Research Campus Mobility2Grid: From Lab to Reality in Research and Development

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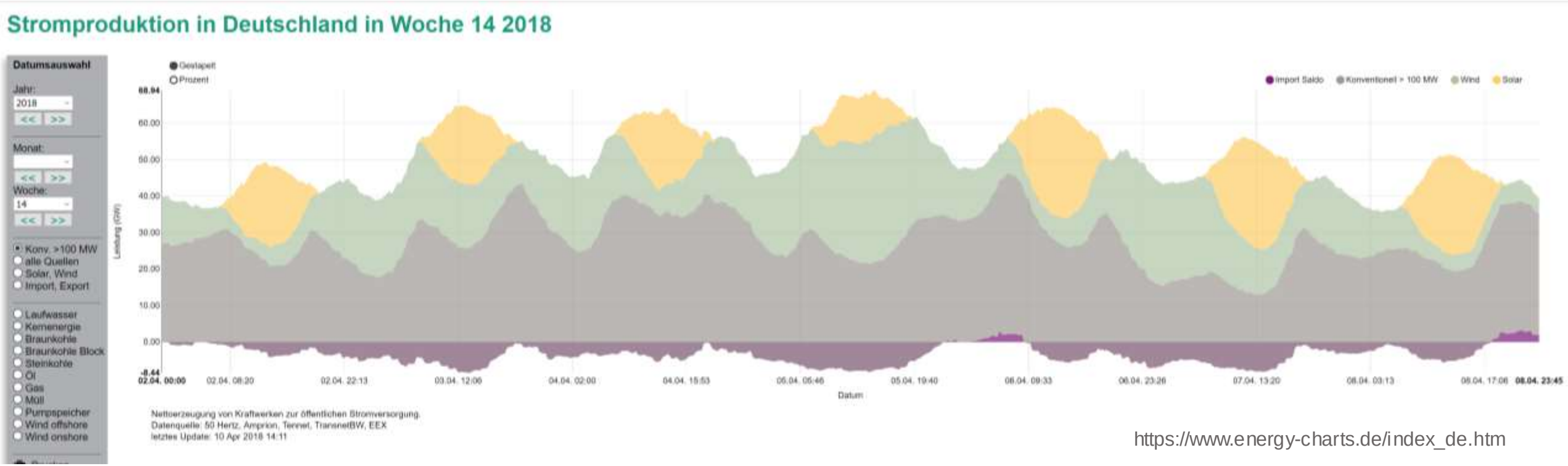
RESEARCH CAMPUS
Public-Private Partnership for Innovation

