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Potentials of the Sharing Economy for the Electricity Sector regarding Private Capital Involvement and Decarbonisation

Decarbonisation implies changes to the European electricity sector

- Shifting to renewable electricity generation as major pillar of decarbonisation
  - Shifting from large central conventional power plants to numerous decentralised power plants
  - New financing and business models for electricity generation: about 40 % of German renewable power plants in the hand of private citizens

  [Heinrich-Böll-Stiftung et al., 2018]
- Decentralisation trends also in other sectors and often show characteristics of sharing economy (e.g. AirBnB, Uber)
  - High involvement of private capital by exploiting idle capacities owned by private citizens
  - Exploiting idle capacities expected to incorporated environmental benefits
  - Actual environmental benefits still subject to research

  [Harmaala (2015), Frenken and Schor, 2017; Acquier et al., 2017; Martin, 2016; Frenken, 2017, Ritter and Schanz (2019)]

Research questions & approach

- (First) sharing approaches within the electricity sectors
  - E.g. Brooklyn Microgrid in the United States of America, Piclo in the United Kingdom, Ènostra in Italy, Vandebron in the Netherlands, sonnenCommunity and Heidelberger Energiegenossenschaft in Germany
- Research questions
  - What are main drivers and barriers for increased private capital involvement through approaches from the sharing economy in the electricity sector?
  - Which of these drivers and barriers are important for a simultaneous reduction of carbon emissions?
- Multifold approach
  - Literature review to identify drivers and barriers
  - Analyses of selected cases to check on identified drivers and barriers

Characteristics of sharing economy and their applicability in the energy sector *[Plewnia, 2019]*

Aspect	Application in the energy sector
Platform-based	Digital energy platform companies which do not own many assets themselves, but instead offer services of coordination and optimization.
Leverage on digital technologies	Digital coordination mechanisms as the backbone of the energy infrastructure, especially with increasingly fluctuating energy supply and need for demand or storage management.
Consumer-to-consumer/ peer-to-peer interaction	Distributed decentral renewable energies, energy storage, and smart management devices offer potential for increased C2C interaction. Local microgrids and digital platforms as spaces for increased C2C exchange of energy, money, information, and knowledge.
Access instead of ownership	Traditional core principle of energy system. Now increasing ownership of energy production, storage, and management devices in households and small businesses. Potential for optimization by sharing among decentral actors.
Under-utilized resources	Not applicable for renewable energy generation facilities as these have little to no idle capacities. Batteries and electric vehicles can be used more efficiently if shared in districts or energy communities.
Shared values/ mission driven	Important factor for sharing business models in the energy sector to compensate for lack of cost advantages. Possibly even more pronounced in local sharing activities.

Drivers and barriers for sharing economy in the electricity sector

[Tietze, 2019]

Drivers

- High level of automation and mechanisation of the energy sector
- Energy transition to high shares of renewable energies
- Grid access
- Smoothed aggregated load profiles
- Development of storage technologies

Constraints

- Electricity itself cannot be shared
- Electricity is a low-interest product
- High investment in infrastructure
- Complicated and diverse regulations in the energy sector

General information on the three cases

- Piclo (UK)
  - Peer-to-peer energy trading platform
  - Uses smart meter data, producer prices and consumer preferences which include, for example, location, generation technology, and producer costs
  - Consumers prioritize suppliers and with this information, supply and demand are matched by an algorithm every half an hour
- SonnenCommunity (Germany)
  - Peer-to-peer online community platform forming a decentralized energy community
  - Members own photovoltaic modules and a battery storage
  - They feed excess electricity into the grid as well as draw electricity from it
- Heidelberger Energiegenossenschaft HEG (Germany)
  - Crowd-based network
  - Citizens become members through buying shares and the cooperative distributes the economic benefit between its members
  - HEG has a strong focus on photovoltaic projects, but also invests in wind parks

Characterisation of the cases

Aspect	Piclo	SonnenCommunity	HEG
Shared good	Tangible: capacity of renewable generation plants	Tangible: mostly solar systems with connected electricity storage	Tangible: photovoltaic modules and charging stations for electric vehicles financial product: share in wind parks
Market orientation	Profit-oriented: Electricity suppliers pay a fee to Open Utility in order to use the platform	Profit oriented: Community members pay a monthly basic fee called SonnenFlat which allows obtaining the required electricity for free	Profit-oriented: Members hold shares and depending on the annual result members receive a dividend
Market structure	B2B	C2C and B2C	C2B
Industry sector	Energy sector		
Fit to Sharing Economy	✓	✓	✗✓

Drivers and barriers for private capital involvement provided by literature

- General driver: Attractive risk-return-profile of an investment project
  [Anbumozhi et al., 2018]
- General barrier in many countries: regulatory issues
  [World Bank, 2007; Mathur et al., 2017; Anbumozhi et al., 2018; Justice, 2019]
- Barriers for green investments
  - Limited return
  - Too high investment risks related to regulation, technology and financing.

