prepared for the DIRECTORATE-GENERAL FOR ENERGY, DIRECTORATE B – Internal Energy Market.
This work analyses regulatory schemes applied in the Member States to electricity and gas distribution, identifies best practices and makes recommendations for the European Commission on the desirable features of distribution tariff regulation.

Küfeoğlu and Pollitt (2018). The impact of PVs and EVs on Domestic Electricity Network Charges: a case study from Great Britain. Cambridge Working Paper in Economics 1830.
The authors show that the distribution tariffs in Great Britain will be electric vehicles (EV) dominated in the future and that future EV and Photovoltaics penetration projections indicate that the distribution tariffs will likely decrease for all customers in Great Britain

Pérez-Arriaga, I. J. & Smeers, Y. in Transport Pricing of Electricity Networks Ch. 7 (Springer, Boston, MA, 2003).
Describes the fundamentals of defining network tariffs.

Simshauser, Paul, (2016), Distribution network prices and solar PV: Resolving rate instability and wealth transfers through demand tariffs, Energy Economics, 54, issue C, p. 108-122.
This study shows the extent of wealth transfers from non-solar households to solar households under "traditional" network tariff schemes.

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Competing interests

The authors declare no competing interests.