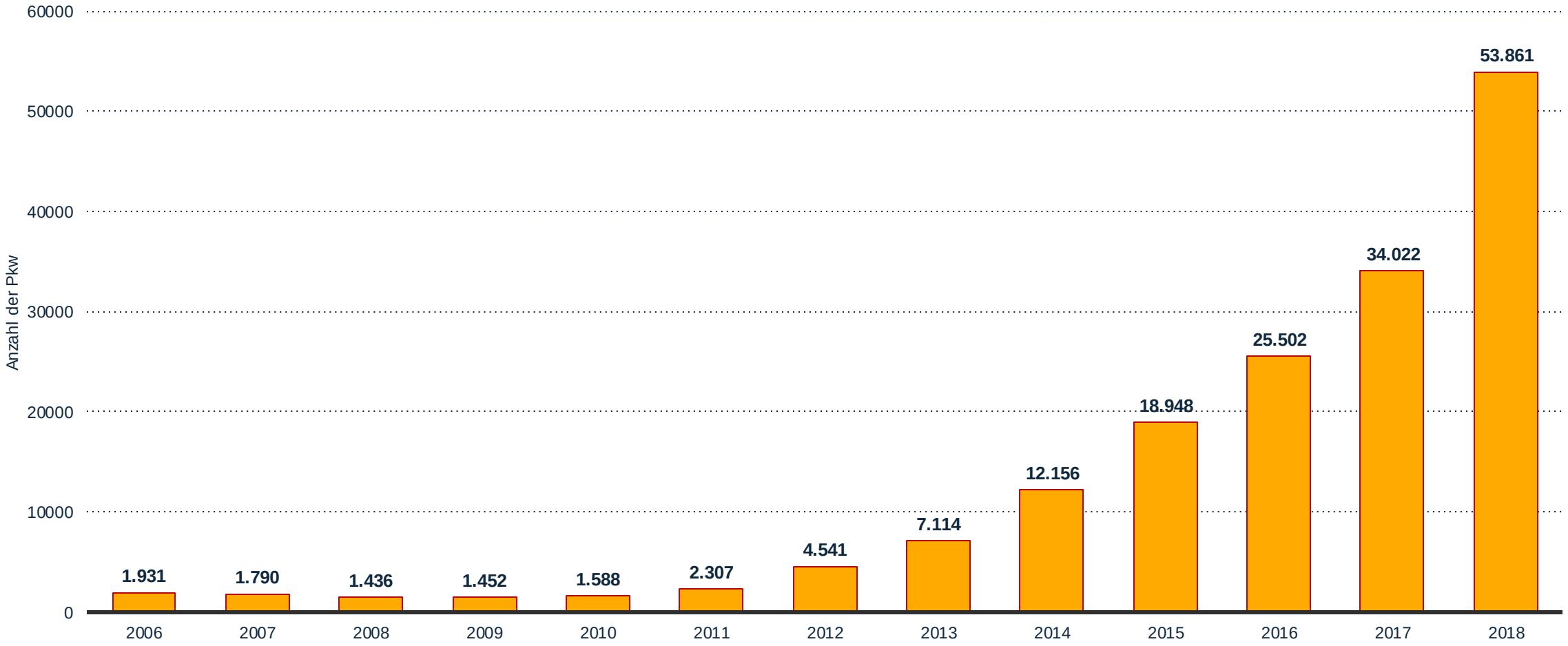
Power generation in Germany

One third of the German power generation in Germany is based on renewable energies (2017), but volatility is compensated for by conventional power plants.



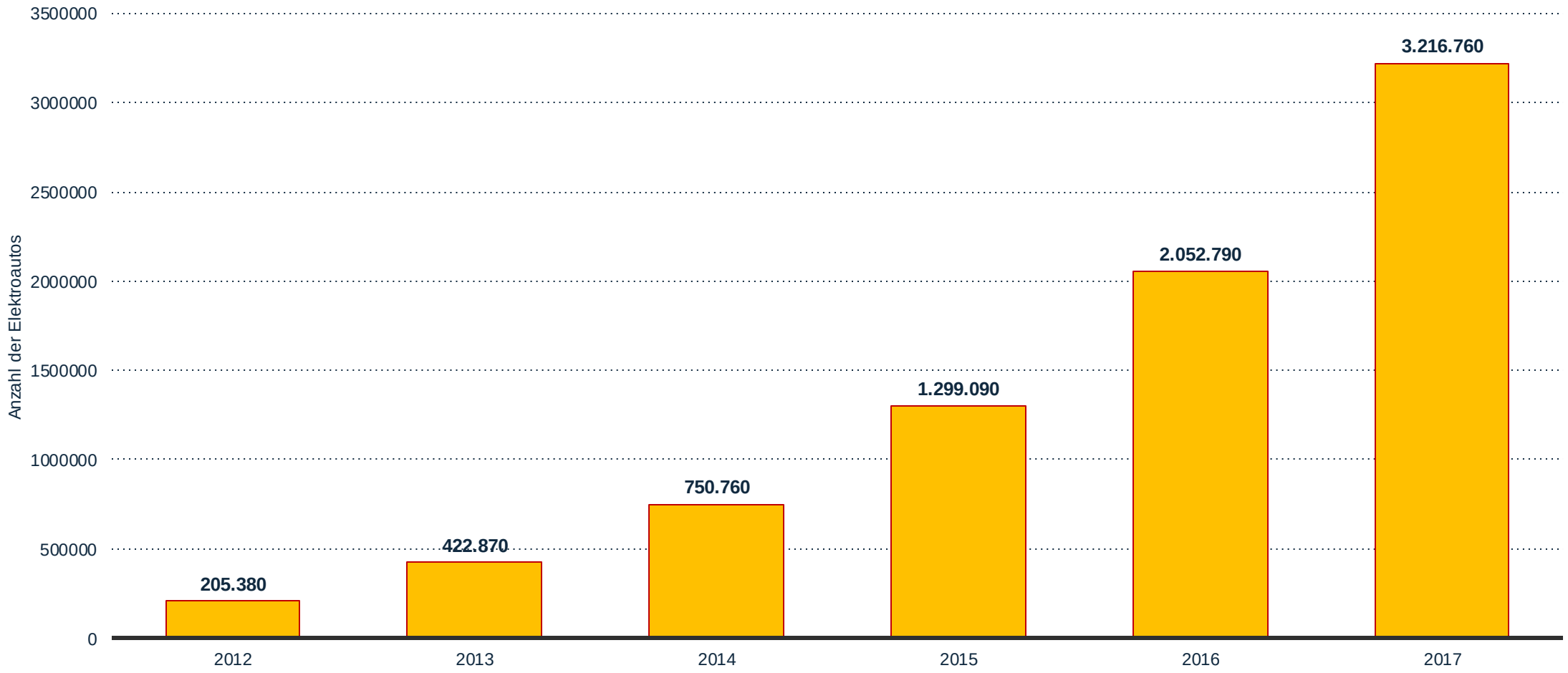
https://www.energy-charts.de/index_de.htm

