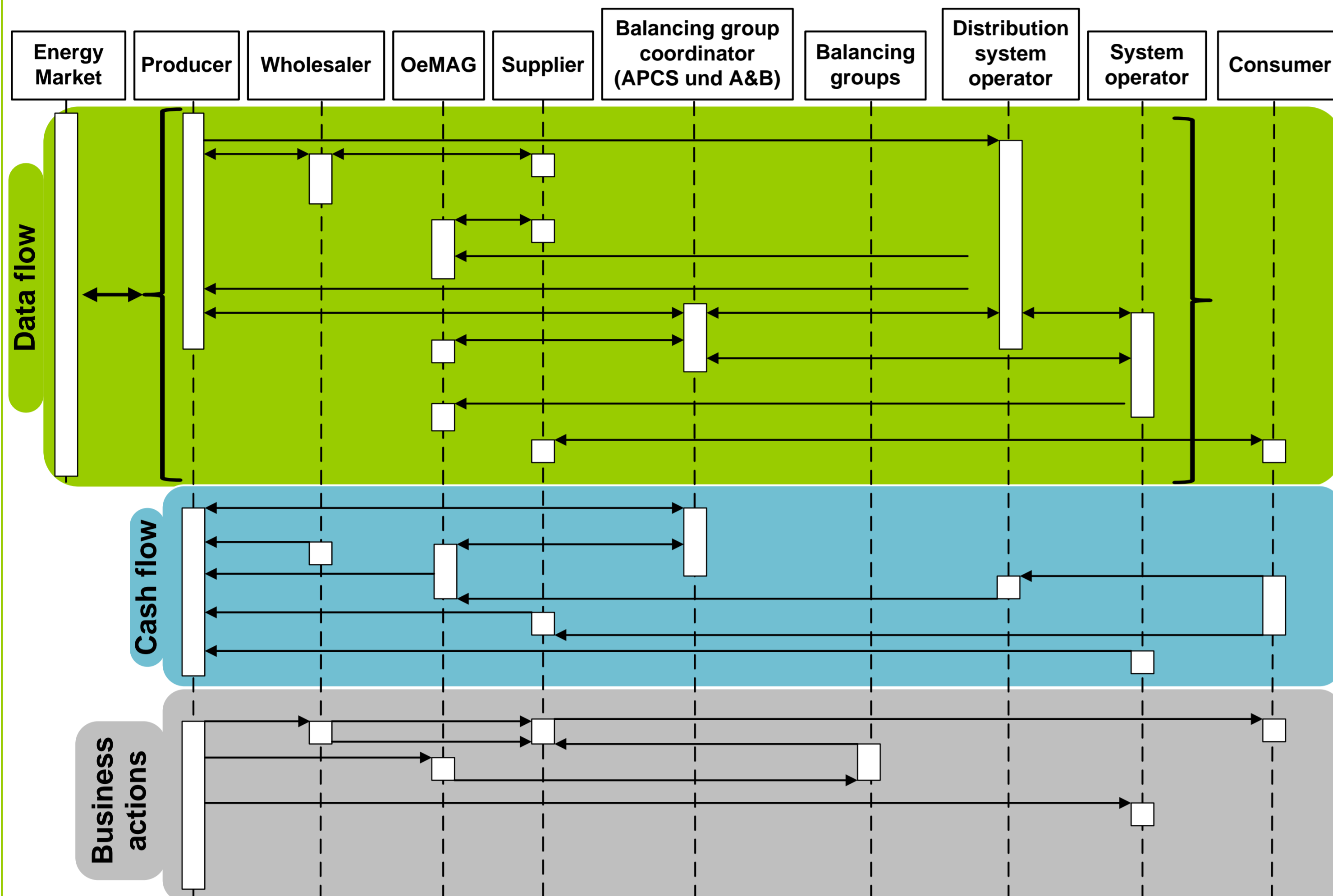


Impact of Electric Vehicles on the Austrian Energy System (V2G-Strategies)

