
BMWi "US-German Energy Dialogue"

E-mobility across Sectoral Components

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Electro-mobility - system and components, experience and development perspectives

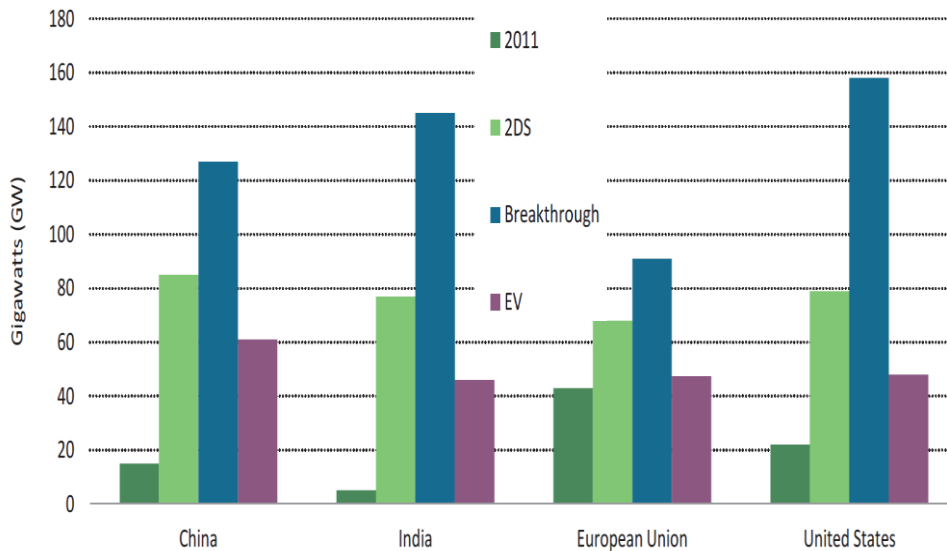
- Motivation and introduction
- Electric vehicles - physical and technical description
- Charging technologies and connections
- Electro-mobility as a system
- Reference projects in Germany

Motivation

- Electro-mobility objectives:
 - Climate protection: - emissions' reduction from conventional vehicles
- further expansion of renewable sources and CO2 minimization
 - Ensuring mobility in individual and public transport
- Current state and scenarios of E-mobility development