Electric Cars in Germany (2006-2018)



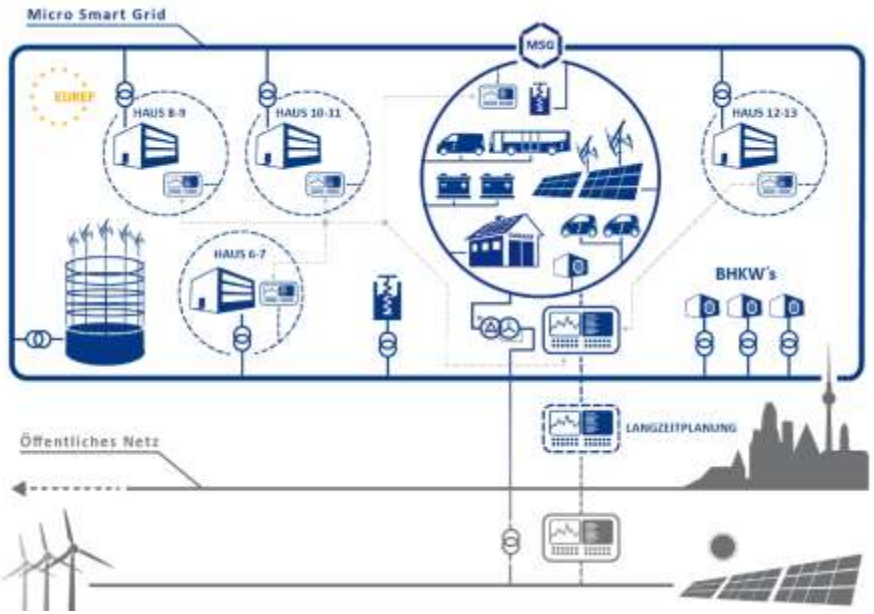
https://de.statista.com
Source: KBA; ID 265995

Electric Cars Worldwide (2012-2017)



https://de.statista.com
Source: ZSW; ID 168350

Mobility2Grid



- Public private partnership
- Central location in Berlin
- Main objectives:
  - Integration of commercial and private electric vehicles in decentralized energy grids
  - Reference district for synergetic collaboration of electric mobility, power and heat supply grids
- Mobility2Grid delivers an essential contribution to make power, heat and mobility:
  - affordable in the long-run
  - safe and
  - completely based on renewable energies

