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Tariff Design Issues: Approaches for Recovering Grid and System Costs

DG Energy - Workshop on
Renewable Energy Self-Consumption

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The Regulatory Assistance Project - RAP

RAP is a global NGO providing technical and policy assistance to government officials and agency staff on energy and environmental issues. RAP Principals and senior staff are former regulators, government officials or senior policy advisors, and RAP's work is funded exclusively by foundations and government agencies. RAP has worked in more than 20 nations and 50 provinces and states. RAP's European offices are headquartered in Brussels, with a second office in Berlin.

Andreas Jahn joined RAP as a Senior Associate in Berlin. Mr. Jahn has extensive experience with power markets and regulation, as well as knowledge of the German national political arena. His work in Germany focuses on issues relating to the German “Energiewende”, or energy transition, helping develop and advance regulatory options for a carbon neutral energy system in the power sector, including demand-side resources. He also supports RAP's work throughout Europe.

Previously, Mr. Jahn was responsible for all energy policy and regulatory matters as the Director of Regulatory Affairs at lekker Energy, a German electricity and gas provider. Through his work as a senior expert for the Association of New Energy Suppliers, he gained valuable insight into political decision-making processes and legislative procedures. He was also a member of the Federal Ministry of Economics' task force on legislation to implement grid regulation in Germany.

Agenda

- Fixed charges don't optimize system
- Volumetric charges are best to incentivize efficiency and optimized system costs
- If the concern is self-consumption, consider time-varying charges for self-consumers / to incentivize flexible demand

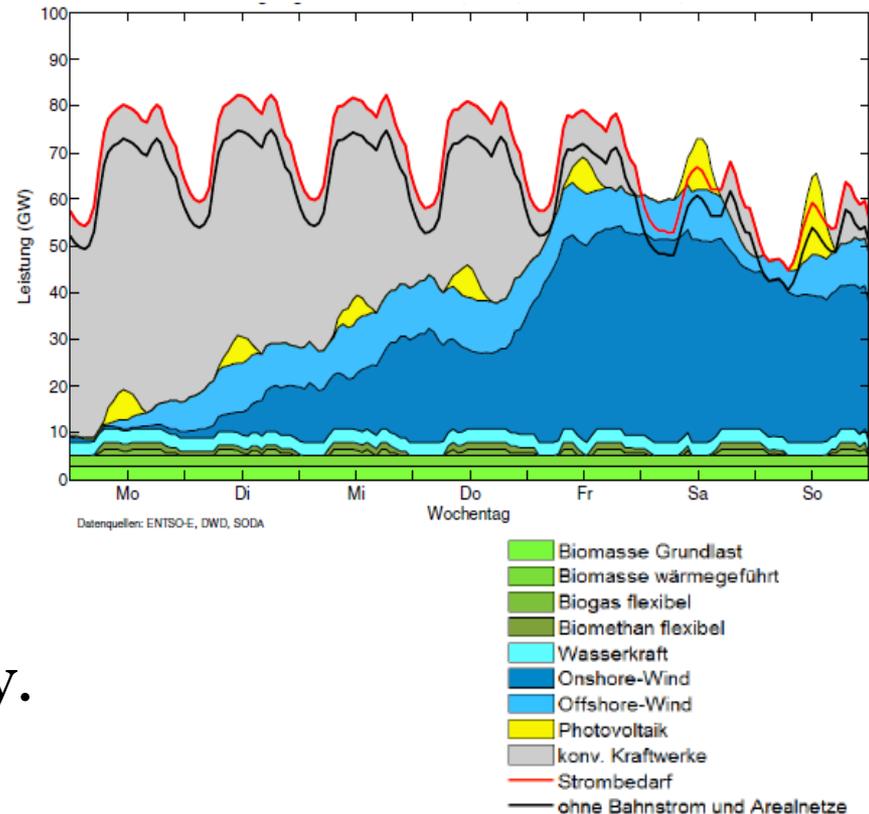
Challenge: Efficiency - incl. Flexibility

Increasing RES will lead to

- need for flexible resources,
- increasing price spreads,
- grid extension and increasing grid costs.

To minimize system costs, future tariff design should encourage efficient consumption that responds flexibly to available energy supply and to grid capacity.

Total demand (red line) and net-demand (grey parts) in Germany within 2nd week Feb. 2022



Definition of Self-Consumption

Self-consumption replaces consumption from the grid by electricity generated (and maybe stored) and used behind the meter.

