Ways out of the Subsidy Trap: How to Revive the Decentralized Energy Transition in the Post-EEG Era

Alexandra Lüth, Jens Weibezahn, Jan Martin Zepter, Pedro Crespo del Granado
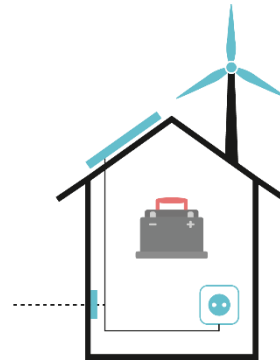*Technische Universität Berlin, Workgroup for Infrastructure Policy (WIP)*

Prosumager in the Electricity Sector

producer of energy via rooftop
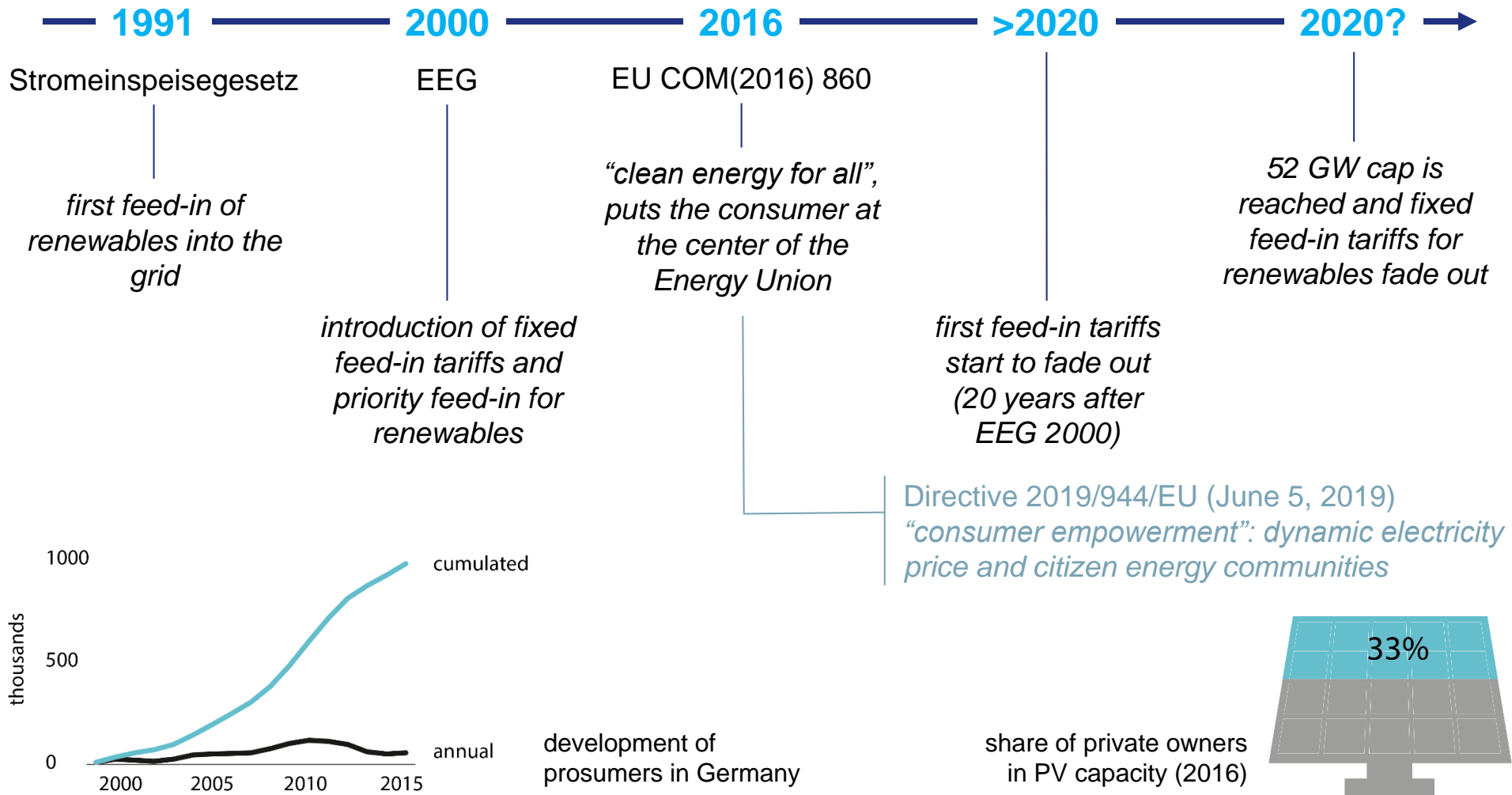photovoltaics or wind turbine

consumer of energy
in the household

PRODUCER

CONSUMER

PROSUMAGER

STORAGE

possibility to store energy
e.g. in batteries

Why? **Decentralization**, **"Democratization"** (Participation & Acceptance), **Efficiency Gains**