Electricity storage by region in 2011 and 2050

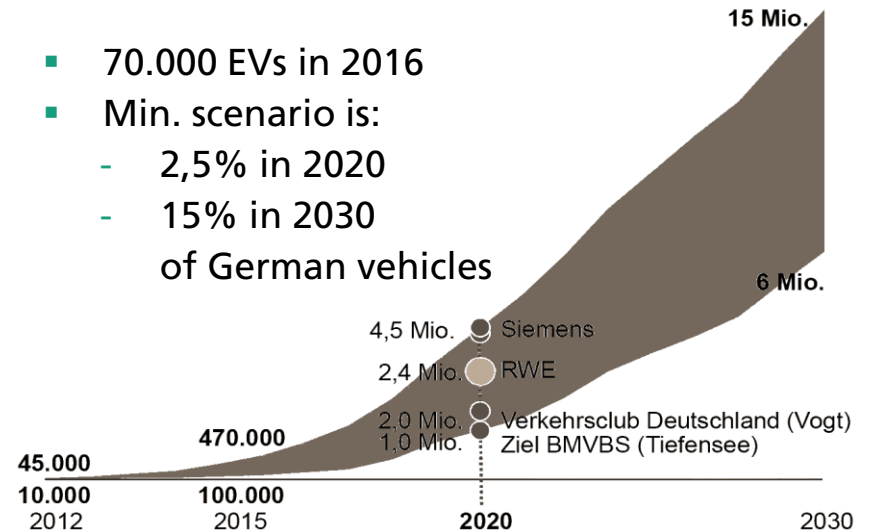
Source: IEA



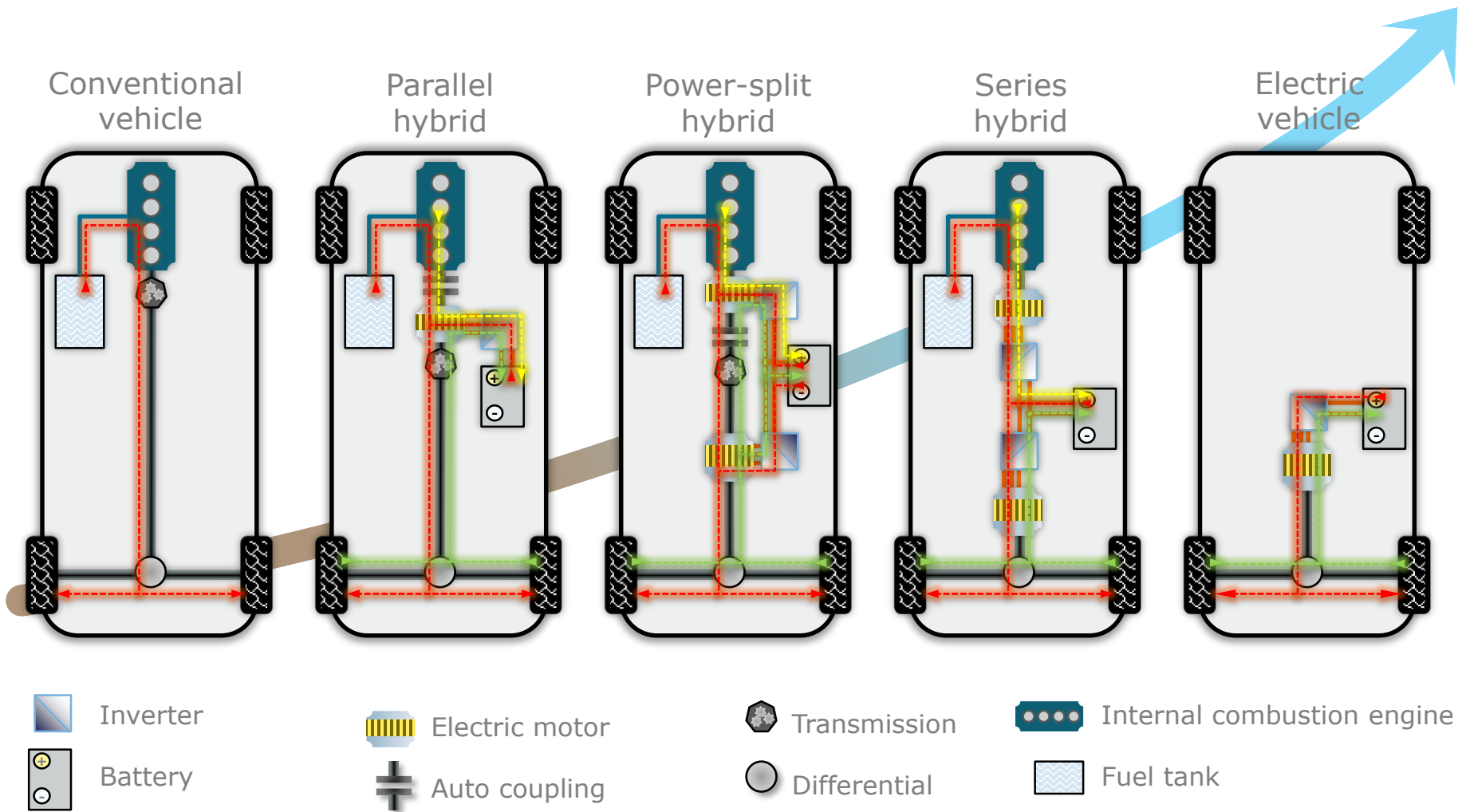
EVs in Germany by 2030