- Any kind of feed-in or feed-in-tariffs are additional, and *not* included in self-consumption.

Two main resources are able to supply electricity for self-consumption: PV and Mini-/Micro-CHP. Because of bio-gas use, both could be counted as RES.

What is the Net-Value of Self-Consumption to the System?

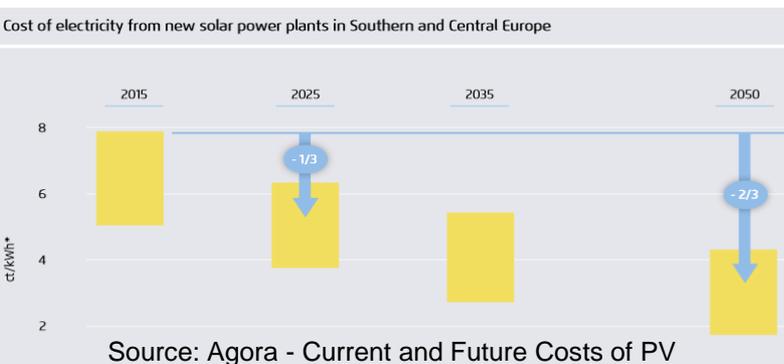
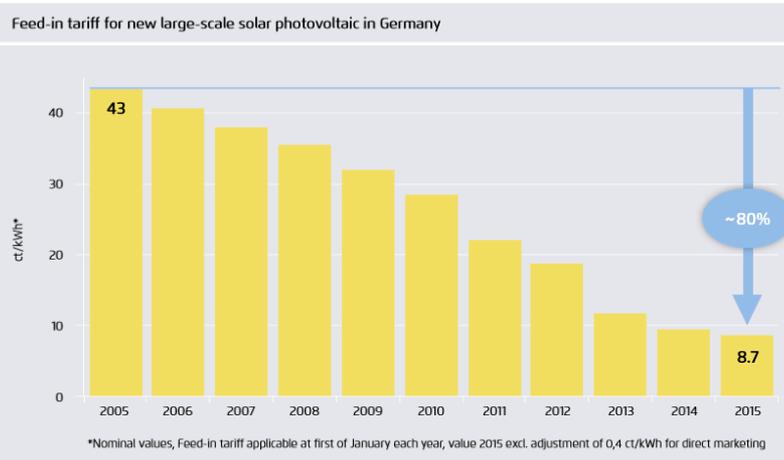
System benefits of self-consumption

- Lower emissions
- Lower overall grid extension costs
- Avoided line losses
- Increased system security/resilience

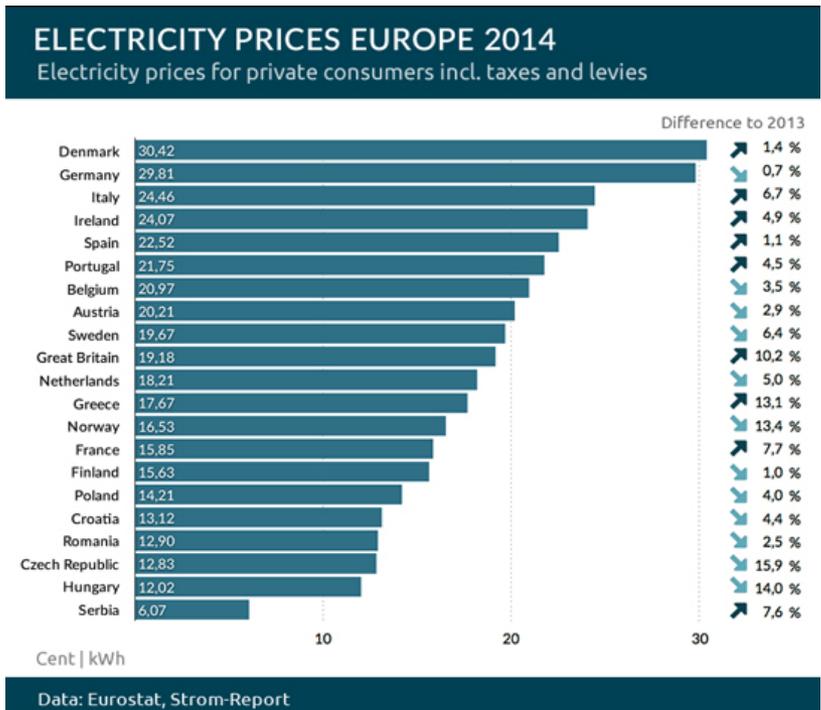
But high numbers of self-consumers also impacts

