Software for feasibility analysis and optimized design of autonomous electric vehicle fleets for on-demand ridepooling or delivery services

SMEs needed:

1) Producer of such vehicles, 2) mobility planning consultants

26.11.2018

Werner Rohlfs

Chair for Electrochemical Energy Conversion and Storage Systems

iSEA Power Electronics and Electrical Drives | RWTH AACHEN UNIVERSITY

Electrochemical Energy Conversion and Storage System Group

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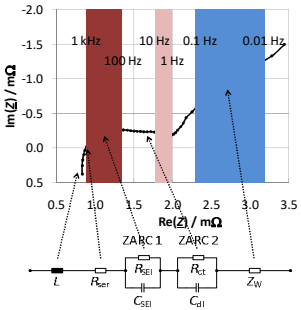
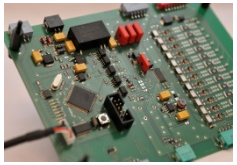
Univ.-Prof. Dr. rer. nat.
Dirk Uwe Sauer

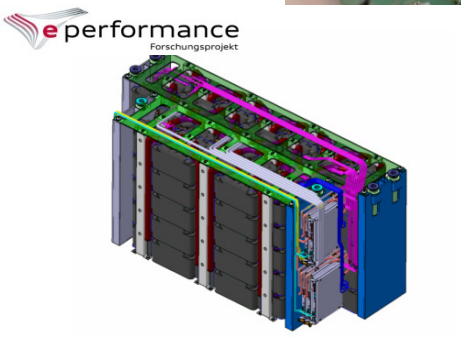
Section
Modeling, Analytics & Life Time Prognosis

Section
Battery System Design and Vehicle Integration

Section
Grid Integration and Storage System Analysis

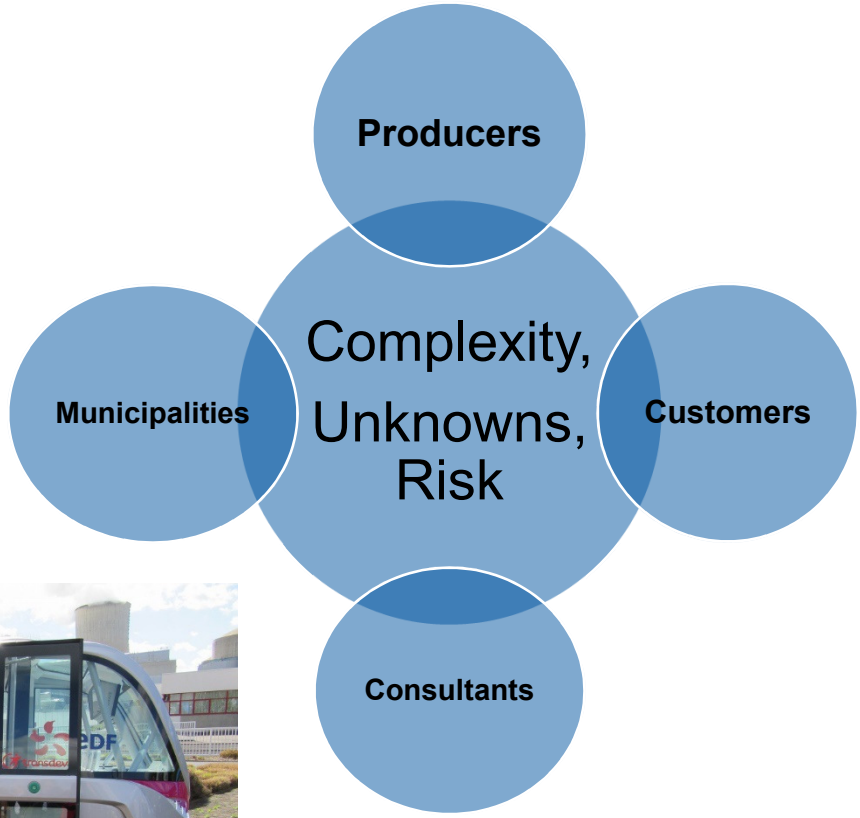






Motivation: Such a tool is currently missing but needed for risk management and planning purposes

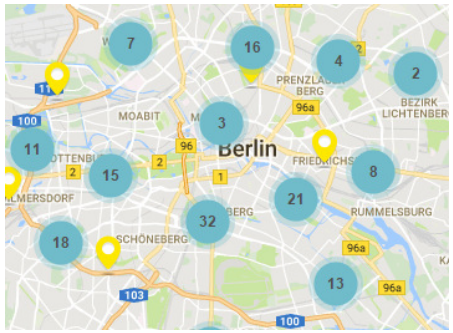
- No driver costs: Autonomous electric vehicles at town district level potentially economical
- Who is involved?
  - Vehicle **producers** (often SMEs)
  - Vehicle **customers**: Fleet operators
    - Public transport organizations
    - Urban logistics & delivery companies
  - City **municipalities** (Tender for services)
  - Mobility planning **consultants**



The Sensible 4 autonomous technology is designed to function in a variety of weather conditions, including rain and snow (Credit: Muji / Sensible 4)