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Prosumagers in the German Energy Transition

1991 — **2000** — **2016** — **>2020** — **2020?** →

Stromeinspeisegesetz

EEG

EU COM(2016) 860

first feed-in of renewables into the grid

introduction of fixed feed-in tariffs and priority feed-in for renewables

"clean energy for all", puts the consumer at the center of the Energy Union

52 GW cap is reached and fixed feed-in tariffs for renewables fade out

first feed-in tariffs start to fade out (20 years after EEG 2000)

Directive 2019/944/EU (June 5, 2019)
"consumer empowerment": dynamic electricity price and citizen energy communities

development of prosumers in Germany

share of private owners in PV capacity (2016)

33%

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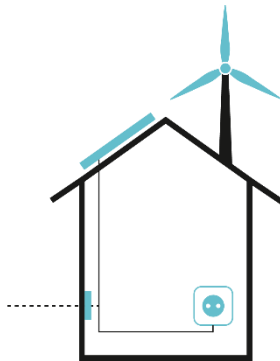TU Berlin, Workgroup for Infrastructure Policy (WIP)

Market Models for Prosumagers

System Feed-In

Regular case:

- self-consumption of generated electricity
- excess electricity is fed into the public grid
- (fixed) feed-in tariffs
- (storage option with batteries)
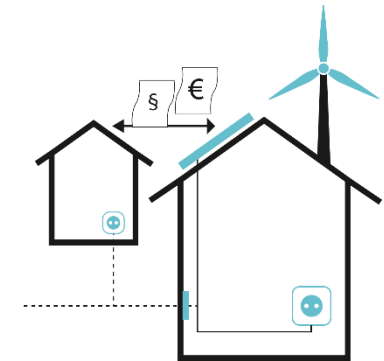
Direct Marketing