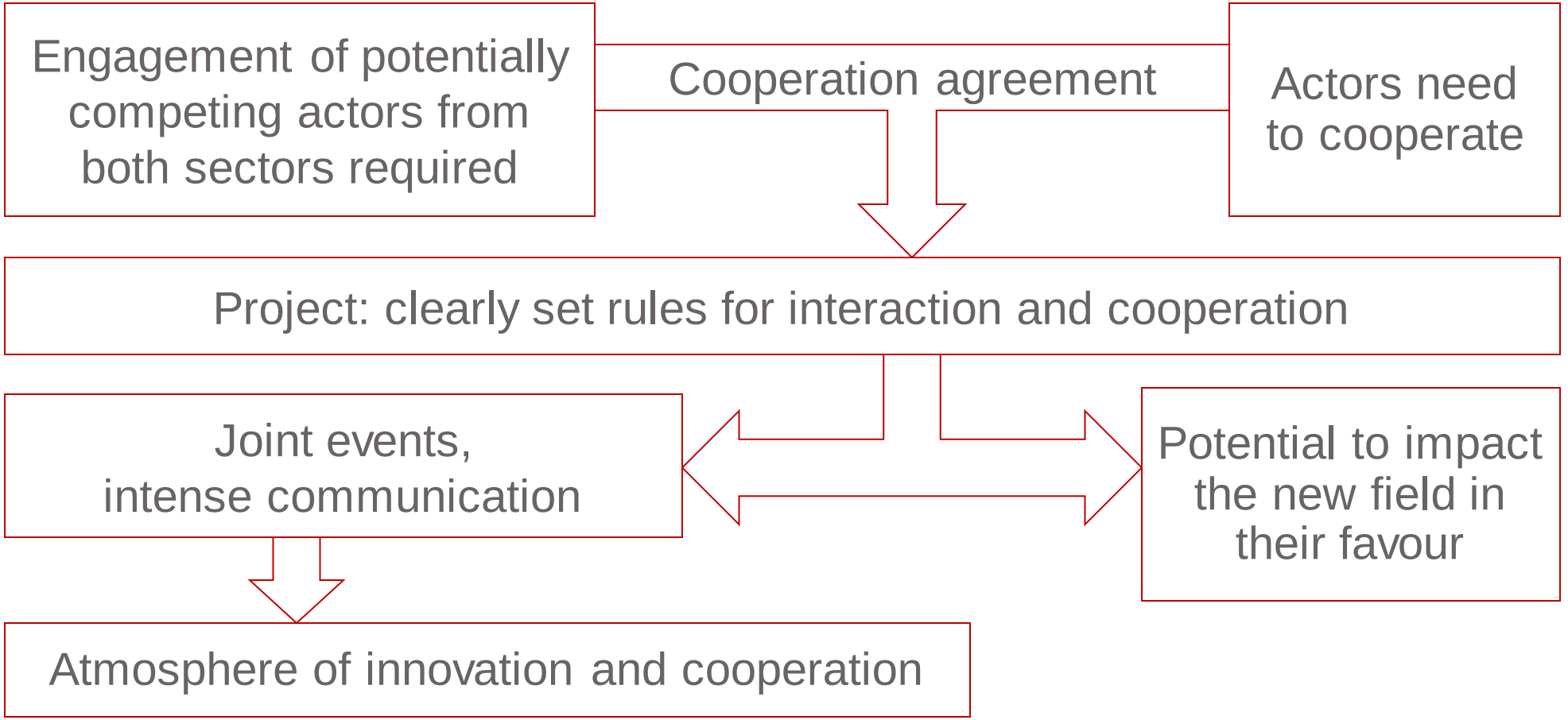
Mobility2Grid Association: Partners

- Smart Grid Infrastructures
- Interconnected E-Mobility
- Bus and Commercial Transportation
- Digital Spaces
- Acceptance and Participation
- Education and Knowledge Transfer
- Operation and Commercialization

Mobility2Grid is a Public Private Partnership, including two universities, three research institutes, 28 companies and five more organizations.

