

German Institute for Economic Research – DIW Berlin

# Prosumage of solar electricity: Tariff design, prices, and capacity investment

Claudia Günther, Wolf-Peter Schill, Alexander Zerrahn  
Strommarkttreffen, 10 May 2019



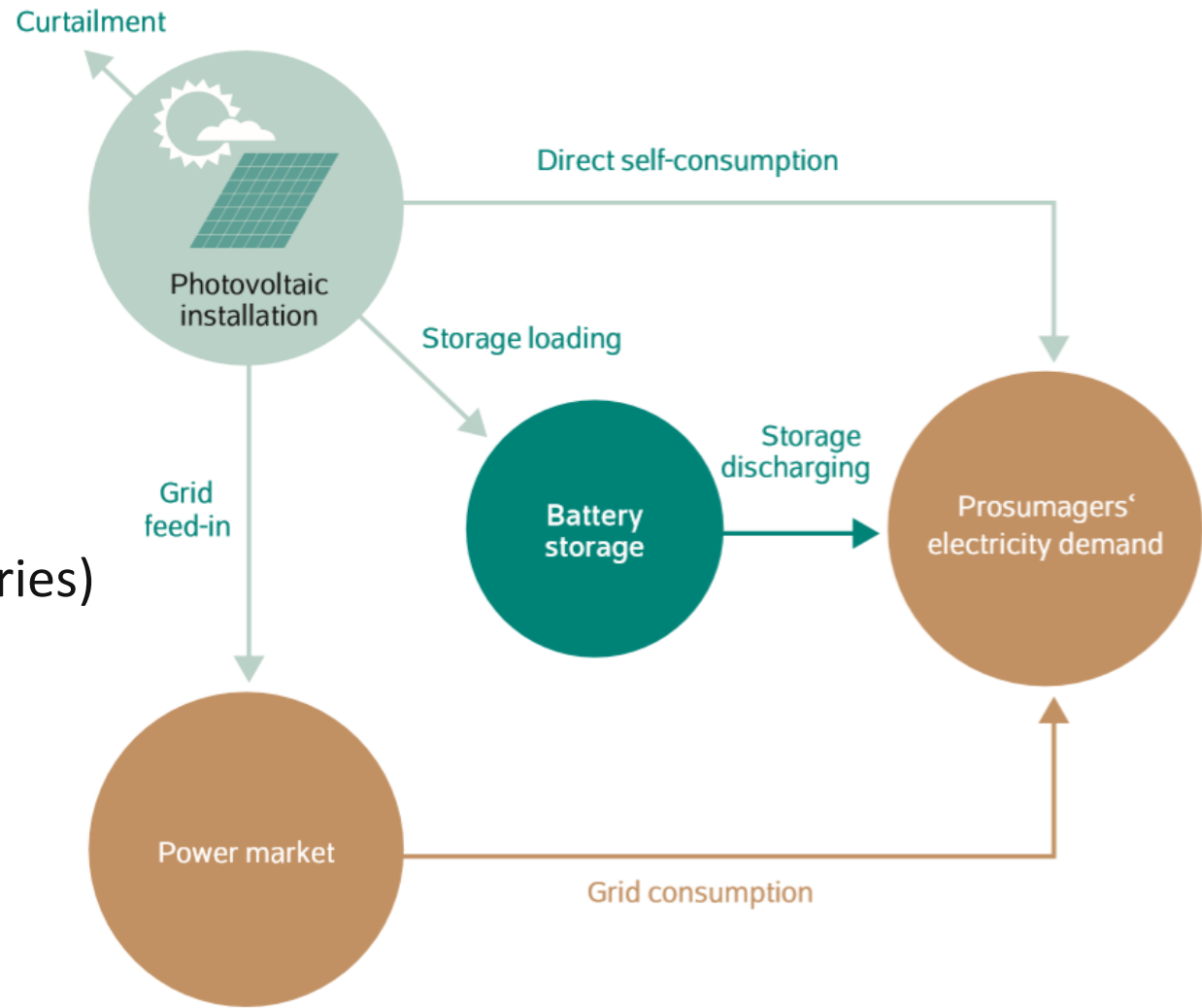
GEFÖRDERT VOM



Bundesministerium  
für Bildung  
und Forschung

**PRO-SUM-AGE\***

- **PRO**duction
- **ConSUM**ption
- **StorAGE** (batteries)