Bundesnetzagentur

- self-consumption of generated electricity
- market participation for the sale of excess electricity
- remuneration via market price
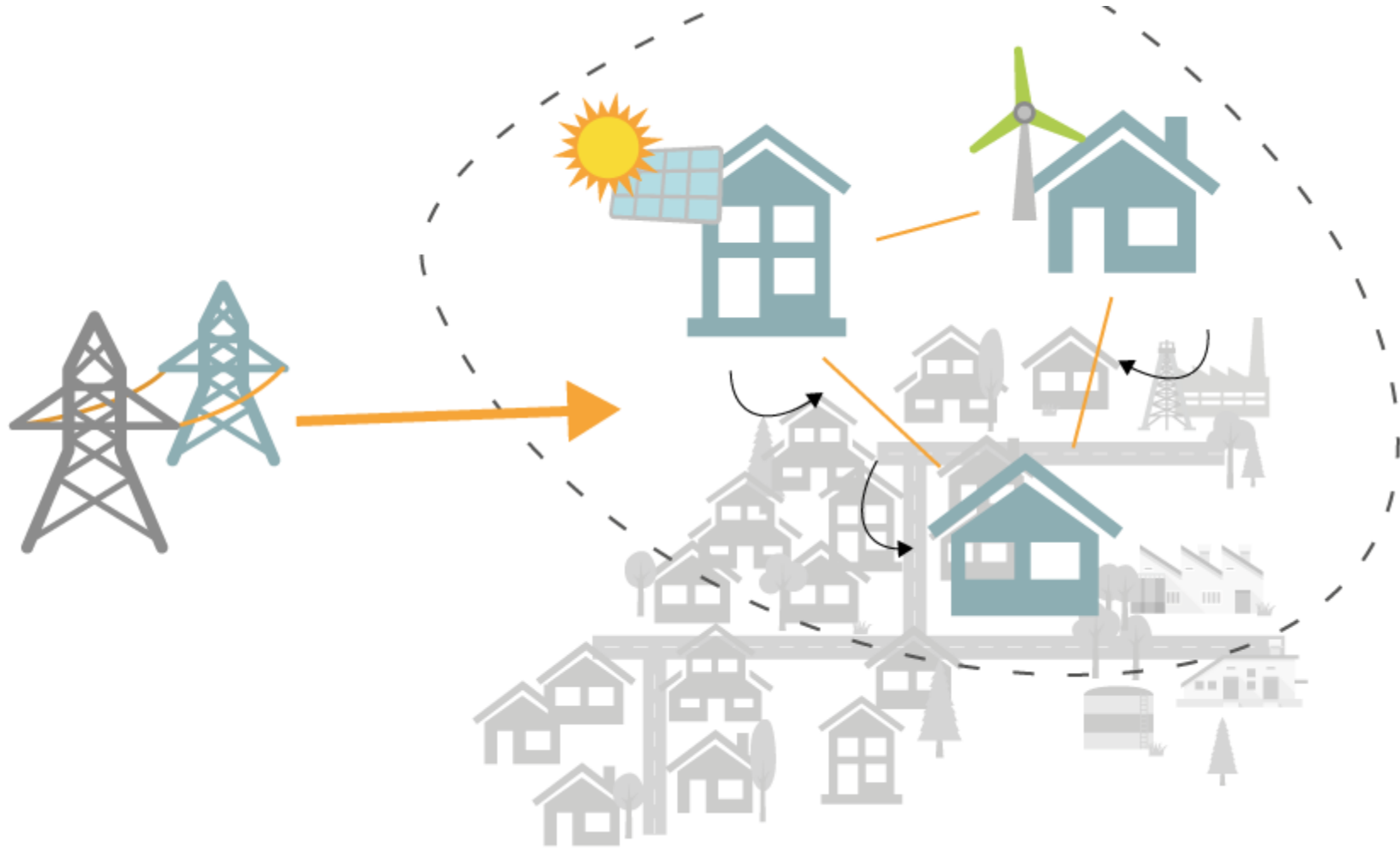- no participation with small capacities – aggregator necessary
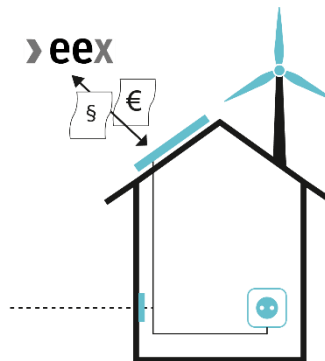
Local Market
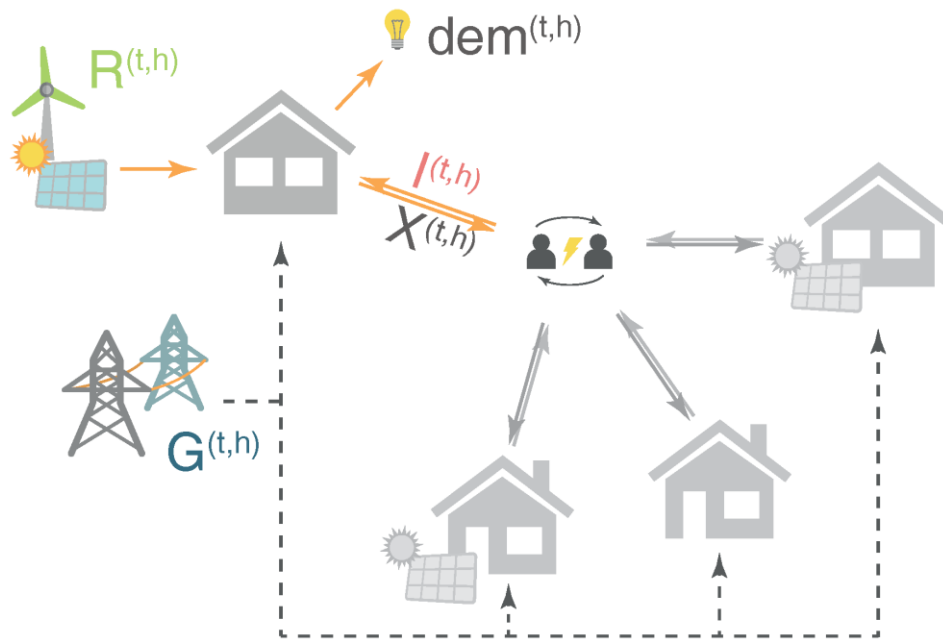
Mengelkamp et al. (2017), Zhang et al. (2018):

- self-consumption of generated electricity
- direct, peer-to-peer trading between neighbors in the community
- usage of the local grid for transmission
- direct flow of money between the parties

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Community of Heterogeneous Model Households

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Model (Schematic)

- **Mixed Complementarity Problem (MCP)**

- **Written in Julia with JuMP.jl and Complementarity.jl**

- **14 model households in *Grevesmühlen*,* Germany**

  - 11 households with PV between 1.2 and 4.08 kWp
 - 1 household with wind turbine of 2 kW

*) There is no specific reason for choosing *Grevesmühlen* as subject of analysis within this project, except for the fact that the village offers different distributed energy resources in the immediate vicinity.