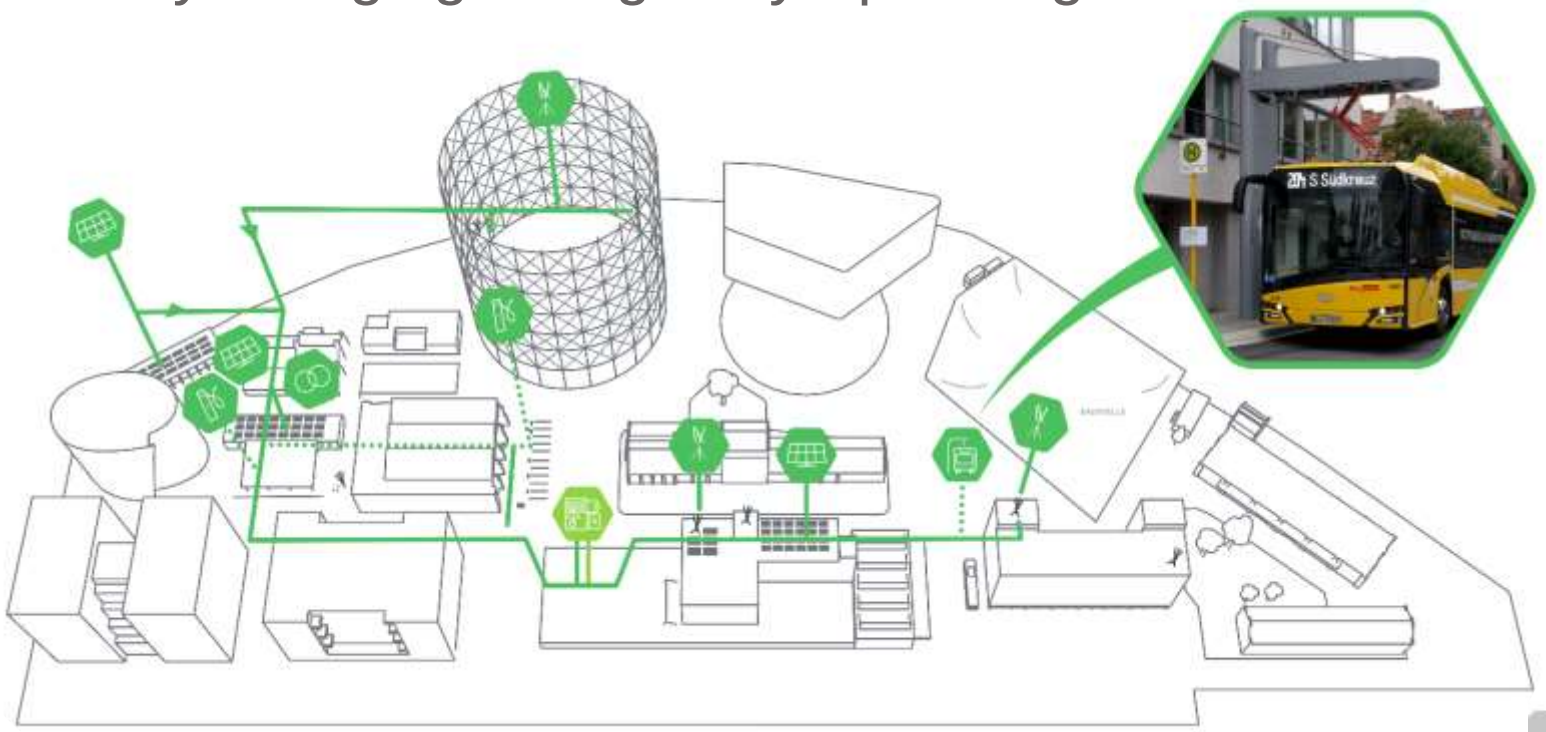
Cooperation and Communication

Nexus of Energy and Mobility: Newly Arising Business Field



Grid and Vehicles: Electric Bus Integration

- Proposing to integrate electric bus fleets in Virtual Power Plant operations
- Designing the integration of charging infrastructure as advantegous as possible → set-up of on-campus charging infrastructure that is integrated into the local smart grid (unidirectional in operation, bidirectional in 2019)
- Daily charging of regularly operating bus



Grid and Vehicles: Electric Bus Integration

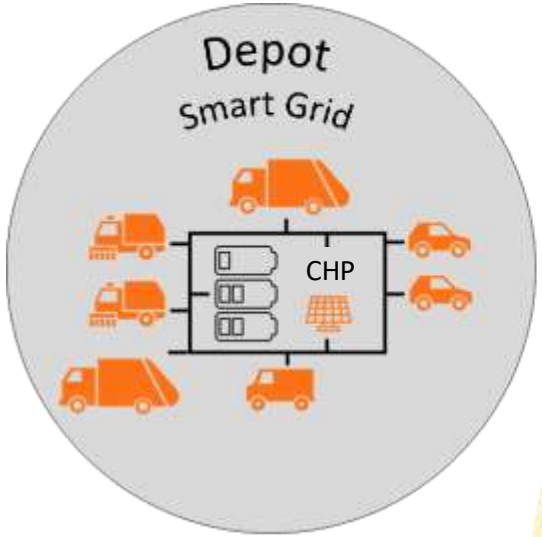
- Bidirectional data exchange
  → varying control and regulation possibilites for different entities:
  - Electric Vehicle Supplier / Aggregator
  - Charging Point Operator
  - System Operator (SO)
  - Virtual Power Plant (VPP)