\*Schill et al. (2017)

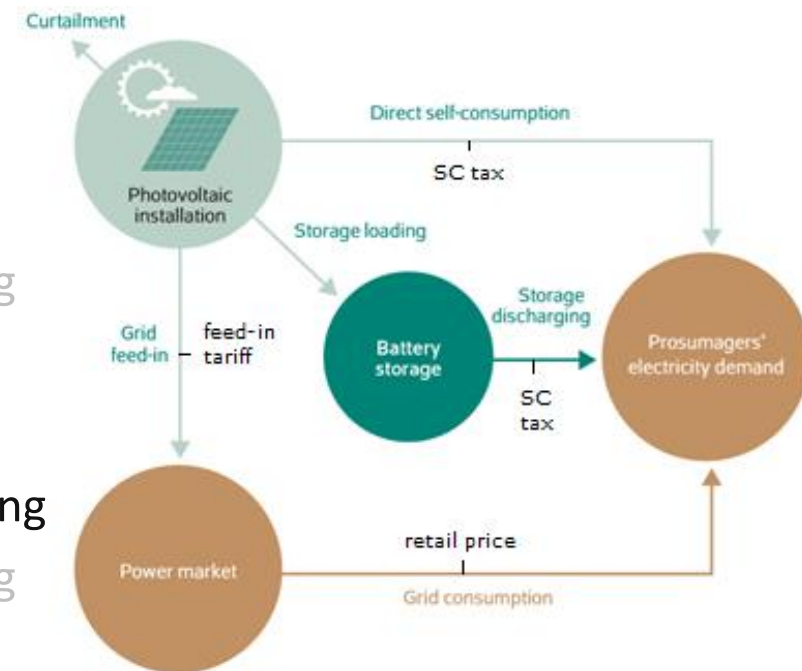
Source: own illustration

## Research question

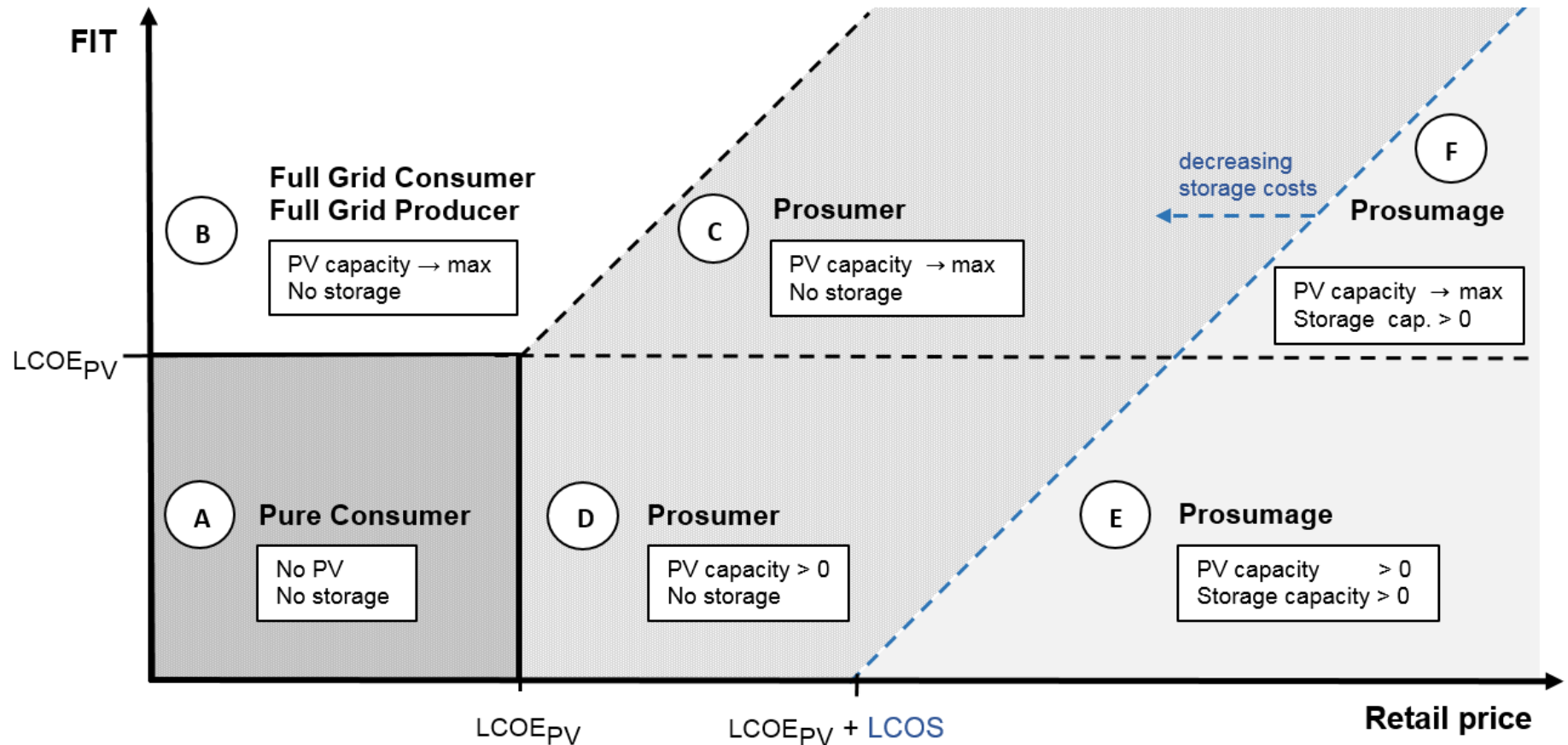
- How does the tariff design affect household incentives for investments in PV and battery capacity?

