Evaluation of the crome EV-Fleet

Barcelona, November 19th, 2013

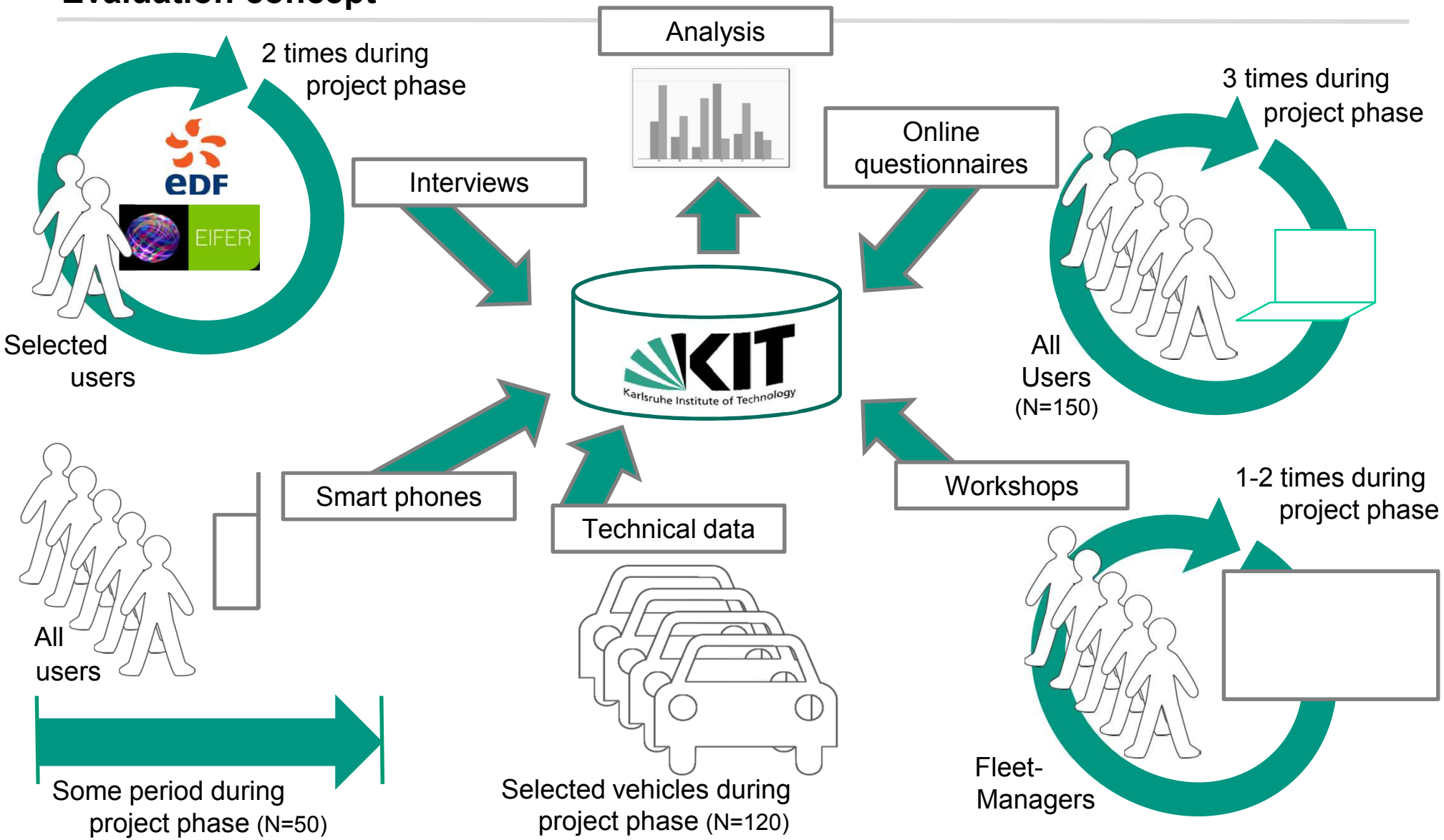
Patrick Jochem

FRENCH-GERMAN INSTITUTE FOR ENVIRONMENTAL RESEARCH (DFIU)
Chair of Energy Economics (Prof. Dr. W. Fichtner)