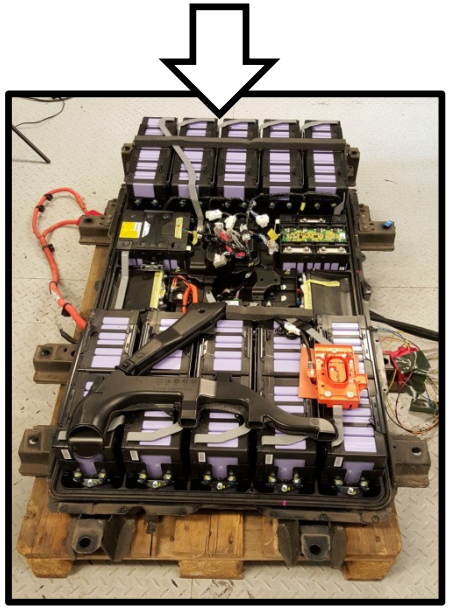
Optimisation of interconnected parameters to reach technical and economic feasibility in a given town district

- **High costs** of autonomous electric vehicles demand cost optimisation to become realistic:
  - Esp. batteries and charging infrastructure
- **Complex optimisation** (interconnected parameters):
  - Vehicle (battery characteristics, etc.)
  - journeys (types, frequencies, ranges, time, purpose, etc.)
  - Charging: Where and how?
    - Centralised or decentralised?
    - Synergies with existing infrastructure?
  - Operations:
    - Economically linking service requests with vehicles
    - Limits of the vehicle battery



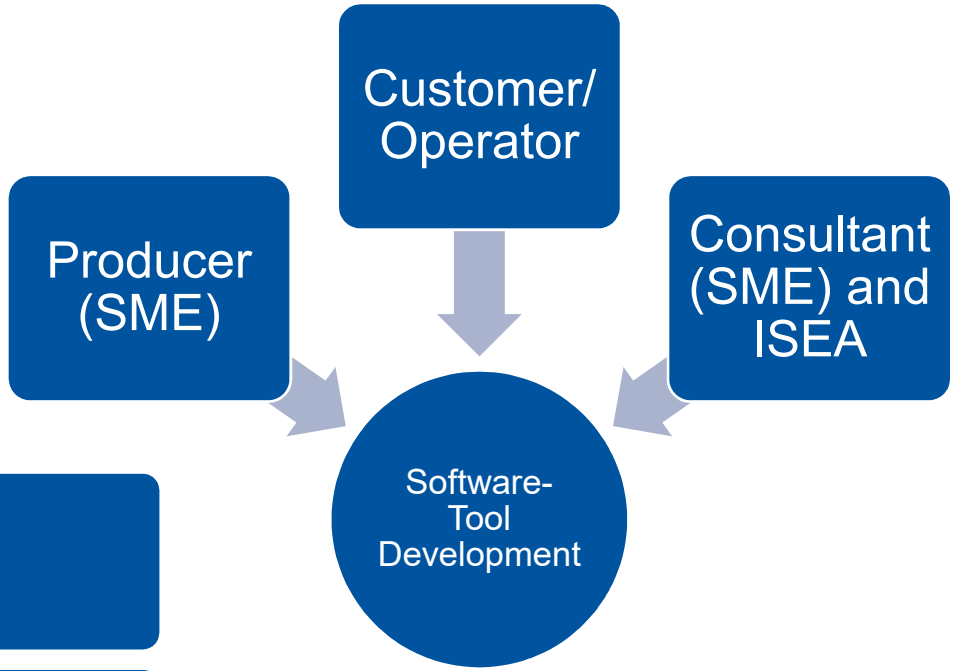
Example: Mitsubishi i-MiEV

Source: pushevs.com



Project partners and their contributions

A city **municipality** is desireable as “Strategic Advisor”.



Customer / Operator	Providing basic data on local area •Existing fleet parameters •Existing charging infrastructure data •Level „town districts“ (below level „city“)
Producer (SME)	Providing data on vehicle flexibility options •Technical (incl. battery) system •Other limiting conditions
Consultant and ISEA	Providing journey data on times, distances and purposes of journeys •„Mobilität in Deutschland“, indicators, probabilities •Programming

SMEs needed:

1) Producer of such vehicles
2) Mobility planning consultants

Scope of the intended research project

Analysis
- Data regarding the mobility in a respective town district
- technical parameters regarding vehicle, battery, charging infrastructure
- Etc.

Deduction
- Boundary conditions, patterns, indicators, probabilities
- Substitution potential by ridepooling / delivery services with autonomous electric vehicle fleets
- Respective technical, operational, and economical requirements

Software
- Simulation and optimisation of operations of a given fleet and town district
- Considering boundary conditions of electric driving and *stochastic demand models**

Validation
- If possible: Within existing project in a town district by real data
- Alternative: Plausibility check by comparison of calculated simulative with archetypal existing realisations

**Stochastic Models:* Mathematical models involving probability.
Probability Distribution is used to represent uncertain factors.

Expected project results

MODELS:

Quantifying demand, technical & economic feasibility
For ridepooling or delivery services
Based on known / deducted / assumed data

Tool(s):

Guide on planning parameters for the vehicle battery and corresponding charging stations

Software:

Software-based consulting & strategic planning of autonomous electric vehicle fleets and associated charging infrastructure for on-demand ridepooling or delivery services

Thank you
for your attention

Werner Rohlfs

Contact

ISEA
Tel.: +49 241 80-49399
wro@isea.rwth-aachen.de
batteries@isea.rwth-aachen.de

Chair for Electrochemical Energy Conversion
and Storage Systems
Univ.-Prof. Dr. rer. nat. Dirk Uwe Sauer
RWTH Aachen University

Jaegerstrasse 17/19
52066 Aachen
GERMANY

www.isea.rwth-aachen.de