## Tariff design options studied

- Feed-in tariff:
  - Different levels
  - Time-invariant vs. real-time pricing
  - Feed-in restriction
- Retail tariff:
  - Energy- vs. capacity-oriented pricing
  - Time-invariant vs. real-time pricing
  - Self-consumption tax



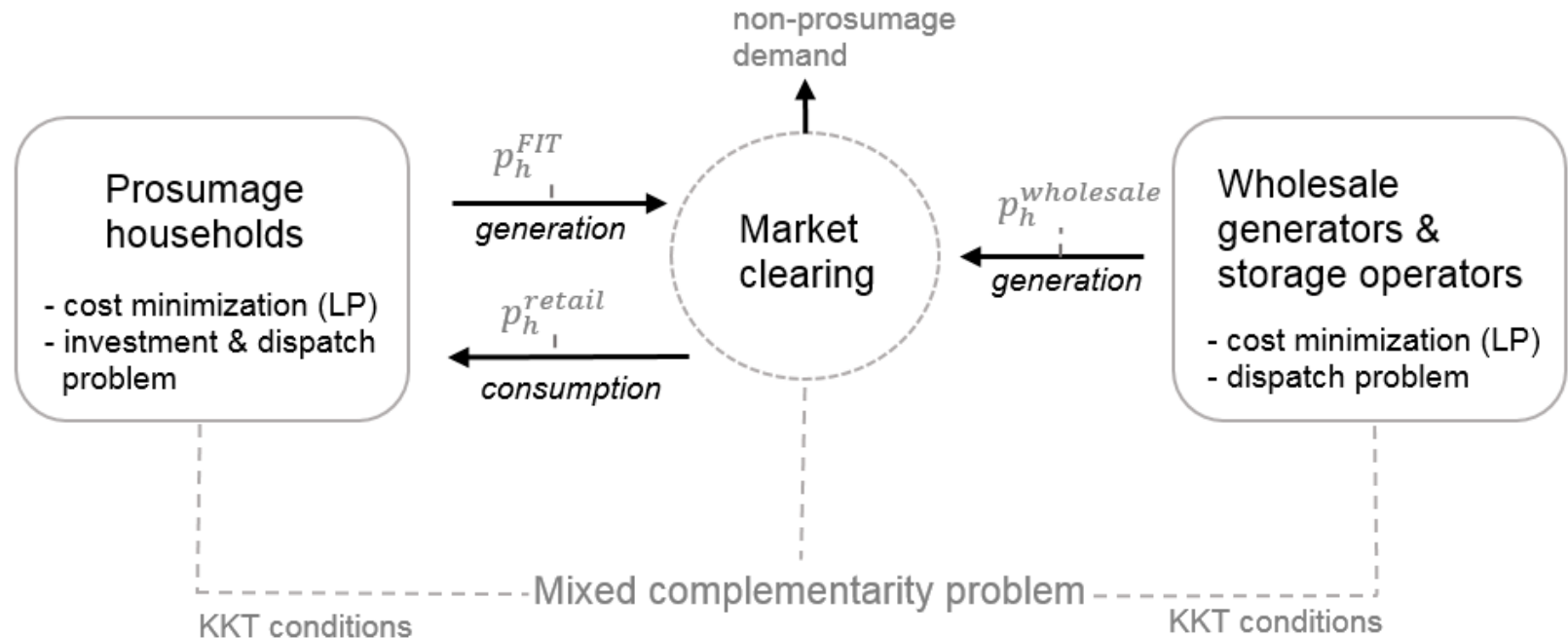
Source: own illustration



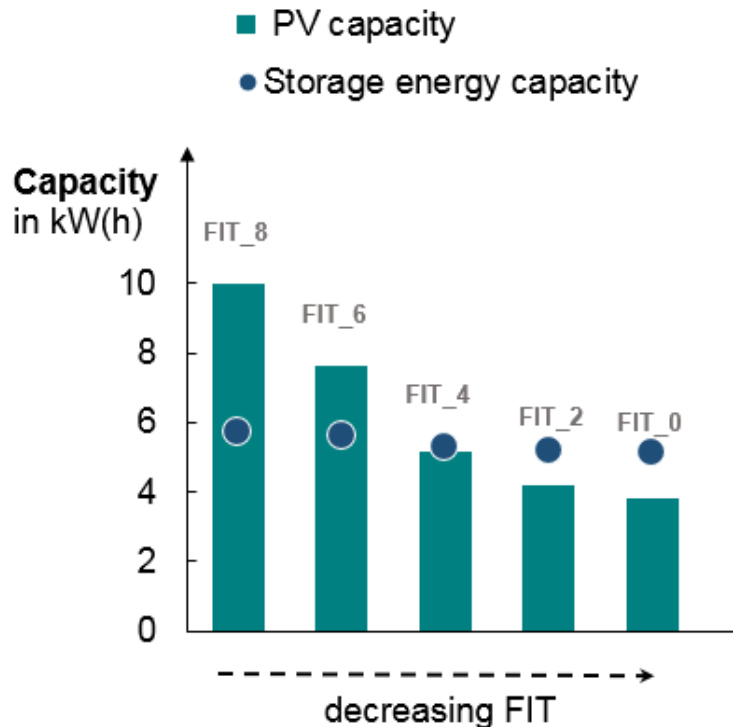
Source: own illustration adapted from Ossenbrink (2017).