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



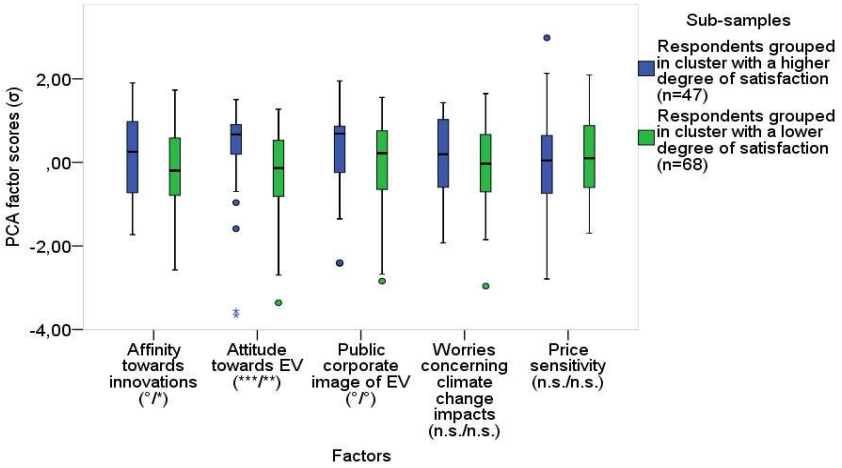
Acceptance analysis from online questionnaires

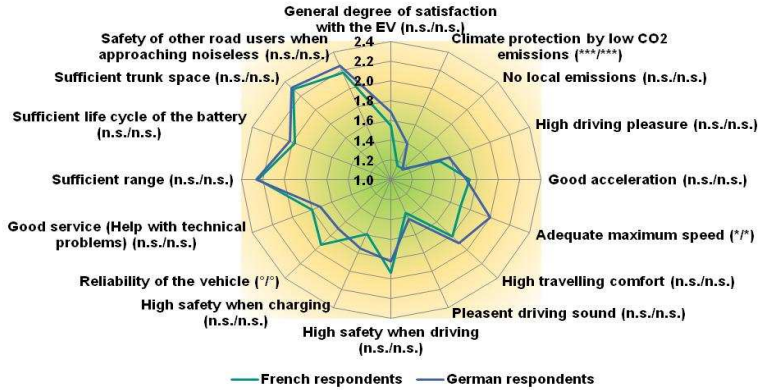
Methodology

- **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, CO_2 emissions; concerns: e.g. range, life cycle of battery)

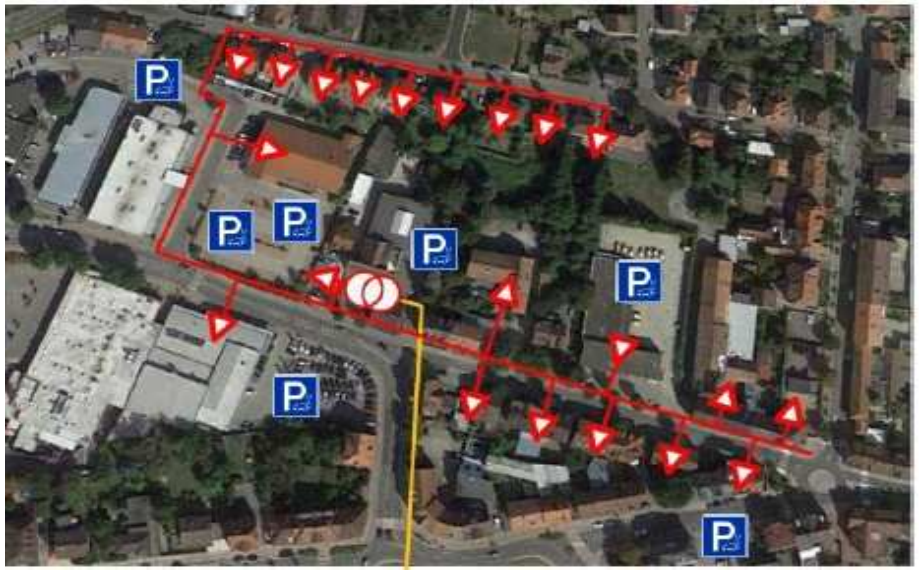
  - ✓ **Differences in beliefs** (e.g. worries concerning climate change)





Presentation: Axel Ensslen, Session 8DTomorrow at 10:35

Fast charging EVSE in the local grid (1)