Source: Elektromobilität, RWE

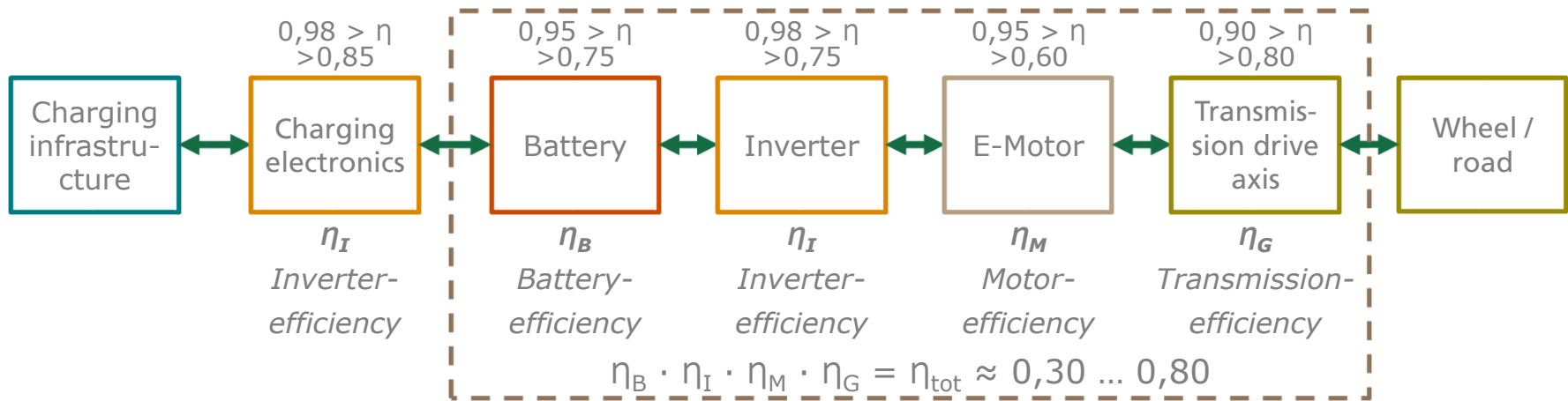
- 70.000 EVs in 2016
- Min. scenario is:
 - 2,5% in 2020
 - 15% in 2030 of German vehicles