- Transaction costs (e.g., because load curves will become individual, standard load profiles must be reviewed)

Decreasing Costs for Distributed Generation (PV) Incentivise Self-Consumption



LCOE from PV generation are low compared to household tariffs



High Volumetric Charges in Tariffs Incentivise Self-Consumption



⇒ Volumetric charges create incentive to reduce consumption, independent from time of use and flexibility requirements

2011 - Source: Eurelectrics/Eurostat

Principles on Grid Tariff Design

- Grid fees have to cover grid costs/regulated revenues
 - Should minimize grid costs and system costs, e.g. charges to incentivize efficient integration from variable (over) supply
- ⇒ Complexity to address minimized grid *and* system cost within one mechanism is a long term target.
- ⇒ But today's tariff design should minimize system costs within *existing* grid infrastructure, e.g. to shift demand to low wholesale price periods (caused by wind or PV)

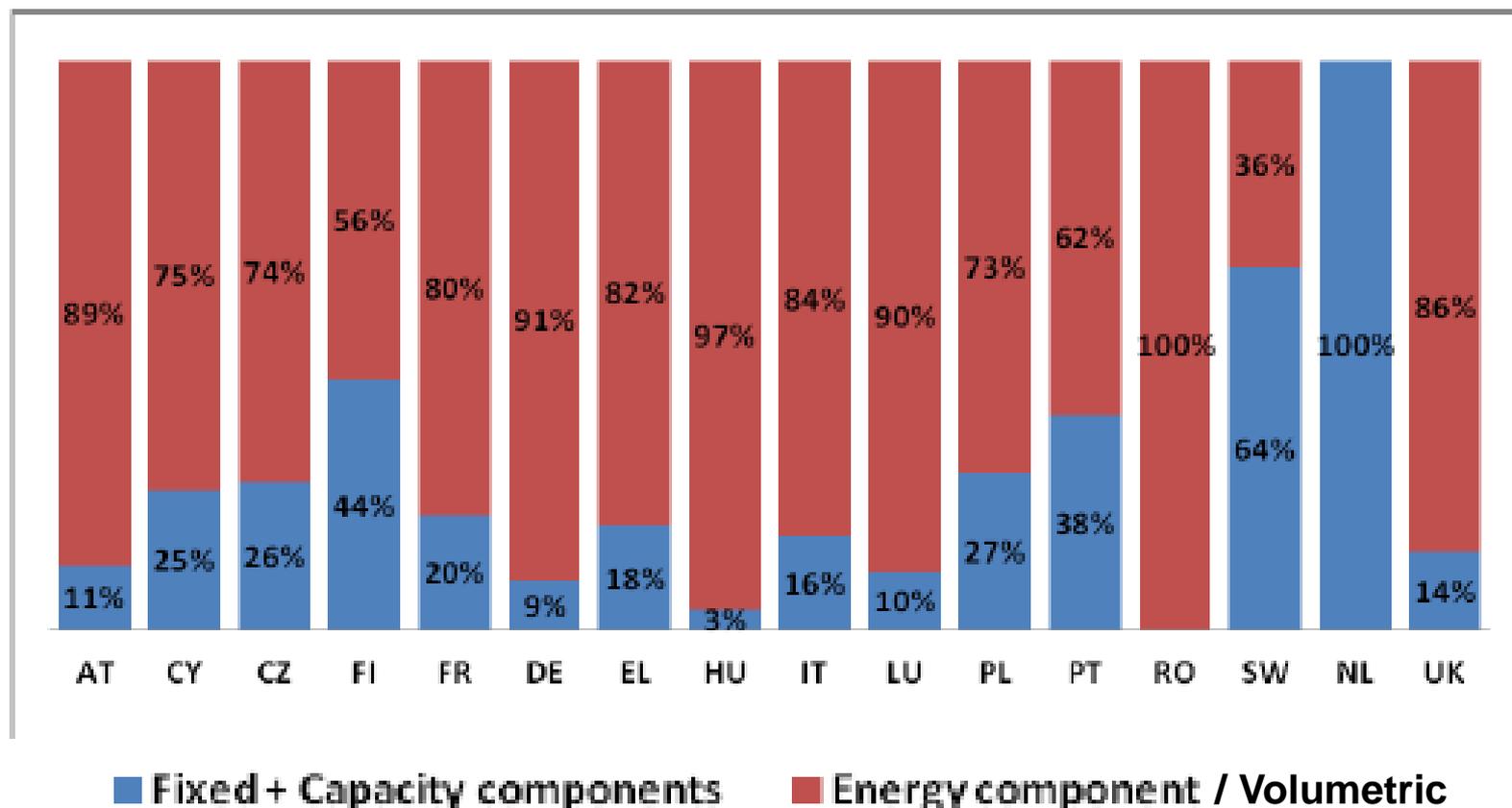
Low Impact of Self-Consumption to other Customers

