Main goals of the work

- Business models that optimize the system integration of EVs under consideration of Grid to Vehicle (G2V) and Vehicle to Grid (V2G) concepts
- Influence of different market penetration and charging strategy scenarios on electricity grids (focus on medium and low voltage grids)

Integration in the energy market

A vehicle owner could sign a contract with an aggregator
- No interaction between energy market and vehicle owners
- Aggregator duties could generally have the similar aspects as a supplier, a balancing group representative or a producer has.
- Aggregator could operate at the market for primary and balancing energy. He could consider a voltage regulation in low and medium grid as a possible ancillary service

Charging and discharging strategies

- The penetration of different EV-models is derived from the number of persons in each selected grid area and subsidy constraints (Source: Maximilian Klose, Vienna University of Technology, Energy Economics Group)
- Analyzing of EV-discharging during a day (minutely profiles) is based on driving patterns in different Austrian federal states (Source: Markus Litzlbauer, Vienna University of Technology, Power Systems Group)
- Market based charging and discharging strategies for summer, winter and transition times (a weekly based analysis)
- Considering of discharging patterns
- Use linear optimization for definition of charging times
- Definition of plug-Patterns

Impact on different grid levels

- Concentration on low and medium voltage levels
- Selection of grid parts with different demand characteristics
  - Grids from rural and urban areas
  - Grids with only households as a demand
  - Grids with household in combination with a high share of business demand in some selected grids

Selection of low and medium voltage grids

Impact on different grid levels

Outlook (next part of the work)

- Considering of statistical data from balancing energy market and the frequency deviation in control area of APG (Austrian Power Grid)
- The impact of market based strategies on the selected grids (Voltage and power impacts)
- Business models and commercial exploitation of EVs

This project is funded by the „Klima- und Energiefonds“ and is part of the programme „NEUE ENERGIEN 2020“.  
Rusbeh Rezania, Wolfgang Prüggler, Markus Litzlbauer, Vienna University of Technology, Gusshausstraße 25-29/373-2, Tel: +43-1-58801370375, Email: rezania@eeg.tuwien.ac.at