Mobility development roadmap



Efficiency in the energy conversion chain

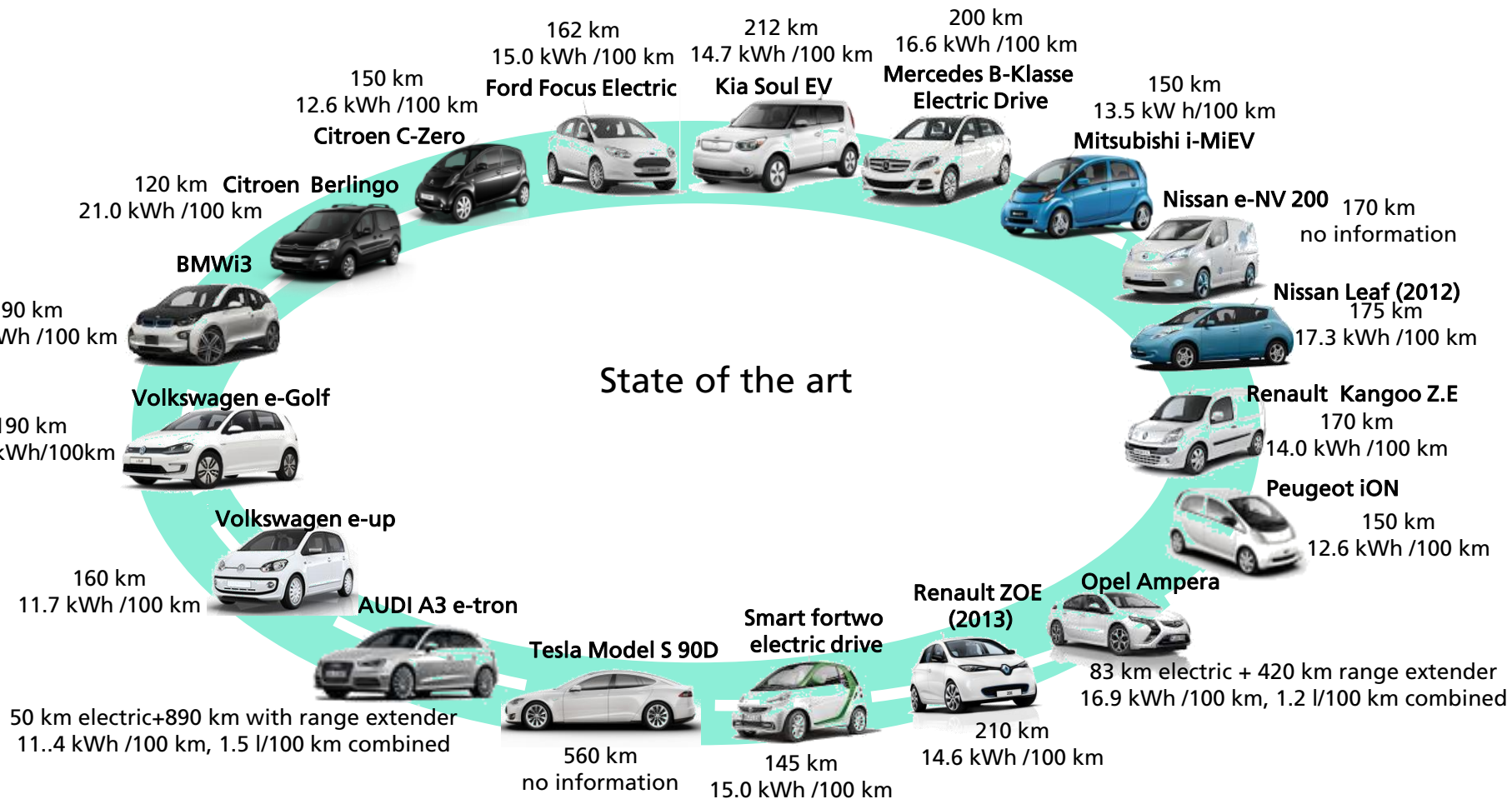


Efficiency depends on components considered conversion chain and operating point of the components

- Battery-efficiency (temperature, power / current)
- Inverter- efficiency (voltage, current, frequency)
- Motor- efficiency (speed of rotation, torque, current)
- Transmission- efficiency (speed of rotation, torque) \approx const.

Electric vehicles – state of the art

State of the art



Mobile energy storage vs. distribution grid



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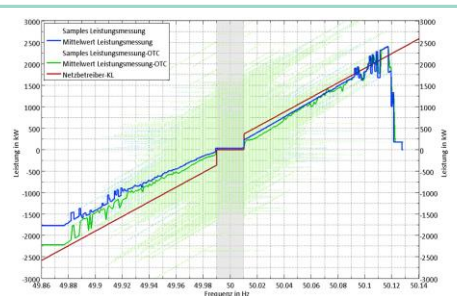
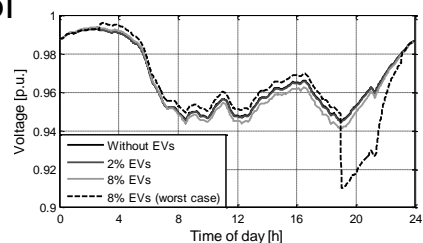