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Model: Three Scenarios

How is demand covered?

What happens to excess production?
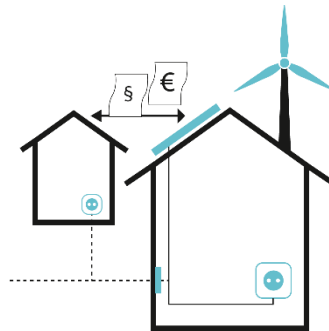
What are the prices?

System Feed-In

- self-consumption
- no trade between houses
- excess electricity is fed into the grid at feed-in tariff
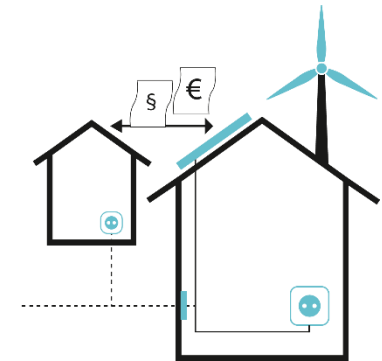- electricity from the grid at <u>fixed</u> rate
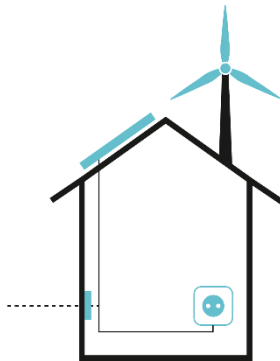
Local Market (stat.)