What's the amount of avoided grid fees from self-consumption paid by other customers compared to total grid revenues?

⇒ Germany's 2015 forecast: 2.8 TWh by PV (0.5% of total use) shifts ~1% of total grid revenues. – Traditionally excepted industrial self-consumption by approx. 50 TWh.

⇒ Household PV self-consumption is limited by nature (roofs compared to use, winter periods) but batteries and Mini-CHP will increase amount further.

Distribution Tariff Component Weight in Households Grid Tariffs



Source: DG Energy

Are Higher Fixed Charges the Answer?

Arguments for:

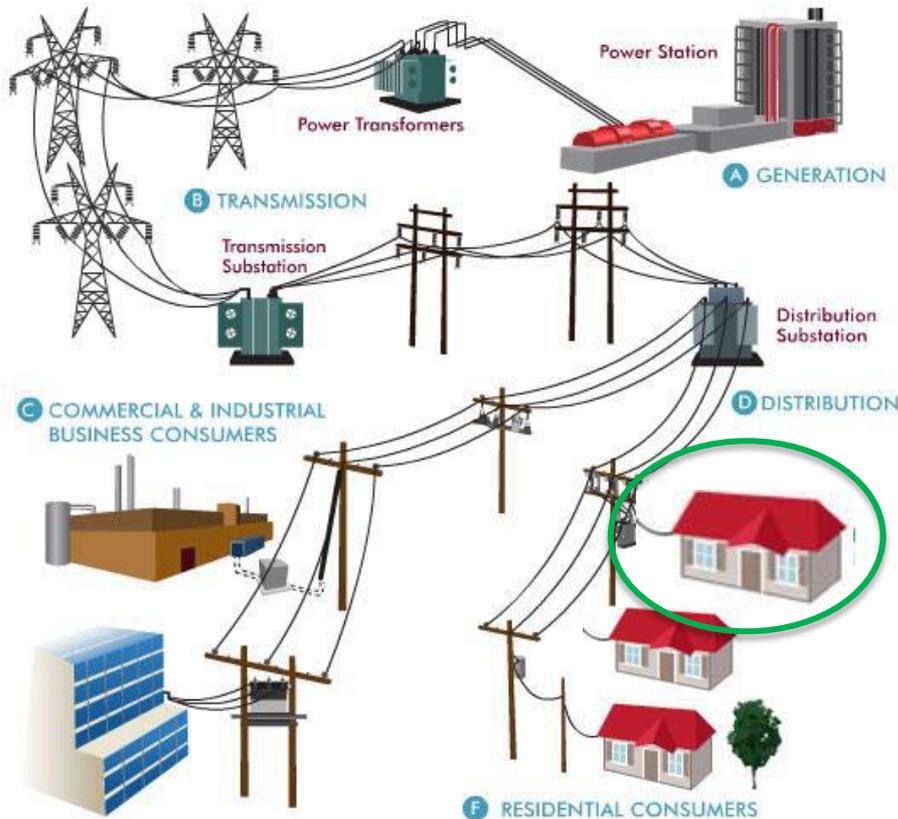
- Network costs don't vary with consumption, thus cost recovery should not be linked to usage
- They increase revenue stability for distribution companies

Arguments against:

- Recovery of grid costs via fixed charges is *not* efficient
 - Efficient markets recover fixed as well as variable costs through usage-based prices
 - Recovery through fixed charges discourages economic self-consumption & efficiency
 - Fixed charges create perverse incentives to opt-out and reduce flexibility
- They are unfair: Low-usage customers pay disproportionately more
- Decoupling solves the revenue problem while preserving usage-based prices

Recovery of Local Distribution Costs

What Belongs in the Fixed Charge?



