

The Impact of E-Mobility on Distribution Grid Expansion? One Research Question, Many Answers

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Motivation

Are the grids ready for the upcoming E-Mobility boom?

Will EV's Break The Grid?

By [Tsvetana Paraskova](#) - Aug 16, 2017, 4:00 PM CDT

Surge in electric cars could strain energy grid, warns EU agency

By [James Crisp](#) | EURACTIV.com

📅 30. Sep. 2016

Supporters

SMART POWER

Speeding into a Bottleneck

Germany has dragged its feet on electro mobility. Now it may be paying the price. The electricity grid just isn't ready for the shift away from combustion engines.

Stefan Hajek

September 10, 2017 12:00 pm

- Controversial topic in the industry: Are electricity grids designed accordingly to the expected E-Mobility boom?
- Numerous studies and research projects exploring the question

Agenda

- Scope of research
- Impact factors on research results
- Consistency of research results
- Summary

Scope of research

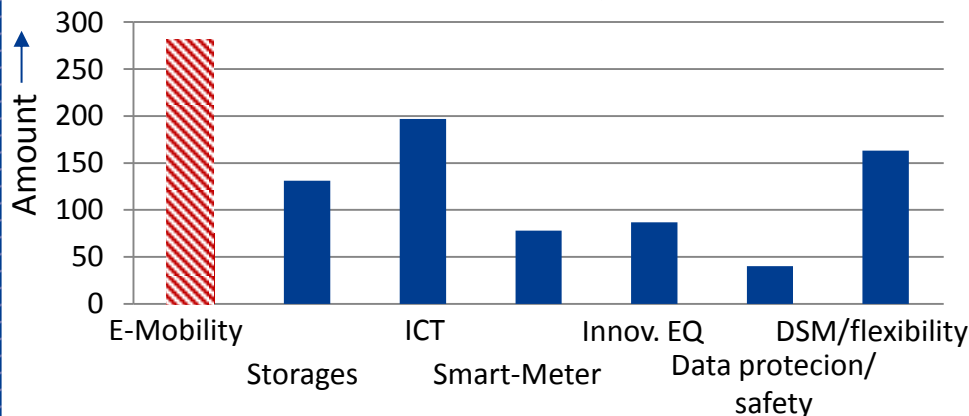
■ Multiple funding programs and initiatives in Germany

- Research initiative „Zukunftsfähige Stromnetze“
- ICT for E-Mobility I/II/III
- Energy Showcases (SINTEG)

■ Evaluation of different information channels on the subject of smart grid (2016)*

- Numerous projects that investigate the effects of electromobility on networks
- Projects well linked to other fields of smart grid research,
Exception: Data protection (few projects)
and innovative equipment

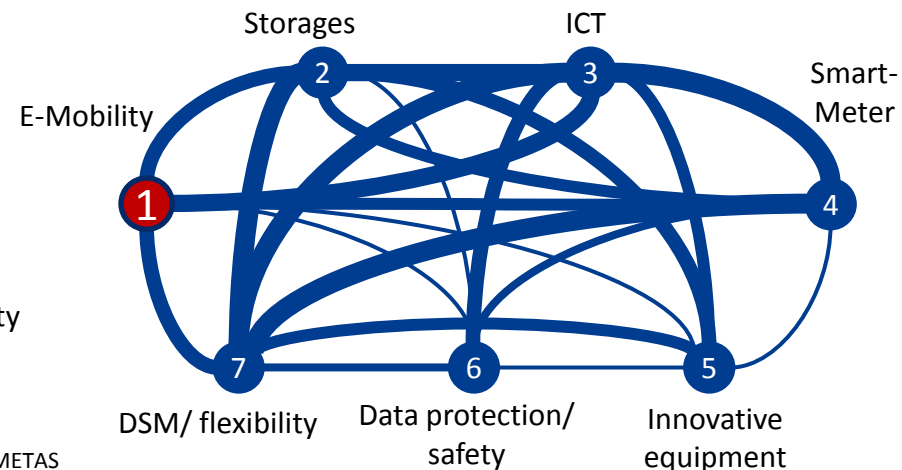
Classification in 7 categories



* BDEW-Meta-Studie „Smart Grid“, available online:

[https://www.bdew.de/internet.nsf/id/816417E68269AECEC1257A1E0045E51C/\\$file/METAS_TUDIE%20Smart%20Grid%20Abschlussbericht.pdf](https://www.bdew.de/internet.nsf/id/816417E68269AECEC1257A1E0045E51C/$file/METAS_TUDIE%20Smart%20Grid%20Abschlussbericht.pdf)

Links between categories

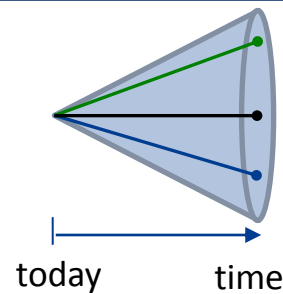


Impact factors on project results

Classification

Roll-out scenarios

- Electric cars per person
- Derivation?
- Commercial use?



Demand scenarios



- Load profiles
- Simultaneities
- Daily covered distance
- Shift of demand possible?
- Price signals

Battery



- Power
- Capacity



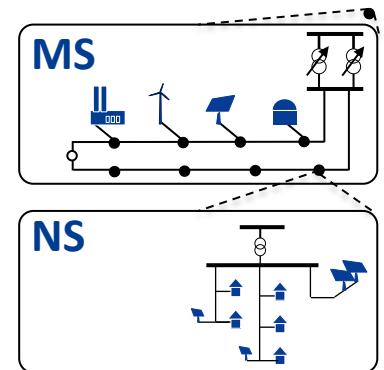
Results

Power system

- Additional battery use
 - Control reserve

Grid

- Which effects were quantified?
- Which voltage levels?
- Which connection point? (House, fast-charging, commercial)
- Analyzed grids?
- Technical restrictions?
- Conventional or innovative grid extension?



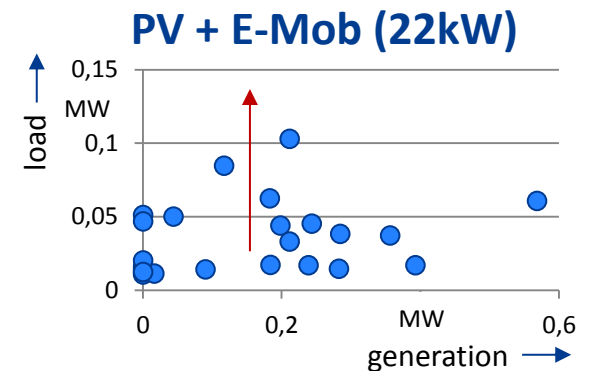
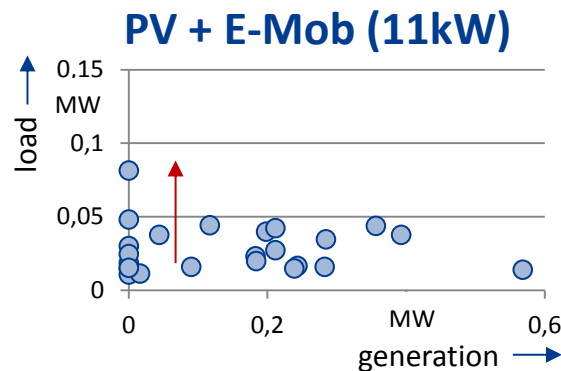
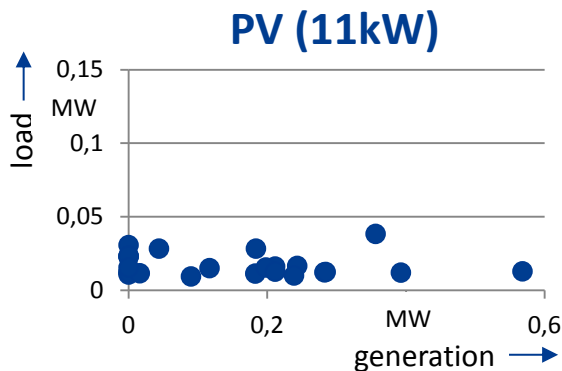
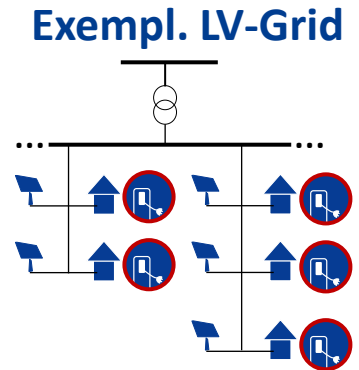
Impact of assumptions on results – an example