- self-consumption
- free trade between houses
- market bid based on LCOE of the house
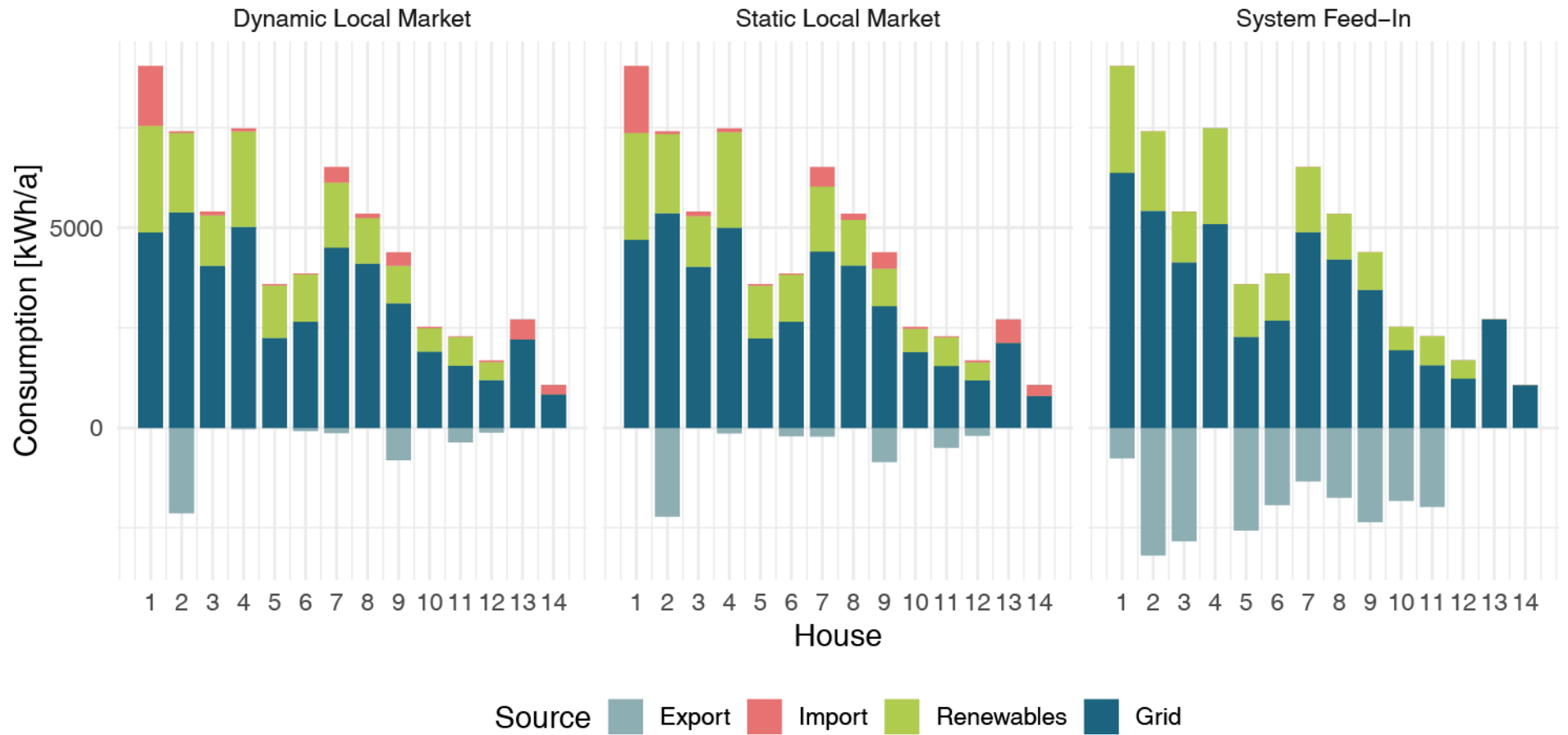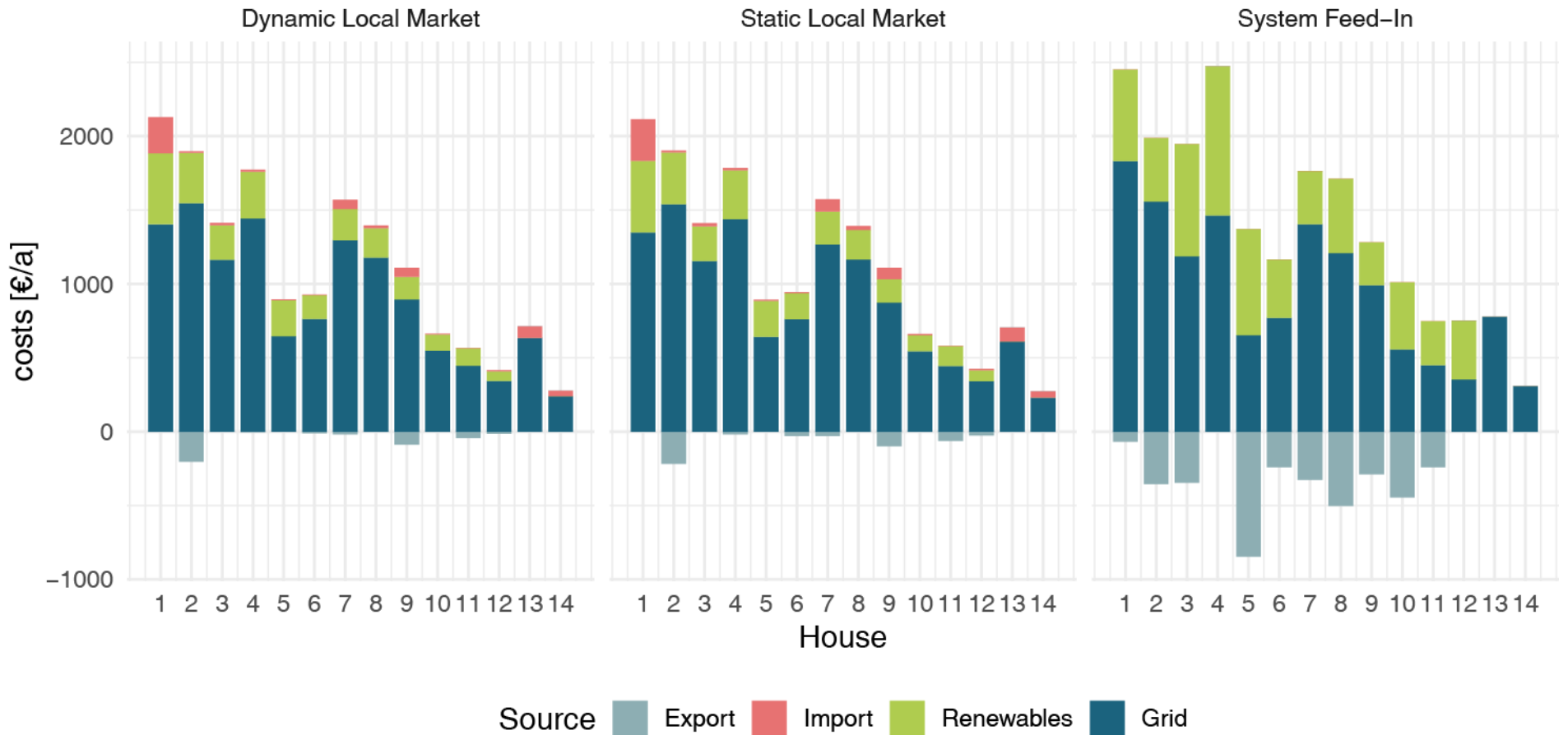- electricity from grid at <u>fixed</u> rate

Local Market (dyn.)