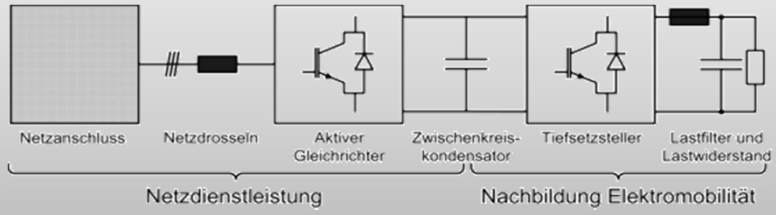
Demonstrator at KIT

Real-time load flow calculation

Load flow calculation

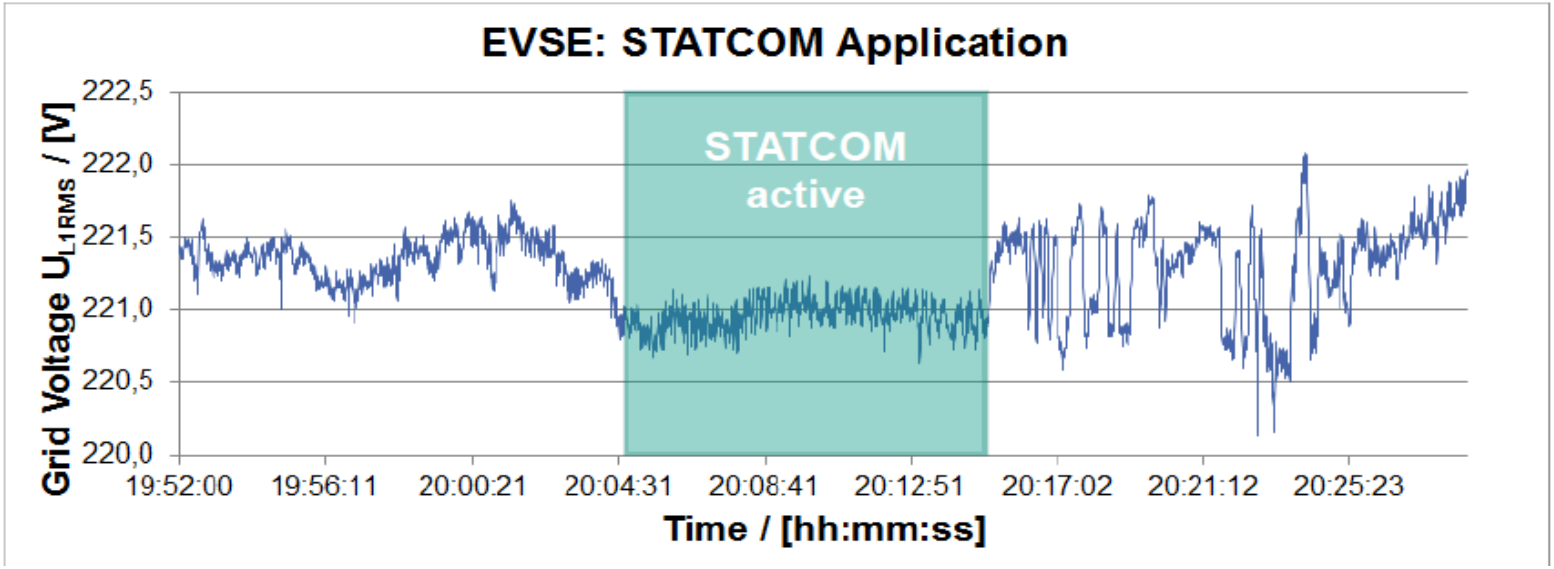
Network simulator

Fast charging EVSE Demonstrator



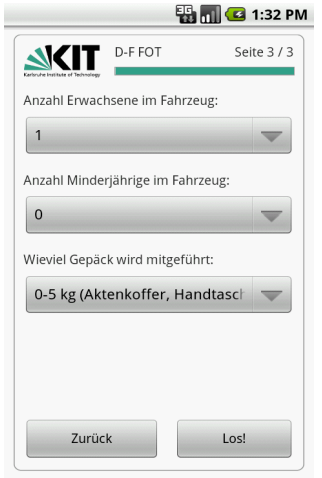
Fast charging EVSE in the local grid (2)

- 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).