grid

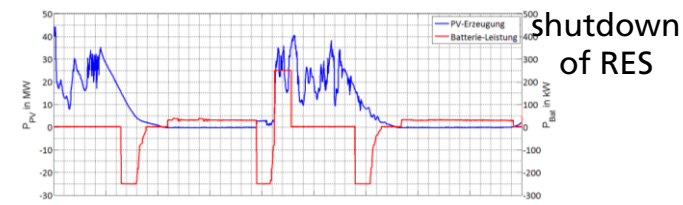
V4G services

market

voltage control

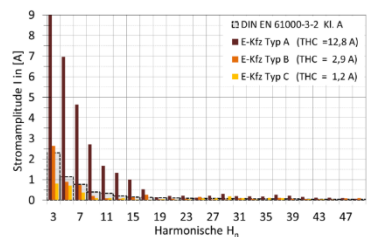


frequency co-regulation

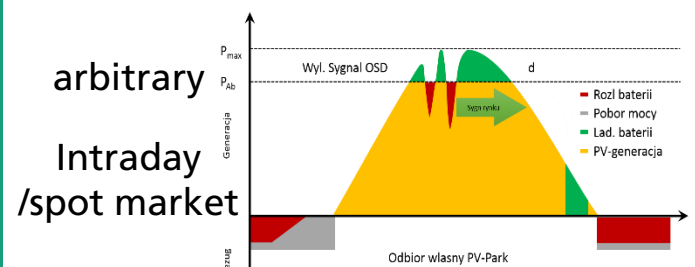


shutdown of RES

Own load/ night generation profile



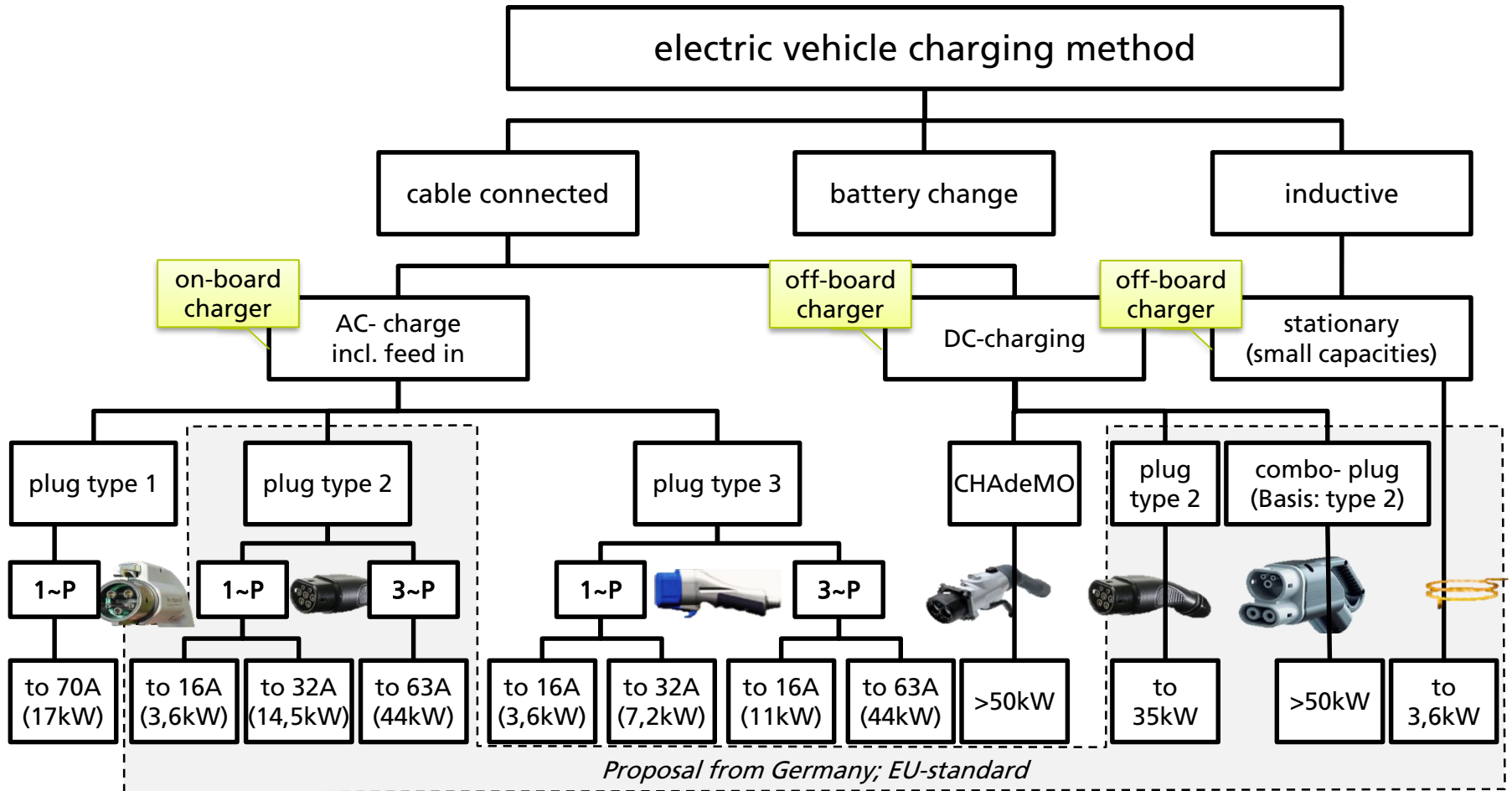
power quality



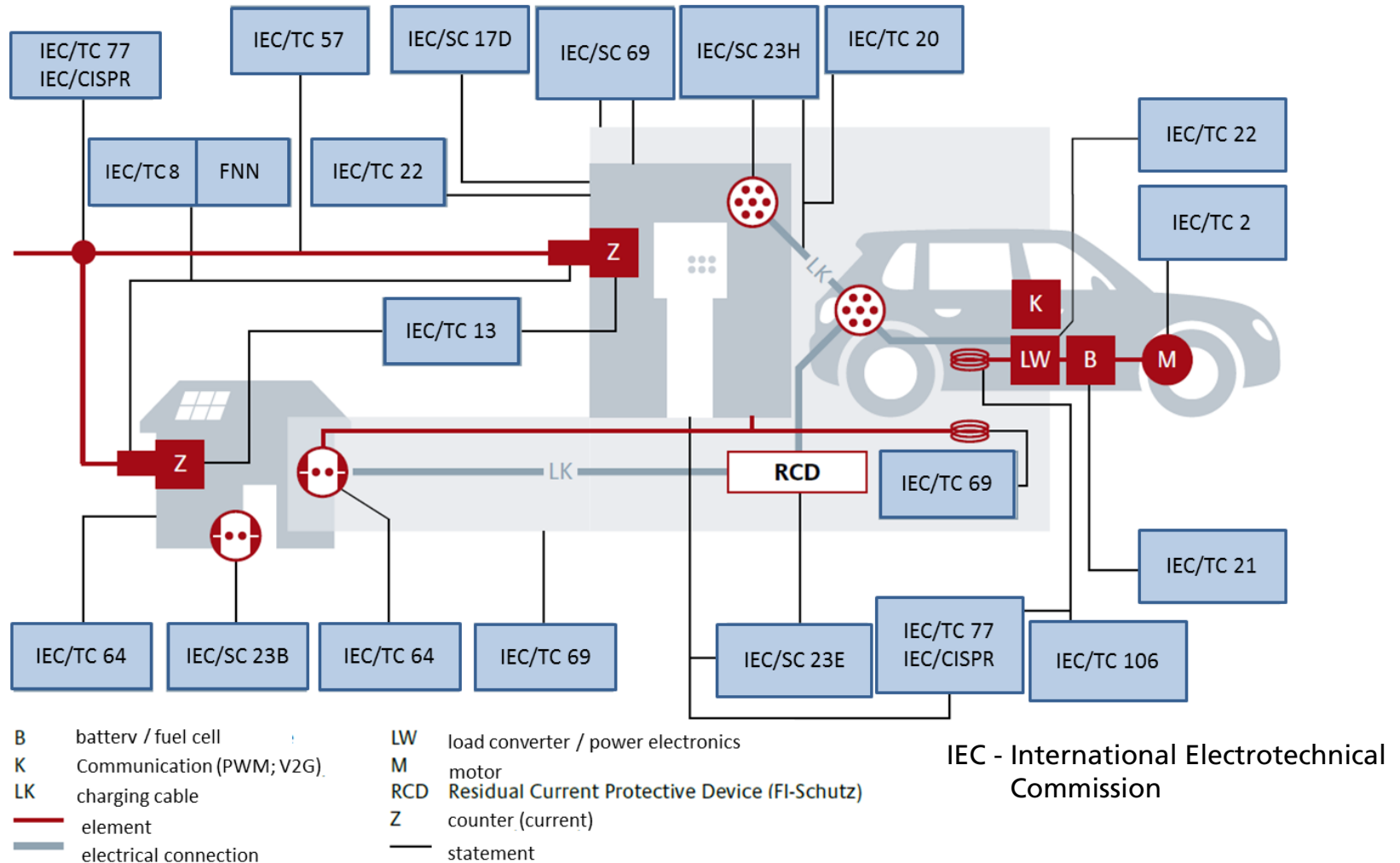
arbitrary

Intraday /spot market

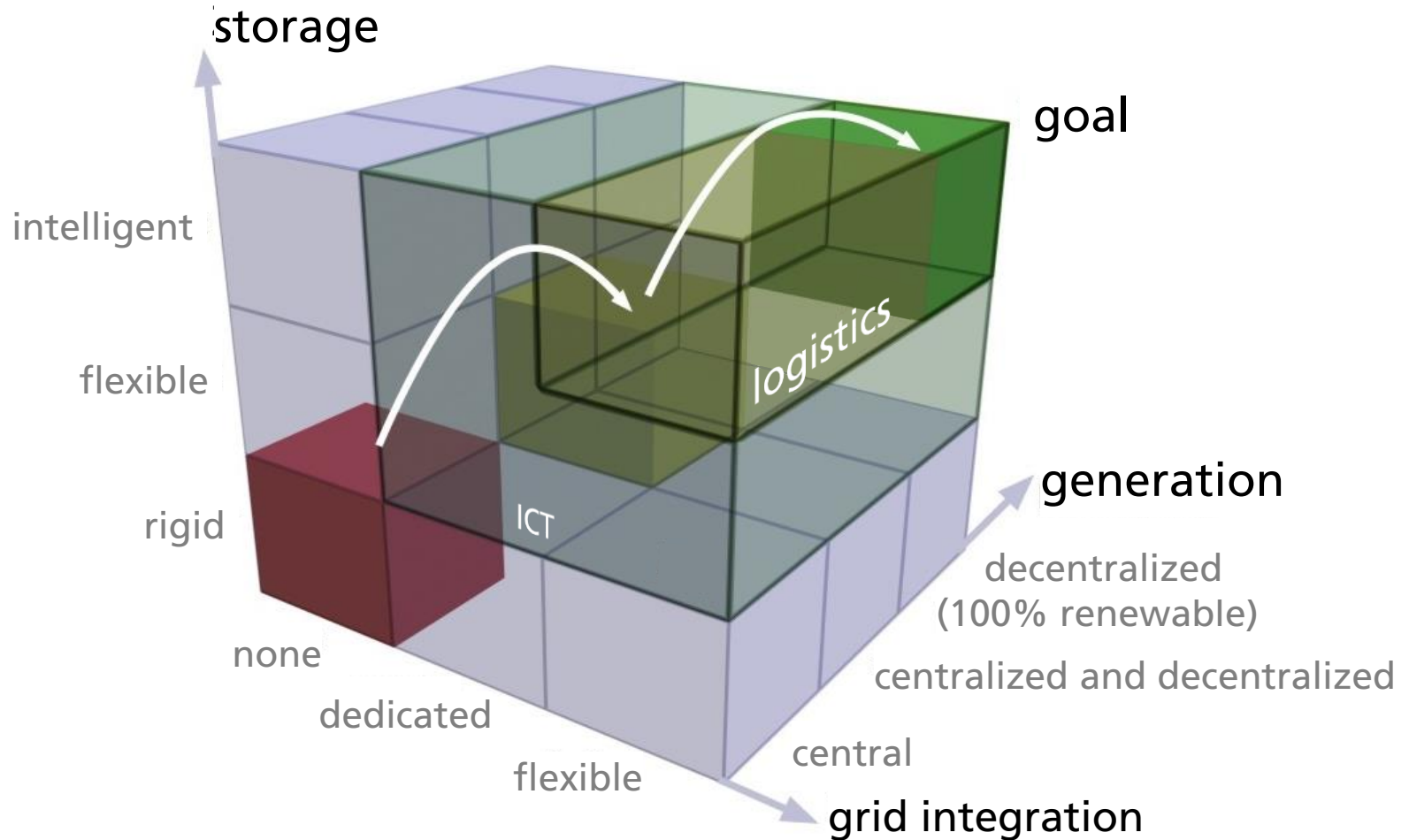
Charging technologies and connections



Electro-mobility standards