- self-consumption
- free trade between houses
- market bid based on LCOE of the house
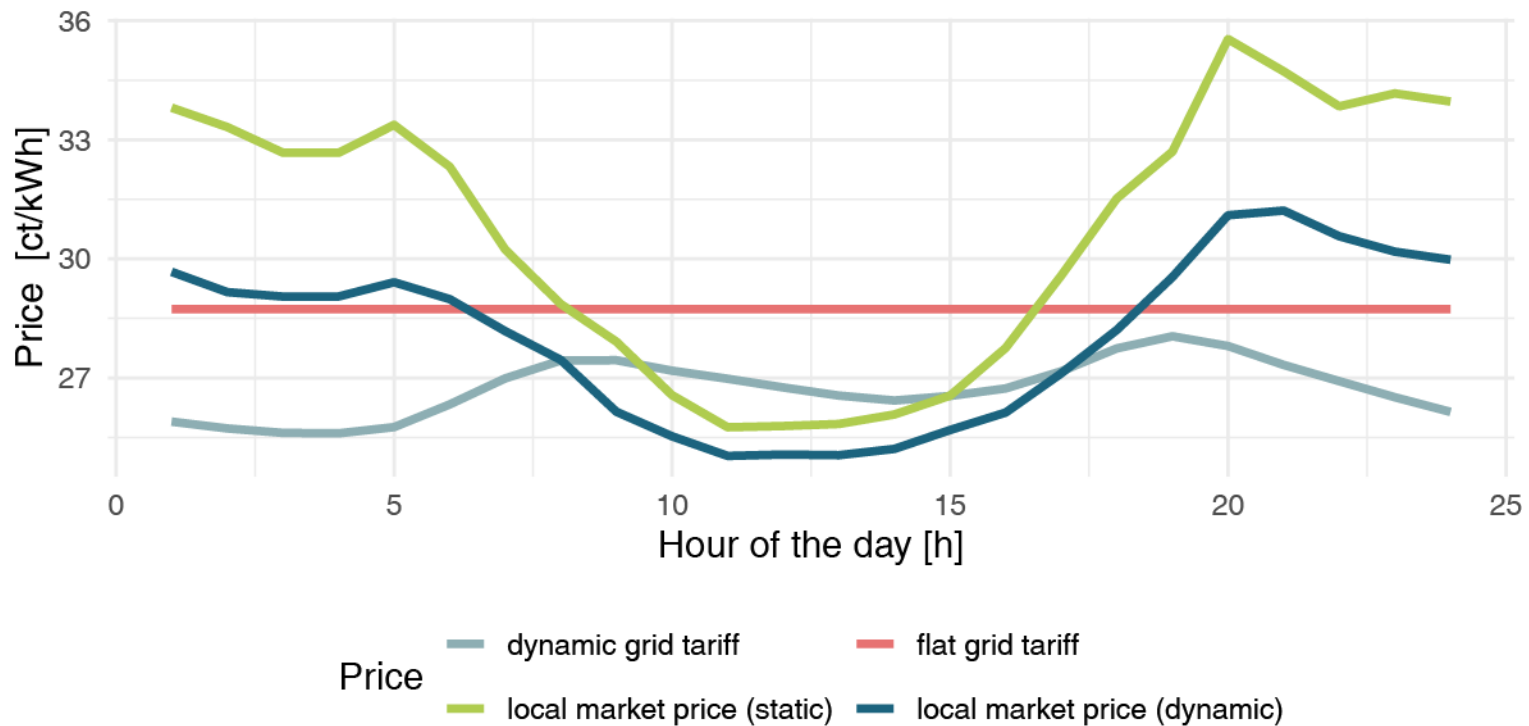- electricity from grid at <u>dynamic</u> rate

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Model Results: Quantities

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Model Results: Costs

Dynamic Local Market · Static Local Market · System Feed-In

costs [€/a] · House

Source: Export · Import · Renewables · Grid

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Model Results: Prices (Average)