## Electricity system modeling

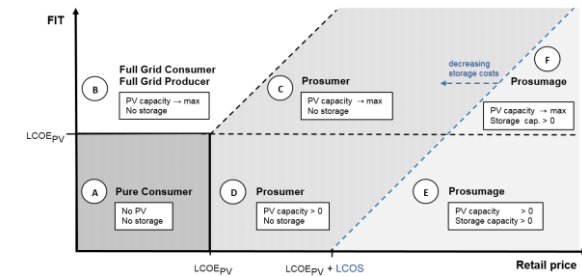
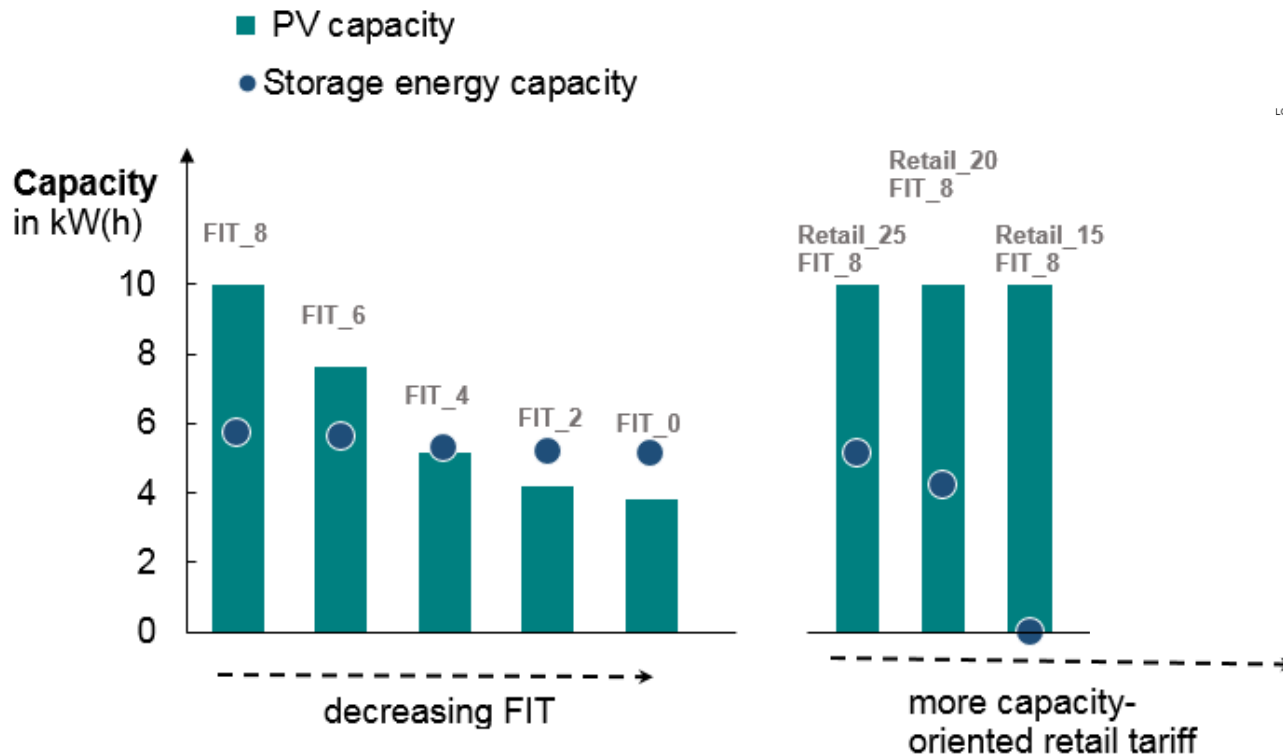
- Formulation of DIETER\* as mixed complementarity problem
- Prosumage segment 1 mio. households
- DIETER calibrated to German network development plan 2030