Source: RAP

The only distribution costs that are attributable to any particular customer are the **meter, service drop, and billing costs.**

A fixed charge that covers more than this diverges from regulatory traditions.

The transformer must be sized to the combined load of a few customers.

The rest is sized to the combined load of many customers.

Flexible Supply Requires Time Differentiated Tariffs

Increasing flexibility requirement should be integrated into pricing systems incl. grid fee tariffs: Volumetric pricing can be differentiated by time of use, critical peak, real time or dynamically e.g. related to wholesale prices.

⇒ Periods with high wholesale prices and grid restrictions should have higher grid charges than low price periods without grid restrictions.

⇒ Examples exist e.g. in Austria, Germany and US

Conclusion

- Fixed charges don't optimize system
- Volumetric charges are best to incentivize efficiency and optimized system costs
- If the concern is self-consumption, consider time-varying charges for self-consumers / to incentivize flexible demand

RAP Publications

Fundamentals of Rate Design (Presentation – 2014):

<http://www.raonline.org/document/download/id/7357>

Tariff Design in Germany: Netzentgelte in Deutschland - Herausforderungen und Handlungsempfehlungen (2014):

<http://www.raonline.org/document/download/id/7431>

Electric Utility Residential Customer Charges and Minimum Bills: Alternative Approaches for Recovering Basic Distribution Costs

(2014): <http://www.raonline.org/document/download/id/7361>

Designing Distributed Generation Tariffs Well - Fair Compensation in a Time of Transition (2013) www.raonline.org/document/download/id/6898

Time-Varying and Dynamic Rate Design (RAP/ The Brattle Group - 2012): www.raonline.org/document/download/id/5131

About RAP

The Regulatory Assistance Project (RAP) is a global, non-profit team of experts that focuses on the long-term economic and environmental sustainability of the power sector. RAP has deep expertise in regulatory and market policies that:

- Promote economic efficiency
- Protect the environment
- Ensure system reliability
- Allocate system benefits fairly among all consumers

Learn more about RAP at www.raponline.org

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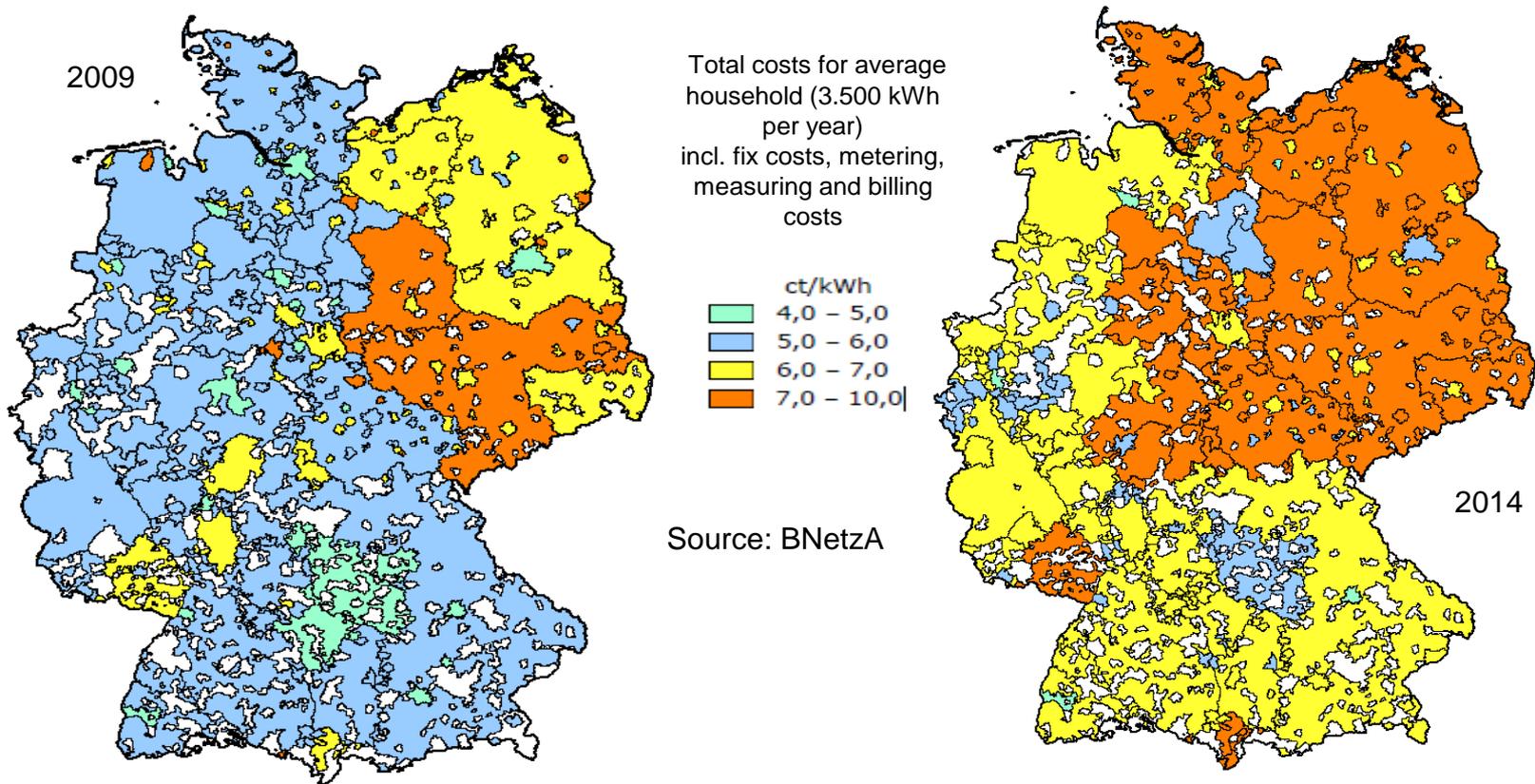
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Backup