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Model Results: Prices (Seasonal)
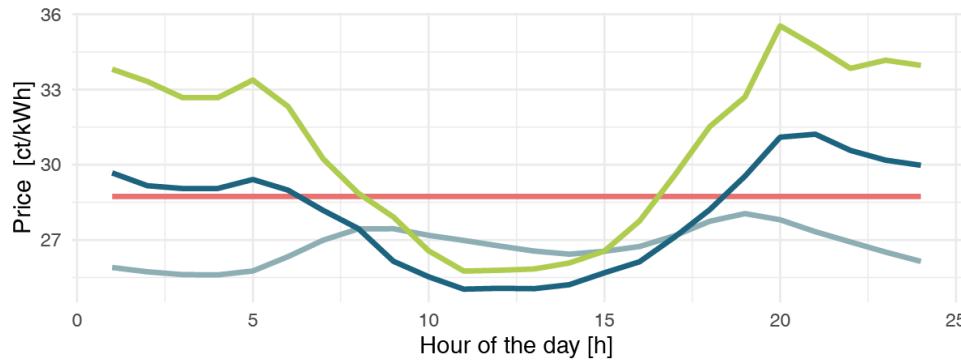
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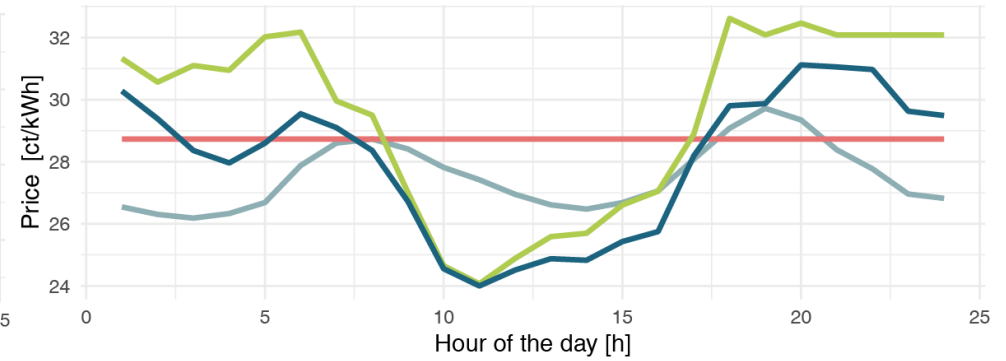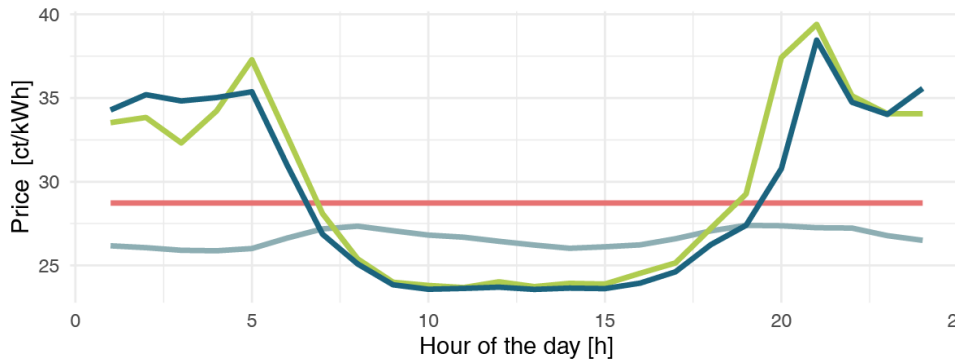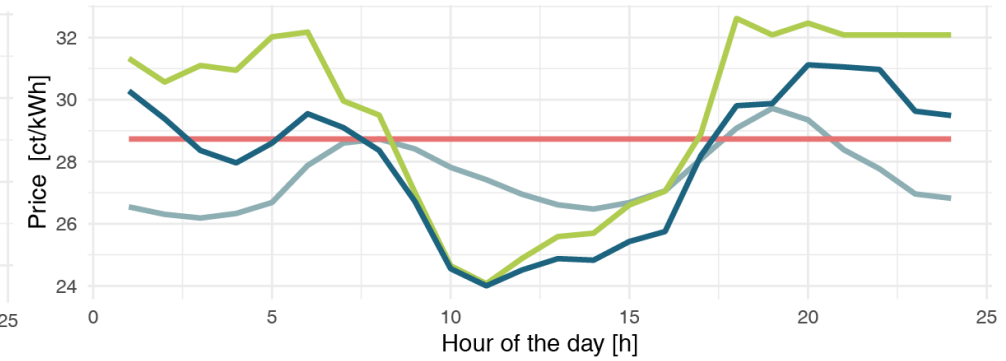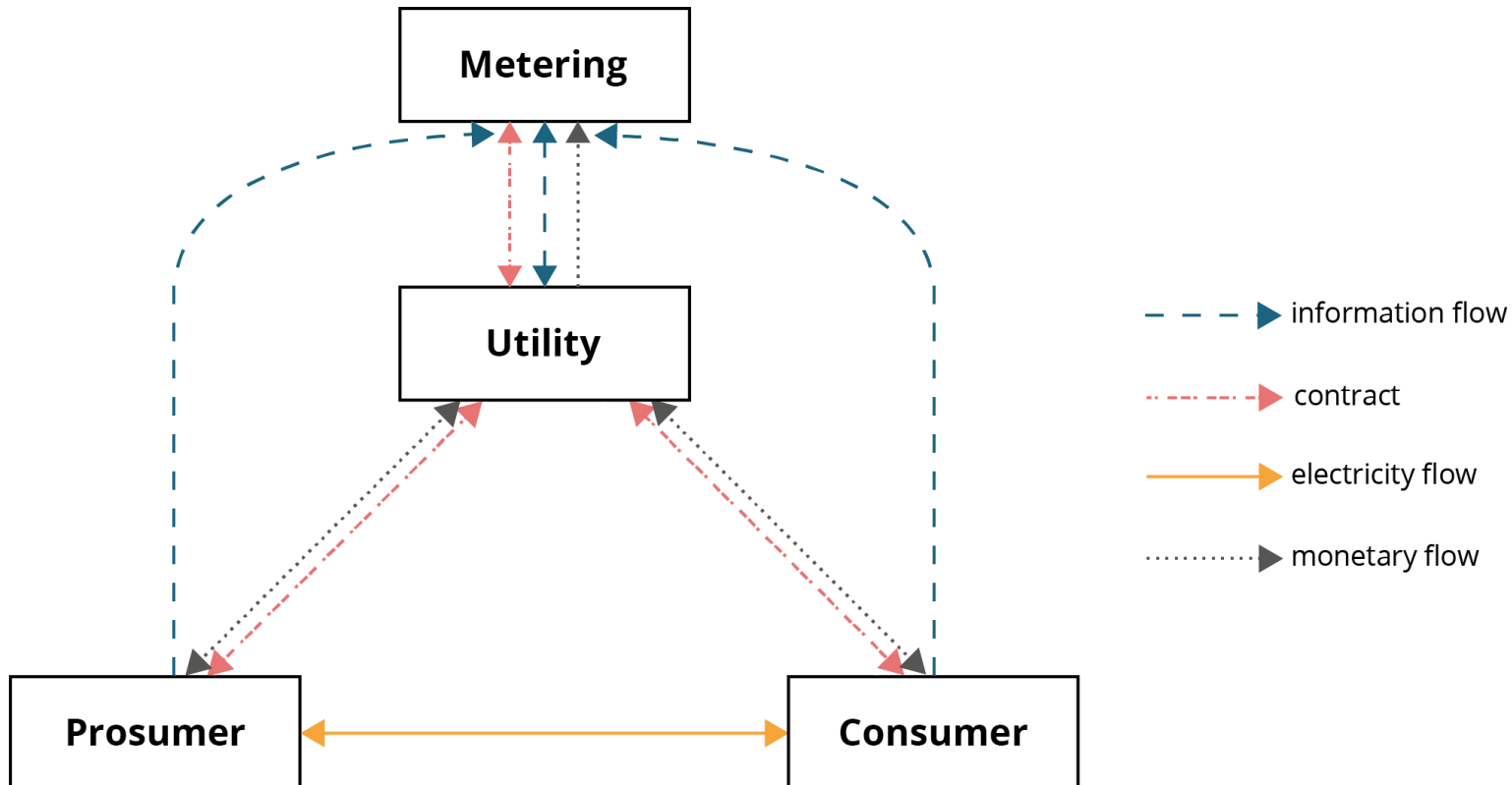
Business Case: Local Market

Economically viable:

- Savings per prosumer: 97 €/year
- Savings per consumer: 53 €/year

Conclusion: The Regulatory Regime is Limiting New Market Models for Prosumagers

- Under the current regulatory regime, self-consumption is the most viable solution to integrate the capacities of prosumers
  - fixed feed-in tariffs over 20 years but possible loss of feed-in tariffs in the future when the 52 GW cap is reached (~mid-2020)
- Alternative market models are only viable via the support of third parties (aggregators)
  - provisioning of platforms for neighborhood power (e.g. Tal.Markt, enyway)
  - service providers care for procurement, sales, and technical coordination (e.g. sonnenCommunity)
- Local markets are economically viable yet, under the current regulatory regime, they are facing market entry barriers and little leeway

1) **Transfer of European directives into German law (consumer at the center of the Energy Union & consumer empowerment)**

2) **Extension of the term "self-consumption" (§ 3 Nr. 19 EEG)**

3) **Adjustment of *de minimis* limits for small-scale producers to strengthen local electricity trade**

4) **Simplification and changes to obligations and responsibilities of small-scale producers**

5) **Relief of local electricity markets and prosumagers via restructuring of taxes and levies**

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