The smart potential of e-Mobility
We are eeMobility!
EVs on the rise...

**Strong increase in EV sales**

New Car Registrations BEV and PHEV Europe

<table>
<thead>
<tr>
<th>Year</th>
<th>BEV</th>
<th>PHEV</th>
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<tbody>
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<td>2018</td>
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<td>180</td>
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<td>2019*</td>
<td>200</td>
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</table>

*Jan – Oct 19

Source: Eurostat, ACEA, IEA, insideEVs, own analysis

Global EV Stock Outlook 2018 – 2030

#mutigzukunftdenken
...which creates a huge new market potential...

Markets are all vehicle segments in Europe

- 250M cars
- 892K bus
- 6M trucks (> 3.5t)

Annual road fuel consumption
Germany in power equivalent
- passenger: 67%
- goods: 33%

210 TWh/a electric power

Source: ACEA, own analysis
...and demand for charging services

- 80% of charging demand @Home
- 15% of charging demand @Business/Destination

Home | Business / Destination | Public
Renewable energies - Germany

- Expansion of wind and solar increases volatility
- Decrease of nuclear and coal exacerbates volatility

→ Need for use of demand response

Source: Umweltbundesamt
What happens if

10 M e-vehicles in 2030

100 GW

Flexible demand

25 TWh/a

ca. 5% gross electricity consumption

CO2 - savings

Up to 40% traffic emissions

Source: ecomento
Where is the smart potential

- Weather forecast tools
- Feed with renewable energy
- Pricing

User
Charge point
In-car app
What needs to be connected

vehicles / buildings

connect prosumer / consumer

energy markets

integration energy market
Potential benefits

- Electricity prices strongly variable
- Quarter-hour prices vary widely over trading hours
- Further expansion of renewable energies increases volatility
How could it look like

**Vehicles**
- Communication with charging station

**Energy market**
- Energy market prices

**Backend**
- Analysis of electricity prices
- Creation of charging profile
- Feedback of operating status
- Individual transmission to the charging station

**Charging station**
- Communication with Backend
Smart Charging Roll-Out

**Energy optimization**

- The charging process does not directly start after plugging in the charging cable
- Connection to energy markets for optimal use of renewable energies
- The car will be charged within the smart time window of optimal ¼ hours
The world of tomorrow

Smart charging

• Integration of charging infrastructure in building control systems
• Storage: Vehicle to grid
• Integration of PV, stationary battery storage and heat pumps
• Communication with vehicle
• Inductive charging
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