Distribution Tariffs Are Increasing faster within Low-Demand and High-Renewable Networks



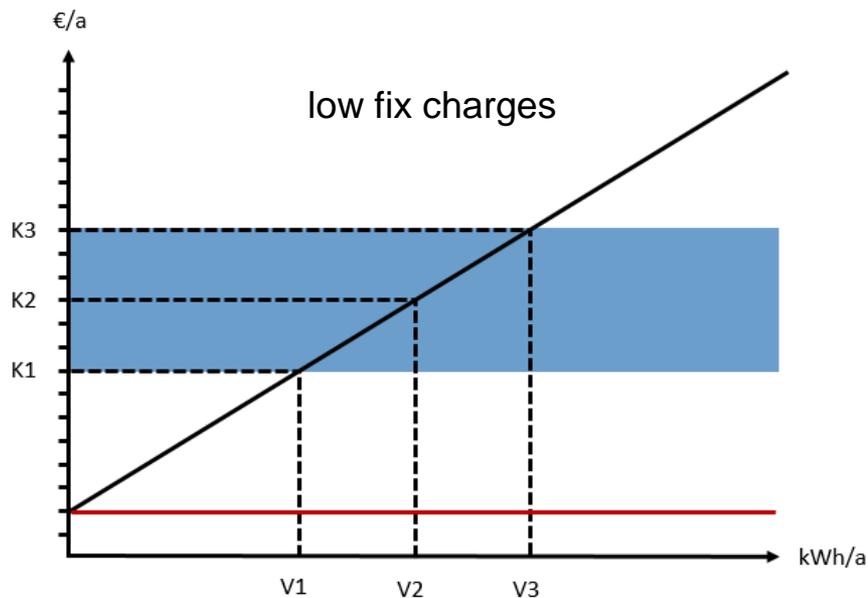
Uniform Tariffs Balance Incentives

Variation in grid tariffs by network/geography (e.g. in Germany) creates different incentives on self-consumption