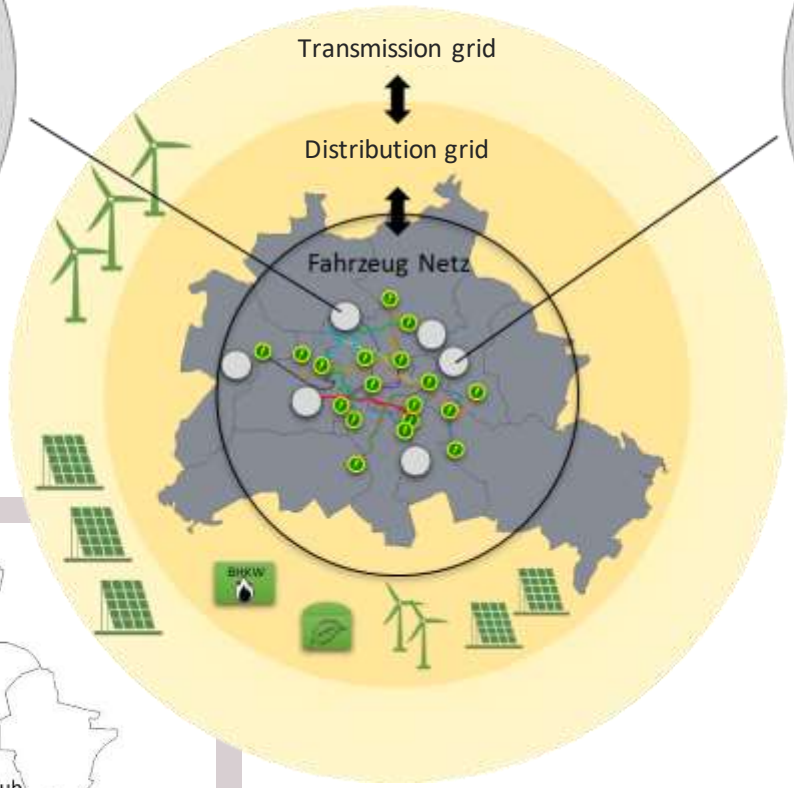
- Validation of charging strategies: opportunity charging / depot charging
- Time delay due to late bus arrival
- Relevant information for VPP operator, SO, local smart grid and power system services

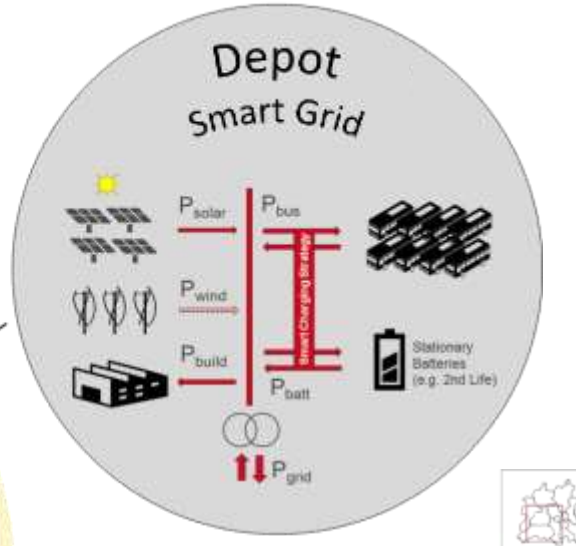
Technische Daten / Specifications

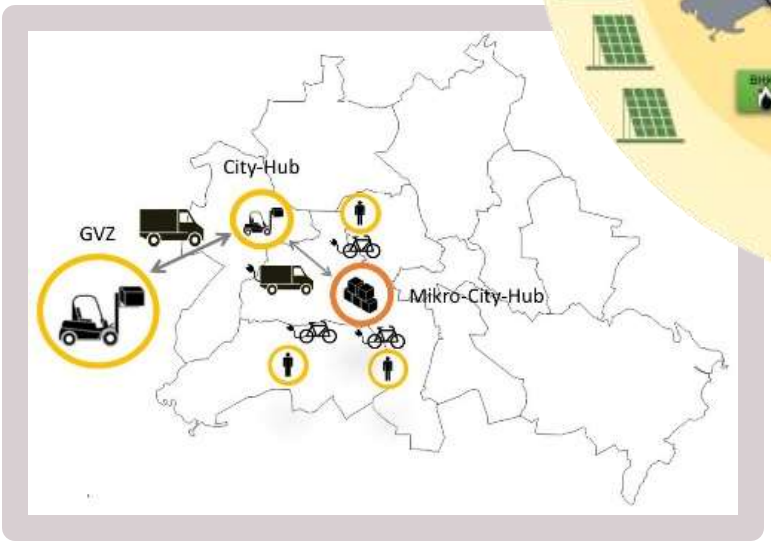
Ladeart Charging type	DC konduktiv DC conductive
Lade- / Endladeleistung Charging / Discharging power	150 kW / 120 kW
Batteriekapazität Battery capacity	160 kWh (LFP)
Ladeschnittstelle Charging interface	Pantograph / Combined Charging System (CCS)
Kommunikationsprotokolle Communication protocols	ISO/IEC 15118, Open Charge Point Protocol (OCPP)