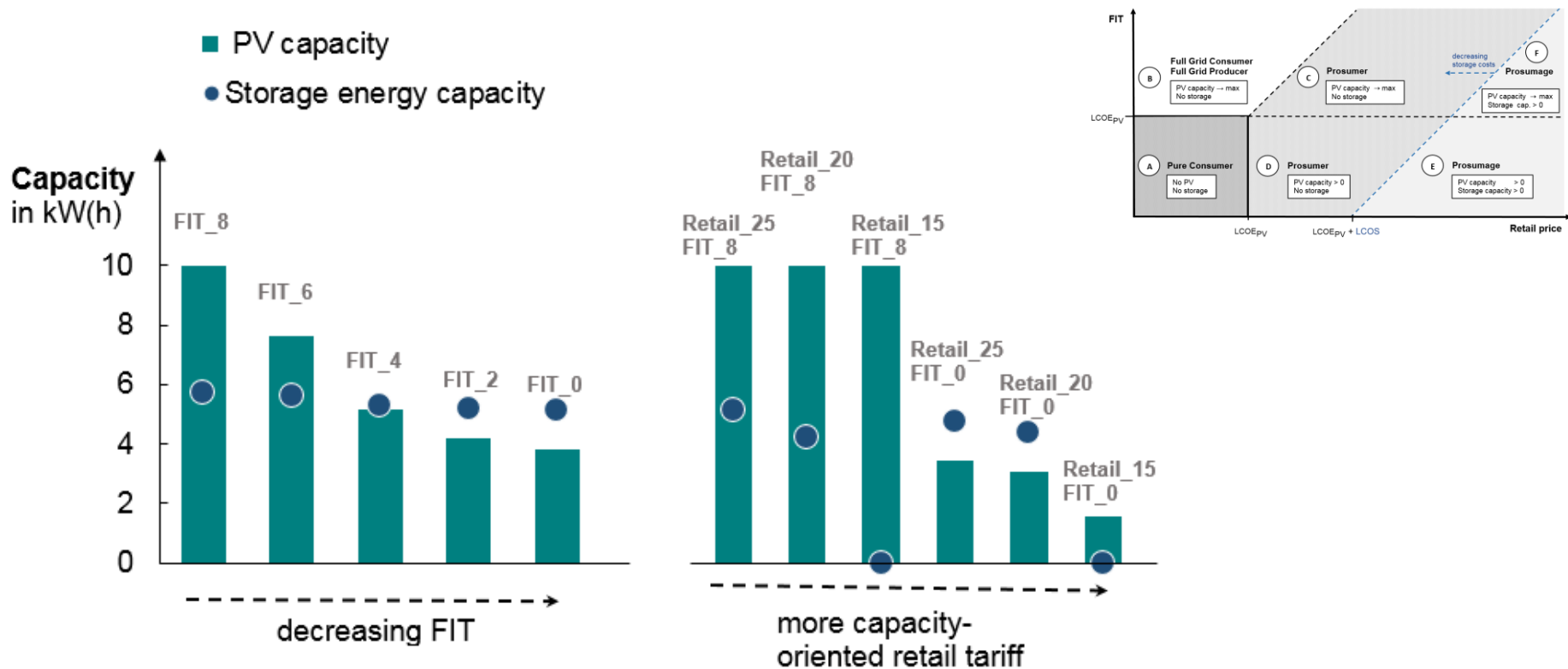
\* Zerrahn & Schill (2017)



- PV capacity sensitive to feed-in tariff design
- Battery capacity rather robust