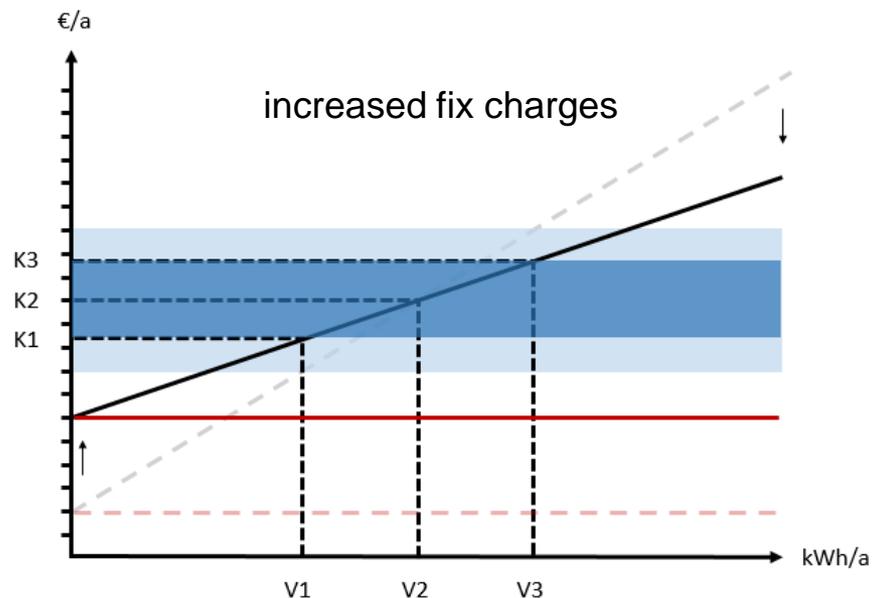
- Low (and slowly increasing) incentives in urban areas
 - Higher (and fast increasing) incentives in (some) rural areas by to additional self-consumption
 - Leading into more than 100% price-differences within Germanys distribution network charges
- ⇒ Uniform grid tariffs as in Hungary or within zones as in Austria balance differences and incentives.

Impact of Fixed Charges

Within regulated total grid revenues, an increase of fixed charges must result in decreasing volumetric prices.

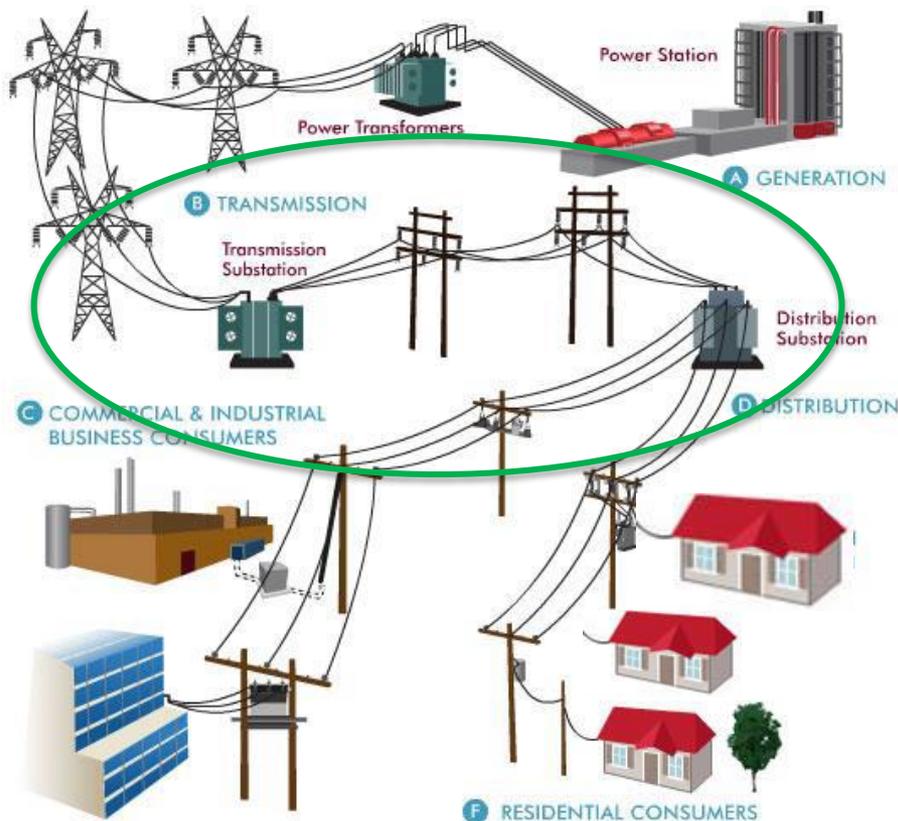


K: Total cost for client 1, 2 and 3
V: Annual consumption of client 1, 2 and 3



— : Volumetric price
— : Fix charges for all clients

How Should Poles and Wires Costs Be Recovered?



The distribution infrastructure is sized to the combined loads of all customers – and to feed-in of DG. Adding (or losing) a customer does not change these costs.

They are built to deliver electricity (kWh). All customers using them should share in the cost.

If combined peak demand changes, the system design would change.

Bi-directional kWh or a kW charge is appropriate.