Main goals of the work

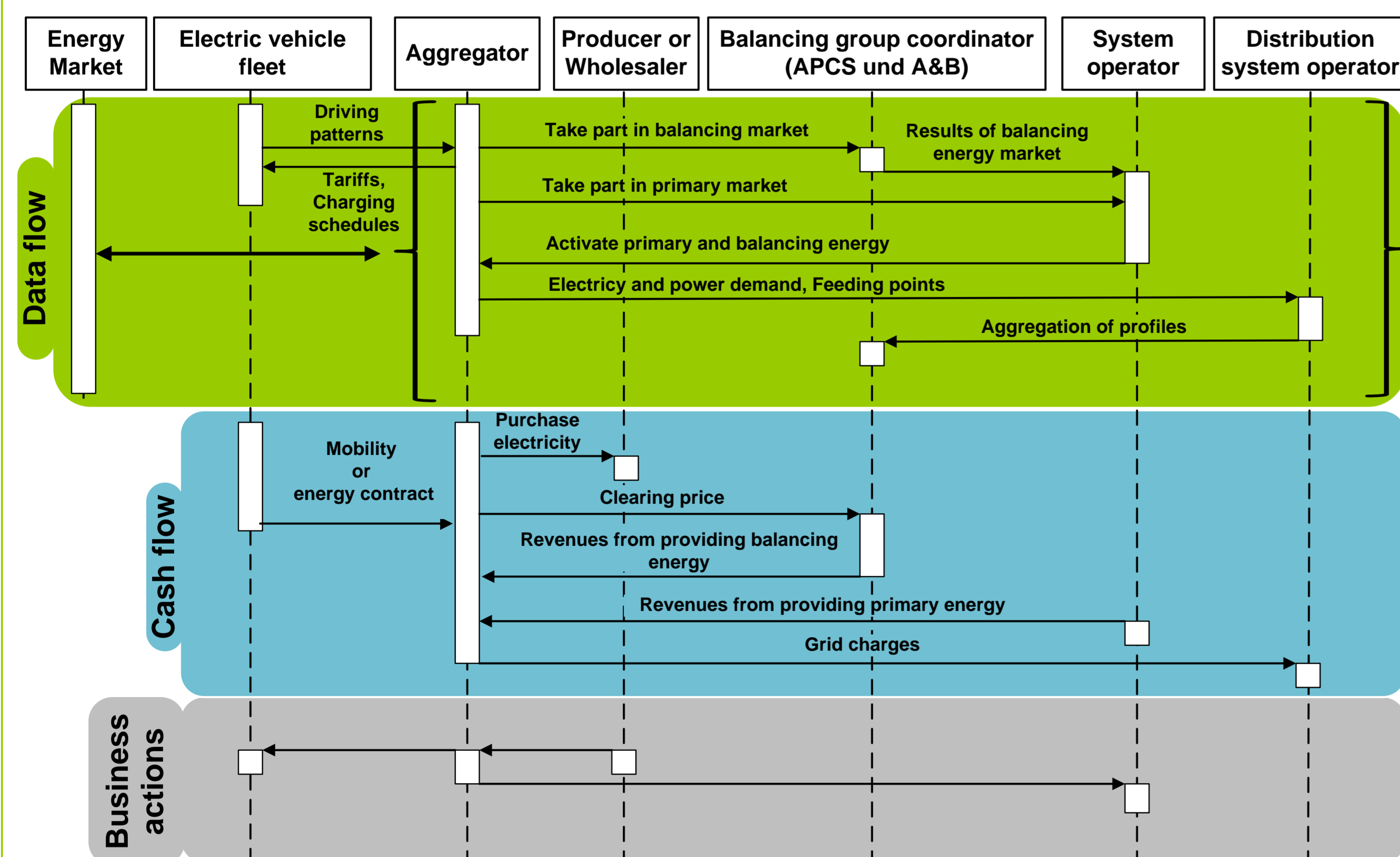
- Business models that optimize the system integration of EVs under consideration of Grid to Vehicle (G2V) and Vehicle to Grid (V2G) concepts
- Influence of different market penetration and charging strategy scenarios on electricity grids (focus on medium and low voltage grids)

Integration in the energy market



Interaction of stakeholders in the Austrian 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