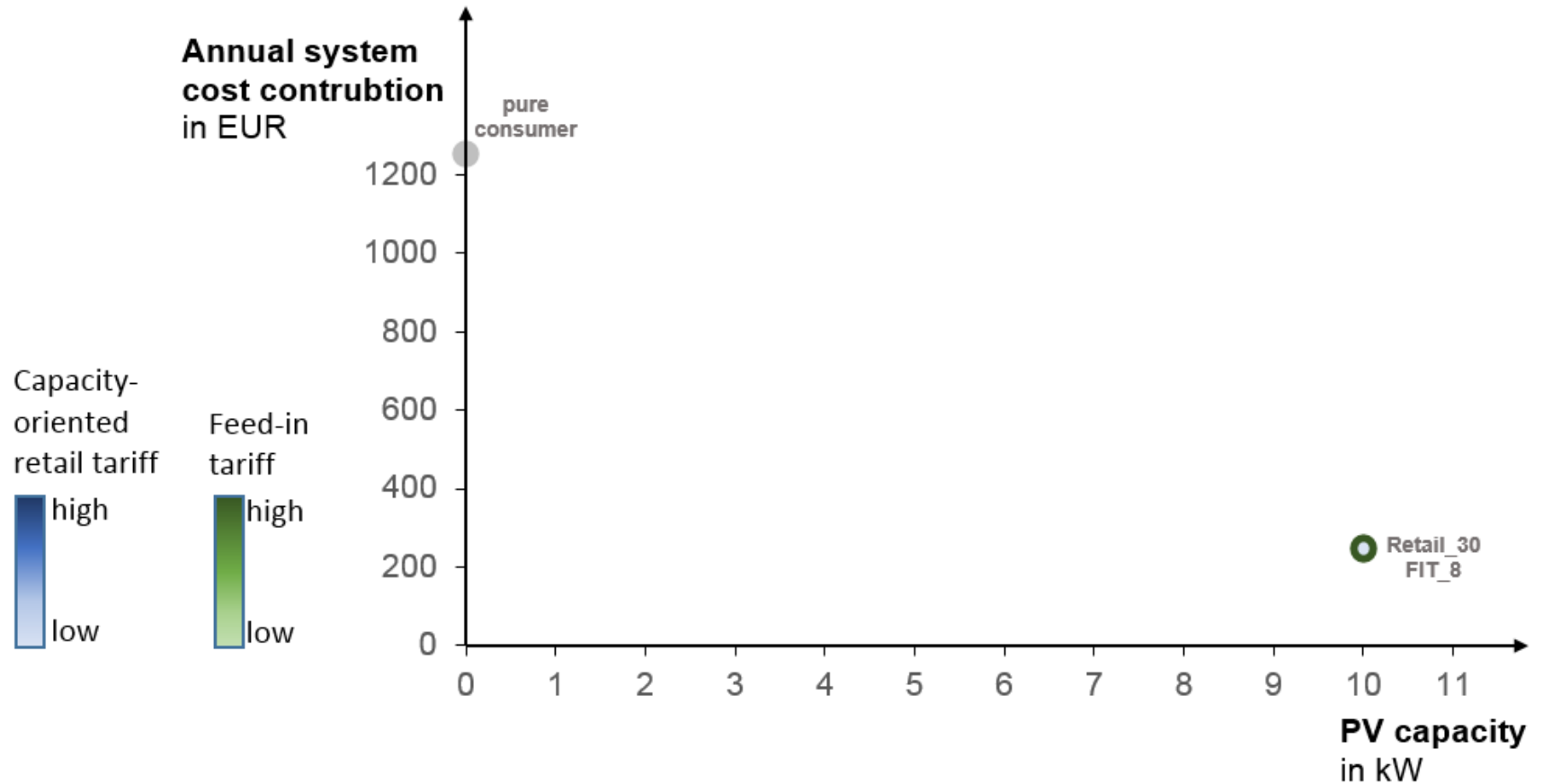


- PV capacity sensitive to feed-in tariff design
- Battery capacity rather robust
  - However, no storage deployed at strong capacity-oriented retail design



- PV capacity sensitive to feed-in tariff design
- Battery capacity rather robust
  - However, no storage deployed at strong capacity-oriented retail design





- Under continuation of current tariff design:
  - Expansion of prosumage segment expected
  - This may lead to load defection issues
- Mitigation possible by more capacity-oriented retail pricing...
  - ... but not with lower FIT
- See paper for other tariff design options

Thank you for your attention.

---



**DIW Berlin — Deutsches Institut  
für Wirtschaftsforschung e.V.**  
Mohrenstraße 58, 10117 Berlin  
[www.diw.de](http://www.diw.de)

**Editor**  
Claudia Günther

---

- BNetzA (2018). *EEG-Registerdaten und -Fördersätze. Fördersätze für PV-Anlagen*. URL: [https://www.bundesnetzagentur.de/DE/Sachgebiete/ElektrizitaetundGas/Unternehmen\\_Institutionen/ErneuerbareEnergien/ZahlenDatenInformationen/EEG\\_Registerdaten/EEG\\_Registerdaten\\_node.html