Grid and Vehicles – Outlook: Smart Grid Depots “Off Campus“







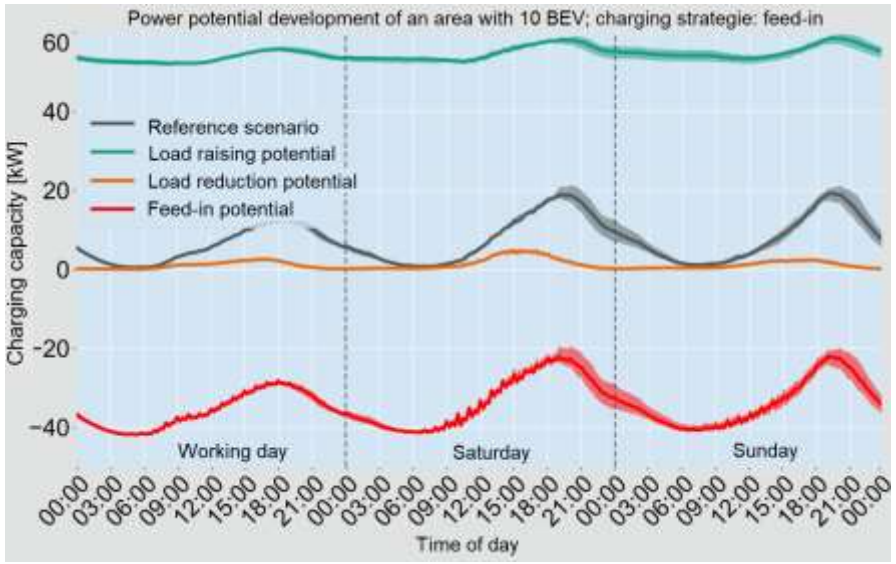


DACHSER
Intelligent Logistics

Grid and Vehicles: Car Sharing Fleet DSM Potential

- Study based on DB Connect car sharing fleet and its potential to contribute to Demand Side Management
  - Data of 1,200 (fossil-fueled) vehicles, 342,350 trips
  - Data parametrized
- Charging strategy scenarios:
  - Reference scenario,
  - Load reduction,
  - Load shifting,
  - Bidirectional charging

Source: Fraunhofer ISE, 2018



- Average required charging load: 5.5 kWh
- Load shifting and bidirectional charging are possible at almost any given time

What good is a technology when it is not being used?

Acceptance and Participation

Forschungscampus Mobility 2 Grid EUREF

Citizen participation:

- Constellation analysis, depicting constellations:
  - energy and mobility transitions (existing)
  - facilitating V2G application (desired)
- Focussed group discussion

→ Additional acceptance-increasing factors

Corporate acceptance:

Interviews with six drivers of hybrid street sweepers:

- Generally positive
- Some limitations and skepticism
- Main challenge: applications planning