Systematic approach - development stages and infrastructure of electro-mobility network



Reference project Harz.EE-mobility

Development and testing of ICT-based key technologies for an efficient implementation of electric mobility into the smart grid

Main focus:

- Maximizing the use of RES
→ Economic viability
- Contribution to stability of electrical networks with a high proportion of renewable energy
→ Security of supply
- unlimited CO₂-minimized mobility for people
→ Climate protection



Harz
Erneuerbare Energien mobility

Optimierte Netzintegration von erneuerbaren Energien
durch Einsatz von IKT für Elektromobilität

Web: www.HarzEE-Mobility.de
Email: info@HarzEE-Mobility.de



Fördervorhaben „IKT für Elektromobilität“
des Bundesministeriums für Umwelt, Naturschutz und Reaktorsicherheit



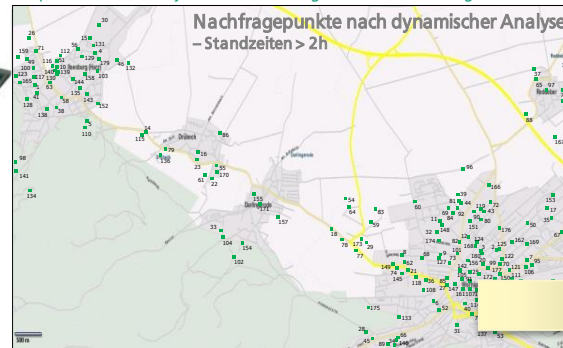
Levels of the E-mobility system – level 1



on of a proper charging infrastructure
 formation system
 d locations of public and semi-public
 spots
 arging capabilities for the e-car user