  [Lindenberg, 2014]
- Driver or barrier: cognitive aspects
  - Type of investor and prior investments
  - Individual preferences ➡ perceived risks and expected returns

  [Wüstenhagen and Menichetti, 2012]

Drivers and barriers for private capital involvement identified in the cases

- Drivers and barriers specific for private capital involvement
  - Better market differentiation (e.g. local photovoltaics instead of a general renewable offer)
  - Possibility to become (more) independent from electric utilities
  - Enabling of private investment by citizens without real estate
  - Provision of a clear risk-return profile
- General drivers for sharing economy
  - Renewable energies (all cases)
  - Storage technologies (sonnenCommunity and HEG in some projects)
  - Smoothing load (or in these case generation) profiles (sonnenCommunity)
- Mechanisms to overcome general barriers
  - Electricity being a low-interest product (Piclo by enabling further market differentiation, all three by supporting the independence from centralised utilities)
  - High investment in infrastructure (esp. HEG by sharing the investment).

Drivers and barriers for decarbonisation identified in the cases

- Major drivers
  - Increasing all over renewable energy consumption through sharing (SonnenCommunity & HEG)
  - Higher efficiency through flexible matching and balancing (SonnenCommunity & Piclo)
  - Motivates energy savings and thus CO_2-savings (Piclo)
  - Local consumption that prevents transmission losses (SonnenCommunity & HEG)
  - Low-income households have access to renewable energies (HEG)
  - Increasing renewable energy consumption due to the implementation of a battery storage (SonnenCommunity)
- Major barriers
  - Capital is divided between the battery storage and the solar system (SonnenCommunity)
  - Flat rates may lead to increased electricity consumption. (SonnenCommunity)

Drivers and barriers for decarbonisation provided in the cases and in literature

- Major drivers for decarbonisation
  - Visualisation of power generation and consumption ➡ energy savings
    [Griese et al., 2016]
  - Flexible balancing of electricity generation and consumption ➡ more efficiency
    [Schultze, 2017; Sun et al., 2018; Tang et al., 2019]
  - Use of renewable plants instead of conventional energy generation ➡ reduction in overall CO_2-emissions
    [Kröhling, 2017]
- Barriers for a decarbonisation
  - Possibly smaller design of photovoltaic systems due to the battery storage invest ⇔ energy storage increases the renewable energy consumption
    [Griese et al., 2016]
  - Customer benefits such as low electricity costs or flat rates can lead to rebound effects
    [Kröhling, 2017]

Conclusions

- Renewable energies as main driver for an increased capital involvement by private citizens and for decarbonisation
  - Decentralised infrastructure fits the idea of the sharing economy
  - Low investment fits to the investment of private citizens
- Advantage to the electricity sector
  - Lacking interest of bigger investors for small projects is compensated for ➡ sharing approaches thus assist the restructuring of the electricity system
- Barrier in terms of regulatory issues: missing financial incentives
- Implication for policy makers: establishing a favourable environment for renewable energies providing a clear risk-return-profile

Outlook

- Manifold sharing approaches in the electricity sector
  - Cases from two countries show different characteristics but do not cover the whole range
  - Request for more cases and practical research
- Need for analyses whether the private capital found in the cases is additional investment or only redirected
- Interviews with experts in Germany on drivers and barriers for environmental benefits of sharing approaches in the energy sector
  - Need for defined framework conditions as driver and/or to overcome barriers
  - Different drivers and barriers for different cases
- Consider not only climate change but also further environmental impacts
- Overall sustainability including social and economic aspects relevant for the assessment of sharing approaches

Thank you!

For references and further information please take a look at our full paper „Potentials of the Sharing Economy for the Electricity Sector regarding Private Capital Involvement and Decarbonisation”.

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Sharing Economy in the energy sector

- (Still) No general consensus on definition
  - Also different terms comprising the same general idea (e.g. Collaborative Economy" , "Collaborative Consumption" , and "Sharing Economy)
- Central elements in the power sector
  - peer-to-peer platforms with a central backbone
  - increased asset utilisation
  - regulatory issues a barrier that needs to be overcome

  [Crosby, 2014]
- Characterisation of sharing business models in the energy sector along the following dimensions
  - shared good
  - market orientation
  - market structure,
  - industry sector

  [Plewnia and Guenther, 2018]