Evaluation of the crome EV-Fleet

Barcelona, November 19th, 2013

Patrick Jochem
Agenda

- General evaluation concept
- Specific results from different research disciplines
  - ✓ acceptance analysis from online questionnaires
  - ✓ fast charging EVSE and its impact on the local grid
  - ✓ tracking of EV by CAN bus data and data from smart phones
  - ✓ applied services
  - ✓ European (energy) law
- Conclusions
Evaluation concept

2 times during project phase

Selected users

2 times during project phase

Online questionnaires

All Users (N=150)

3 times during project phase

Analysis

Selected users

1-2 times during project phase

Online questionnaires

All Users (N=150)

Analysis

Interviews

Selected users

Workshops

Selected vehicles during project phase (N=120)

Technical data

Selected vehicles during project phase (N=120)

Smart phones

Selected users

Fleet-Managers

Some period during project phase (N=50)

All users

Analysis

Online questionnaires

Selected users

Workshops

Selected vehicles during project phase (N=120)

Technical data

Selected users

Fleet-Managers

Some period during project phase (N=50)

All users
Acceptance analysis from online questionnaires

**Methodology**
- Three online questionnaires
  - Expectations
  - First Experiences
  - Recommendations
- Application of different statistical methods (e.g. descriptive analysis, PCA)

**Main Results:**
- High satisfaction with EV
  (advantages: e.g. local emissions, acceleration, CO₂ emissions; concerns: e.g. range, life cycle of battery)
- Differences in beliefs (e.g. worries concerning climate change)

Presentation: Axel Ensslen, Session 8DTomorrow at 10:35
Fast charging EVSE in the local grid (1)

Real-time load flow calculation

Load flow calculation

Network simulator

Fast charging EVSE Demonstrator

Demonstrator at KIT
The impact on the local grid could be significant.

The recommendation is to include technical components in the EVSE for grid services (at least in some).

Reactive power compensation is not only favorable for the EVSE, but also for the local grid environment (e.g. photovoltaic systems).
Smart phones are used as mobile data loggers in EV.
Approx. 50 EVs in France and Germany have been equipped.
Data from data loggers in EV are received from Daimler, Porsche, PSA and Renault.
Comprehensive data sample (e.g. mileage, driving times, speed, trip purpose):

<table>
<thead>
<tr>
<th></th>
<th>Car</th>
<th>Smart phones</th>
<th>Sum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of trips</td>
<td>80,660</td>
<td>6,500</td>
<td>87,160</td>
</tr>
<tr>
<td>Cross-border share in %</td>
<td>0.01%</td>
<td>1.4</td>
<td>0.8</td>
</tr>
<tr>
<td>Number of chargings</td>
<td>16,080</td>
<td>n/a</td>
<td>16,080</td>
</tr>
</tbody>
</table>
- Most trips are shorter than those of ICE business cars.
- Batteries are mostly used at high SOC values with small delta (80% of trips use less than 10% SOC).
- French trips are significantly longer.
- German trips show bigger length variation.
- Trip duration is similar.
- More urban use in Germany.

Poster: Matthias Pfriem, dialogue session today at 1 p.m.
Services in CROME

Services at the EVSE

Definition of basic and advanced services

Services for smart phones

Services for the EV

For now no specific regulations concerning EVSE.

EU is planning a new directive COM 2013(18) final.
- Minimum number of charging stations (GER 1503k FRA 969k)
- Standardization for plugs (Type 2 and suggestion for CCS)
- Regulation exception for the charging station provider
- Charging stations have to implement smart meter technology
- ...

Further harmonization of European legislation required.
Conclusions

- Fleet evaluation concept consists of a multi-disciplinary approach
  - acceptance analysis from online questionnaires
  - fast charging EVSE and its impact on the local grid
  - tracking of EV with CAN bus data and data from smart phones
  - applied services
  - European (energy) law

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USER EXPERIENCE
Conclusion

• A unique wide-scale cross-border field demonstration of e-mobility

• Fully interoperable charging stations with easy access and charging of all EVS over the Crome area

• An assessment based on a wide diversity of new generation EVs, of charging conditions and mode, of standards and of customers (B2B, B2C, fleets, …)

• Customer-oriented charging services :
  • Simplified identification and billing
  • Availability of the charging spots and reservation (investigated)
  • Access to all charging spots within CROME area
  • Roaming of e-mobility services between infrastructure operators

• Test and recommendation on charging infrastructures and services to European standardisation

www.crome-project.eu
Thank you!