Tracking of vehicle data (1)

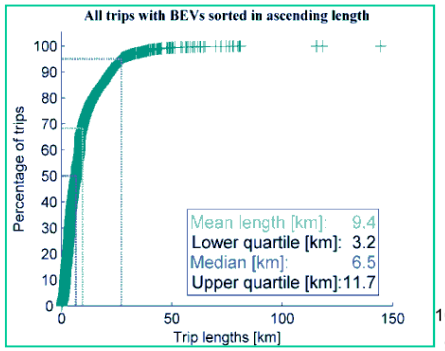
- Smart phones are used as mobile data loggers in EV.
- Approx. 50 EVs in France and Germany have been equipped.
- Data from data loggers in EV are received from Daimler, Porsche, PSA and Renault.
- Comprehensive data sample (e.g. mileage, driving times, speed, trip purpose):

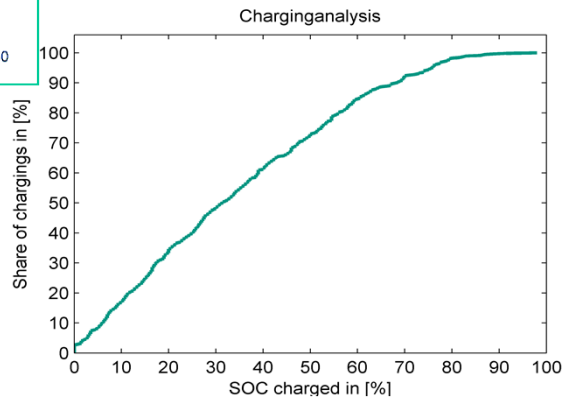


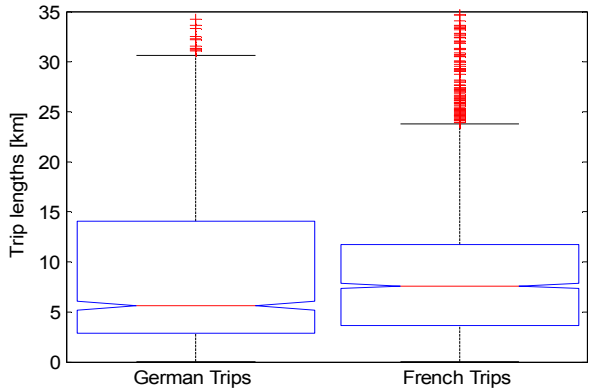
	Car	Smart phones	Sum
Number of trips	80,660	6,500	**87,160**
Cross-border share in %	0.01%	1.4	**0.8**
Number of chargings	16,080	n/a	**16,080**

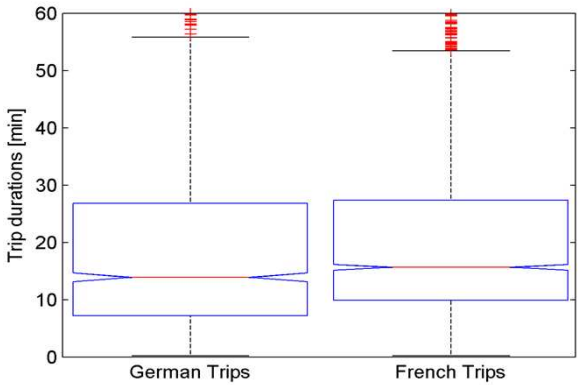
Tracking of vehicle data (2)

- 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.







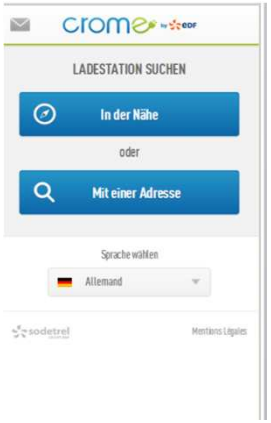


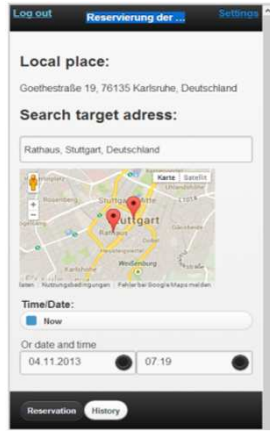
Poster: Matthias Pfriem, dialoge session today at 1 p.m.

Services in CROME

Services at the EVSE

Services for smart phones





Services for the EV

Definition of basic and advanced services

European (Energy) Law

- National Energy Law is based on European provisions (2009/72/EC).
- 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
- Further information upon request:

Dr. Patrick Jochem
+ 49 721 608 44590
jochem@kit.edu
www.crome-project.eu

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 assesment 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

www.crome-project.eu

Thank you!