Research Campus Mobility2Grid: From Lab to Reality

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Electric Vehicle Power System Integration Symposium
Stockholm
Mobility2Grid

- Public private partnership
- Located at EUREF-Campus, Berlin-Schöneberg
- 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

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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.
Nexus of Energy and Nobility: Newly Arising Business Field

Engagement of potentially competing actors from both sectors required → Cooperation agreement → Actors need to cooperate → Project: clearly set rules for interaction and cooperation → Potential to impact the new field in their favour → Joint events, intense communication → Atmosphere of innovation and cooperation

Mobility2Grid innovation examples
Grid and Vehicles: Electric Bus Integration

- Proposing to integrate electric bus fleets in Virtual Power Plant operations
- Designing the integration of charging infrastructure as advantageous 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 possibilities 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

Source: [3] Lauth et al. 2018
Grid and Vehicles – Outlook: Smart Grid Depots “Off Campus“
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
- Average required charging load: 5.5 kWh
- Load shifting and bidirectional charging are possible at almost any given time, varying potential depending on scenario and weekday

Source: [4] Noeren, Bürer, Stryi-Hipp 2018
What good is a technology when it is not being used?
Acceptance and Participation

Citizen participation:
- Constellation analysis, depicting constellations:
  - energy and mobility transitions (existing)
  - facilitating V2G application (desired)

- Focussed group discussion – additional acceptance-increasing factors:
  - Mobility guarantee
  - Economic incentives
  - Transparency
  - Vision

Corporate acceptance:
Interviews with six drivers of hybrid street sweepers:
- Generally positive evaluation
- Some limitations and skepticism
- Main challenge: applications planning

Source: [5] Albrecht & Böhm 2018
Acceptance and Participation

Constellation analysis, depicting desired V2G application

Source: [5] Albrecht & Böhm 2018
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
Aggregation 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
Thanks For Your Attention!

Your Questions?

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