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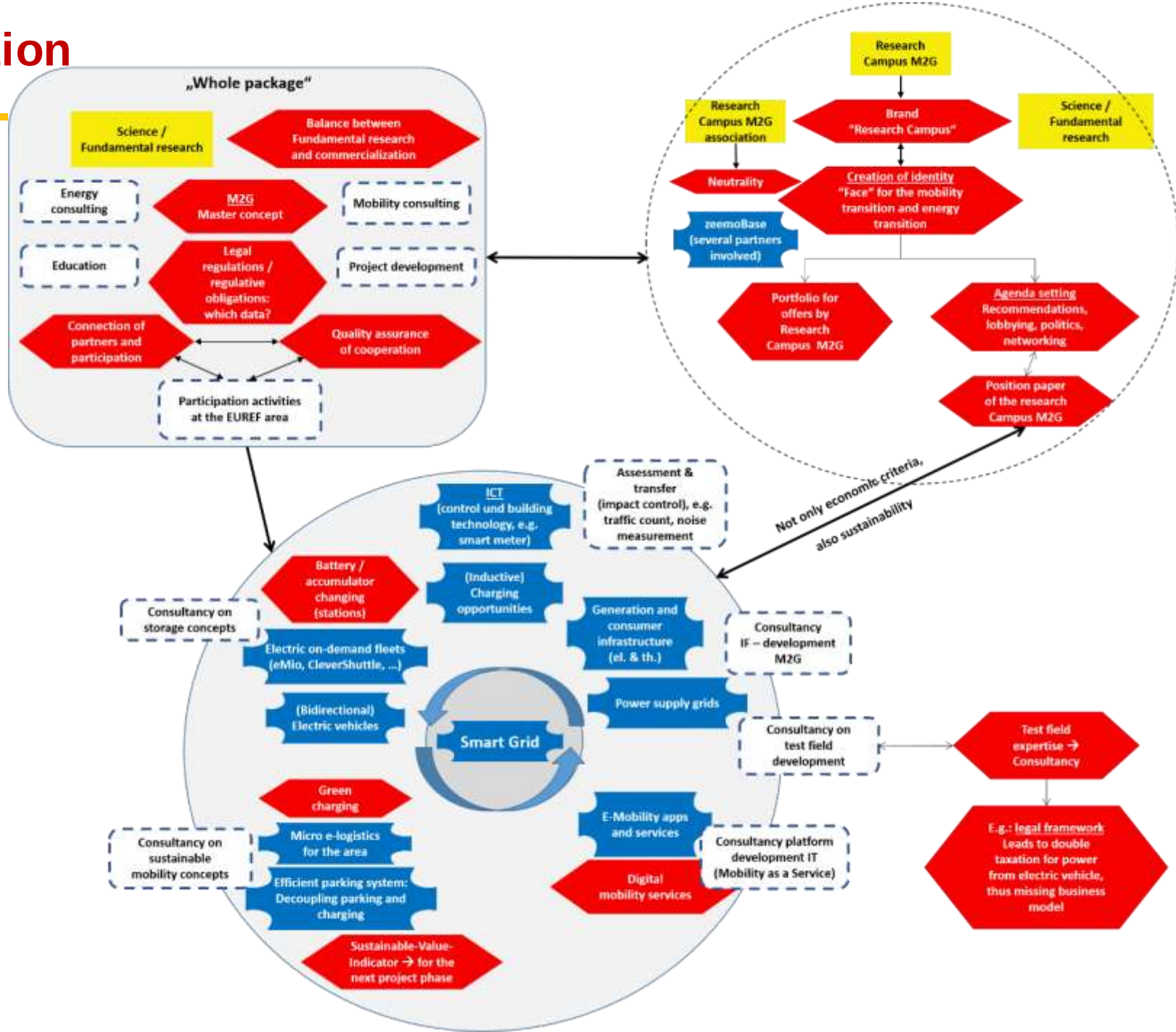
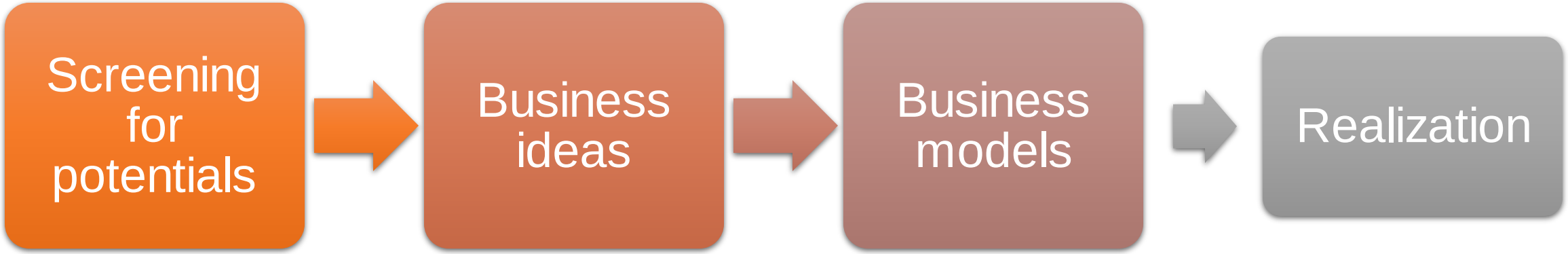


Business Models



- Counselling concept
- Charging infrastructure operation
- Self-sufficient energy supply for railway facilities
- Data and service platform
- Training concepts

Business Models

- No defined market or viable business model → economic challenges:
  - Newly arising business field
  - Late ROI for micro smart grids

- Legal challenges (Germany):
  - Different laws
  - Different definitions of end customers
  - Laws impede business model development for established actors

→ No single business model – it needs to be adapted to the facility

Outlook

Fleet Operators

4.6 million commercial passenger cars and 2.1 million trucks

Aggregration of fleet data → high prediction probability

Campuses

Ca. 400 scientific campus areas: potential model districts for smart grid concepts and integrated transportation solutions

Train stations, freight distribution centers, etc.

Ca. 2,000 buildings and sites in different categories

Decisive role of train stations when developing local smart grids

Residential districts

2000 housing companies with 2.2 million apartments

Increasing in housing communities with autonomous power supply

Exploitation perspectives

Thanks For Your Attention!

Your Questions?

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