

## Smart EV charging: Innovation co-creation for more solar miles and smooth grid integration

- Electric vehicles are on the rise, and so is EV charging.
- But some challenges remain for a sustainable system integration of large number of EV.
- We investigate the innovation eco-system spurring the development for smart and solar charging solutions.
- A qualitative model is developed to highlight the dynamics in the innovation eco system for smart and solar charging.

Merla Kubli

Institute for Economy and the Environment  
University of St. Gallen  
merla.kubli@unisg.ch

### Background

Three main challenges emerge from integrating a large number of EVs in a sustainable manner:

- (1) Attractive EV charging and easy access (Patt et al., 2019).
- (2) Charging with renewable energies (Bauer, 2019).
- (3) Avoiding unnecessary, expensive grid expansions (Muratori, 2018; Rüdüsüli et al., 2019).

Smart and solar charging are promising solution (IRENA, 2019).

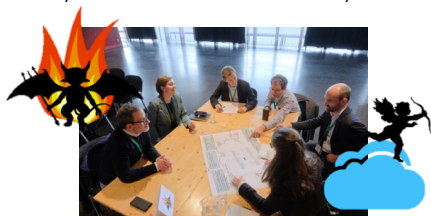
### Research Question

What are the socio-economic leverage points influencing innovation dynamics of business models for smart (solar) EV charging?

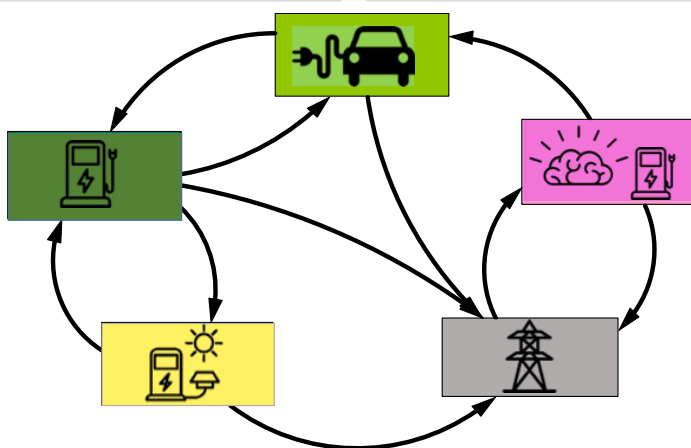
### Method

Qualitative mixed method approach:

- Interviews with experts from the field
  - Literature review
  - Workshop with 22 participants elaborating extreme scenarios.
- Iterative development of a qualitative system dynamics model capturing the dynamics of the innovation eco system.

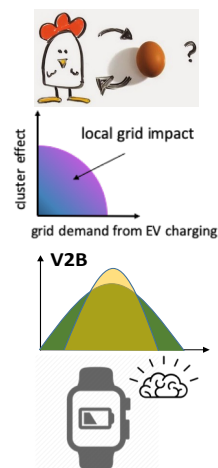


### Overview model of the innovation eco system for smart charging



### Key insights on dynamics of innovation co-creation of smart charging

- Financial attractiveness of public charging investments depends on user base, but EV diffusion depends on public charging infrastructure (Schroeder & Traber, 2012)
- Highly local effects can occur caused by consumer clusters. Even at low EV adoption rates heavy grid impacts can happen (Muratori, 2018).
- Solar charging at companies allow a better match of PV generation and EV charging.
- Smart charging will target to optimally coordinate charging time and power, but also the simultaneity effect.



### References

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