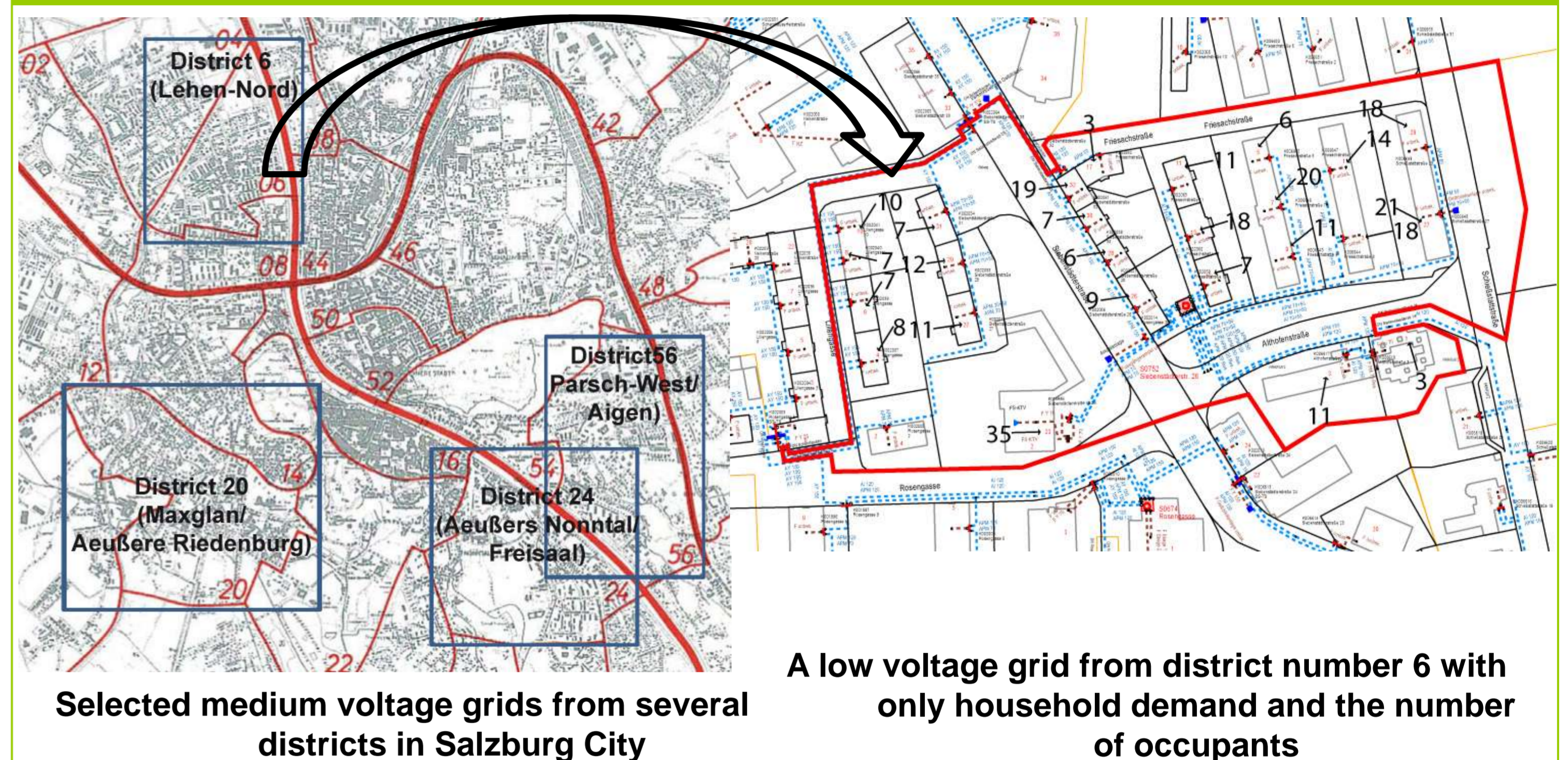


Integration of EVs in the energy market through an aggregator

Impact on different grid levels

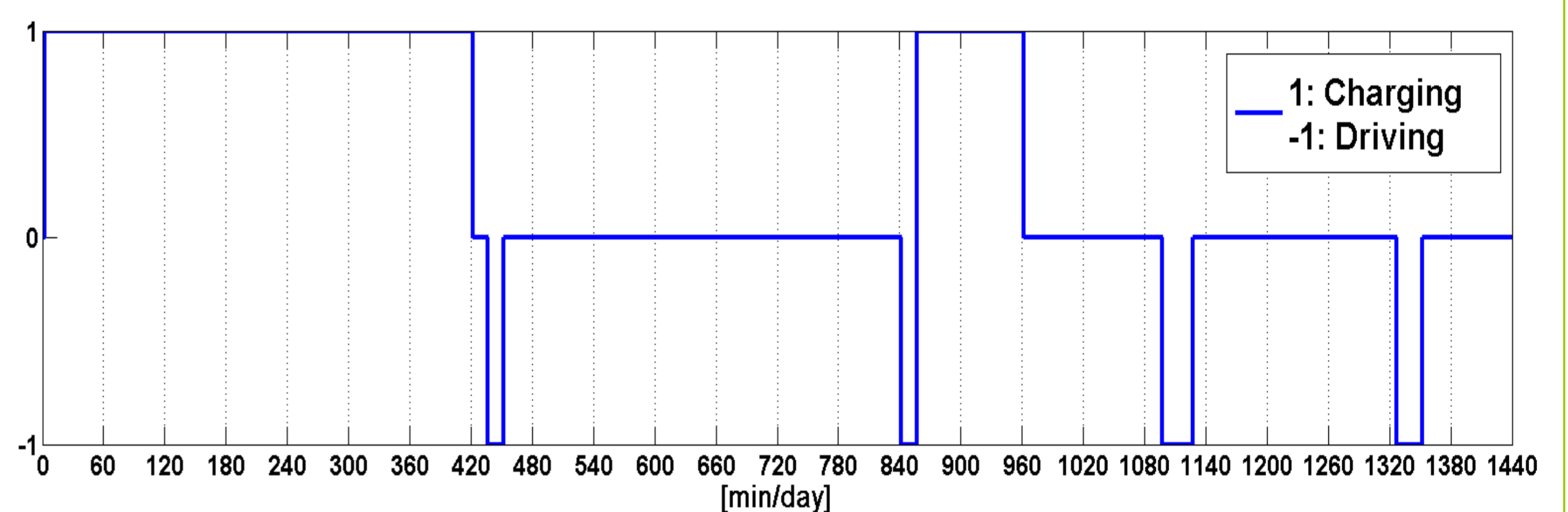
- Concentration on low and medium voltage levels
- Selection of grid parts with different demand characteristics
 - ❖ Grids from rural and urban areas
 - ❖ Grids with only households as a demand
 - ❖ Grids with household in combination with a high share of business demand in some selected grids

Selection of low and medium voltage grids



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 Kloess, 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



Charging and Discharging times for a EV with a battery capacity about 48 kWh, Winter, Weekday

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



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