](https://www.bundesnetzagentur.de/DE/Sachgebiete/ElektrizitaetundGas/Unternehmen_Institutionen/ErneuerbareEnergien/ZahlenDatenInformationen/EEG_Registerdaten/EEG_Registerdaten_node.html). Access date: 01.12.2018.
- Destatis (2018). *Publikationen im Bereich Daten zur Energiepreisentwicklung. Daten zur Energiepreisentwicklung. Lange Reihen. Statistisches Bundesamt. August 2018*. URL: <https://www.destatis.de/DE/Publikationen/Thematisch/Preise/Energiepreise/Energiepreisentwicklung.html>. Access date: 15.12.2018.
- Ossenbrink, Jan (2017). How feed-in remuneration design shapes residential PV prosumer paradigms. *Energy Policy* 108, 239–255.
- Schill, Wolf-Peter, Alexander Zerrahn & Friedrich Kunz (2017). Prosumage of solar electricity: Pros, Cons, and the System Perspective. *Economics of Energy & Environmental Policy* 6:1, 7–31. <https://doi.org/10.5547/2160-5890.6.1.wsch>
- Zerrahn, Alexander, and Wolf-Peter Schill (2017). Long-run power storage requirements for high shares of renewables: review and a new model. *Renewable and Sustainable Energy Reviews* 79: 1518-1534. <https://doi.org/10.1016/j.rser.2016.11.098>