Analysis of an exemplary LV-grid

■ Questions:

1. Does E-Mobility integration lead to higher grid loadings than PV integration?
2. Which impact do the assumptions have?

■ Analysis of an exemplary, rural LV-grid (58 Households)*; exemplary day in June, 1h-pattern



■ When considering consumer-controlled charging: same connection power leads to significantly lower grid loading

■ Doubling of charging power

- Does not lead to doubling of grid loading (reason: simultaneities)
- Causes significant rise of volatility

➔ Impact of assumptions on grid loading can be seen

Consistency of research results

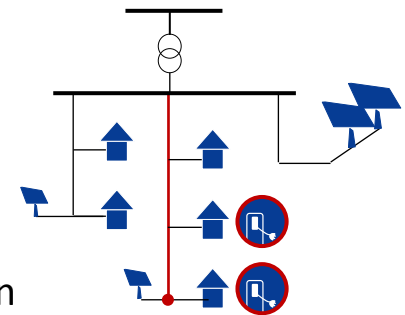
Project Results

■ Question:

What is the impact of E-Mobility on the Distribution System?

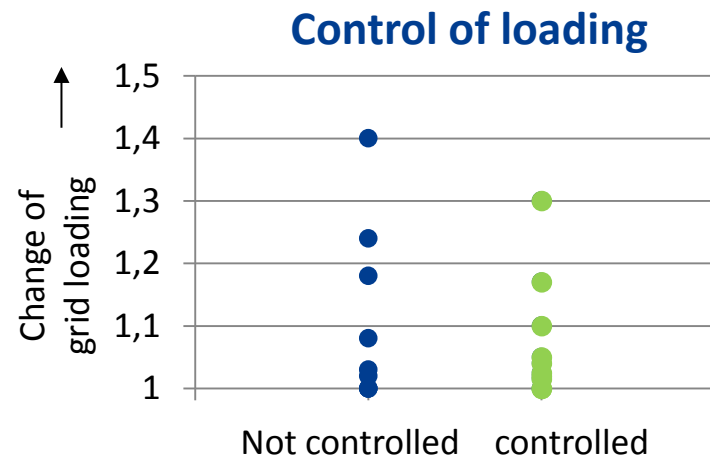
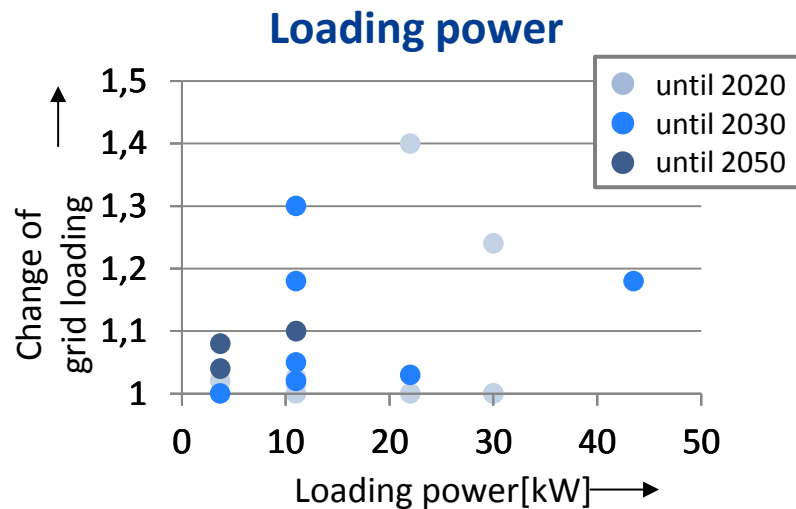
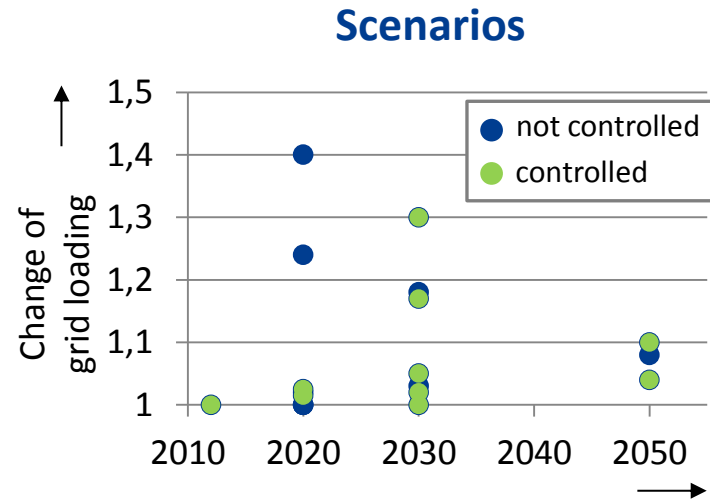
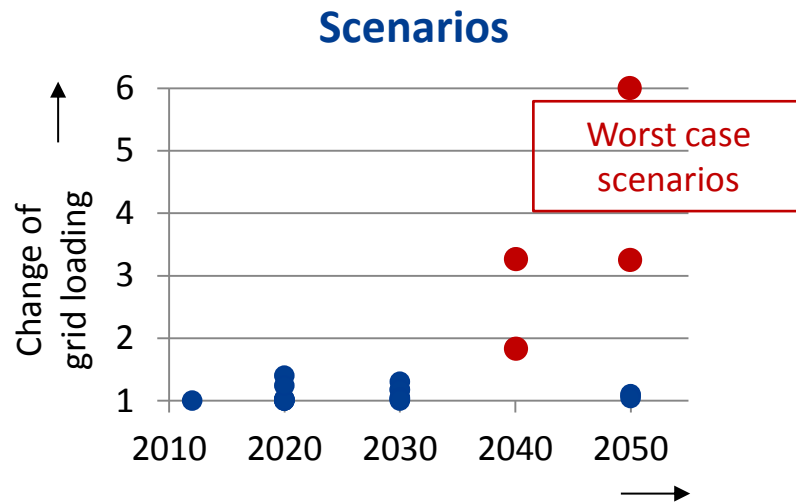
🔴 Contradiction: Does E-Mobility lead to grid congestion?

- P1: Integration of E-Mobility does not entail problems
- P2: New congestions caused by charging will emerge
- P3: Charging control **needed** to avoid grid extension
- P4: Charging control **should be avoided** to prevent grid extension
- P5: E-Mobility scenario 2020 possible without grid extension



Excerpt: Results of selected projects, impact on the grid

Impact of assumptions on grid loading



Summary

- Numerous projects / studies on E-mobility
 - Different assumptions regarding roll-out scenario, demand scenario, battery, grid and other power system
 - Big influence of primary assumptions on project results
 - **Transparent presentation of the scope and assumptions necessary**
- Partially contradictory project results, how E-Mobility affects grid loading
 - No easy link between assumptions and results

No clear answer to the research question possible (not satisfactory!)

- The discussion will continue:
 - Control need from the grid perspective – conflict of interests (Customer, DSO, TSO); typical for the case of the use of customer-specific flexibility
 - Are all the charging capacities currently discussed (up to several 100 kW) already assessed in consistent overall scenarios?
 - Ensuring the technical constraints and the system security aspects are guaranteed with changing vehicles at charging stations

Contact

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