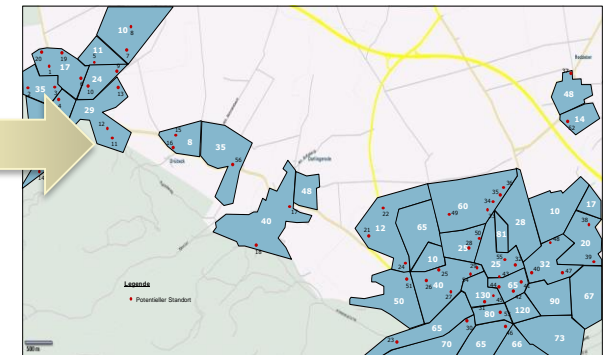


Beispiel: Mobilitätsanalyse von 50 Fahrzeugen in einer Modellregion

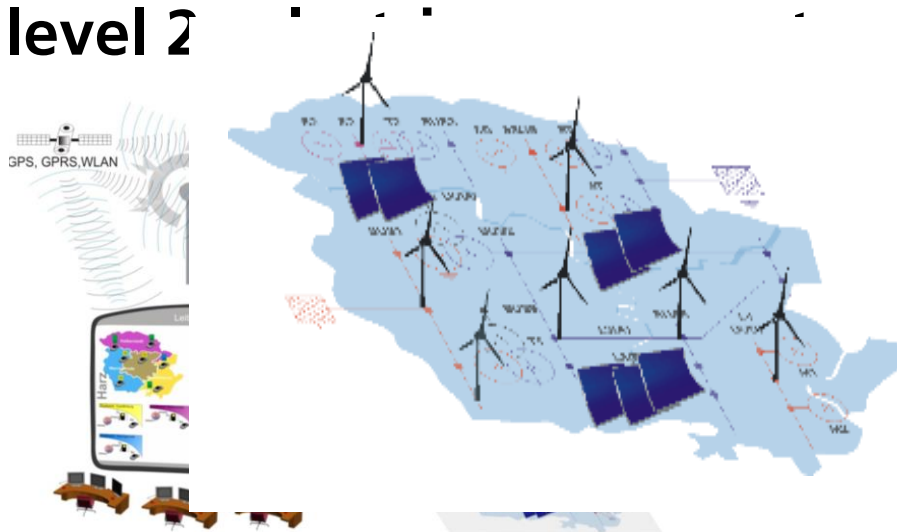


Potential charging demand

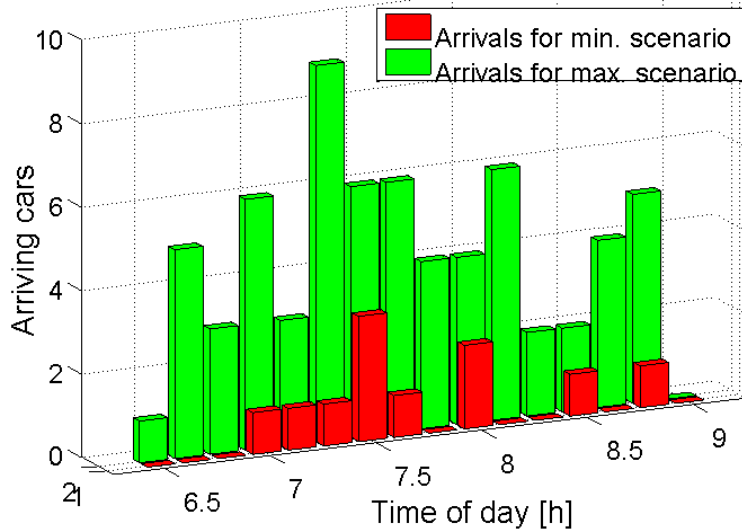
Possible locations



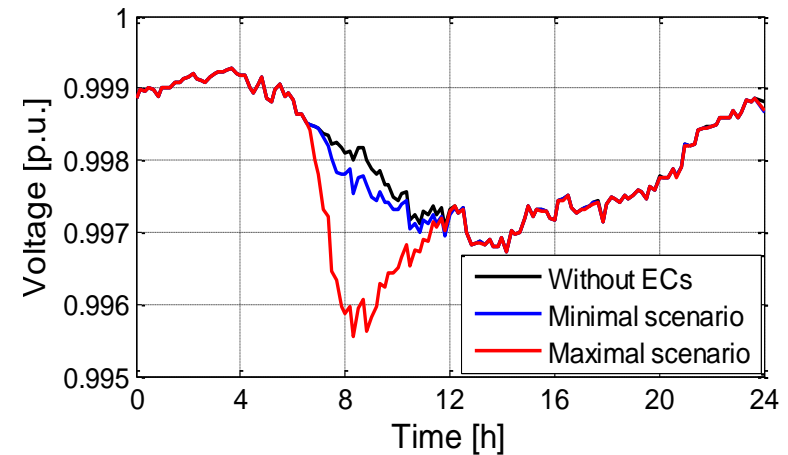
Levels of the E-mobility system – level 2



ased security of supply
mized usage of RES
mized grid operation through mobility
ast



Godziny przyjazdu



Profil napięcia

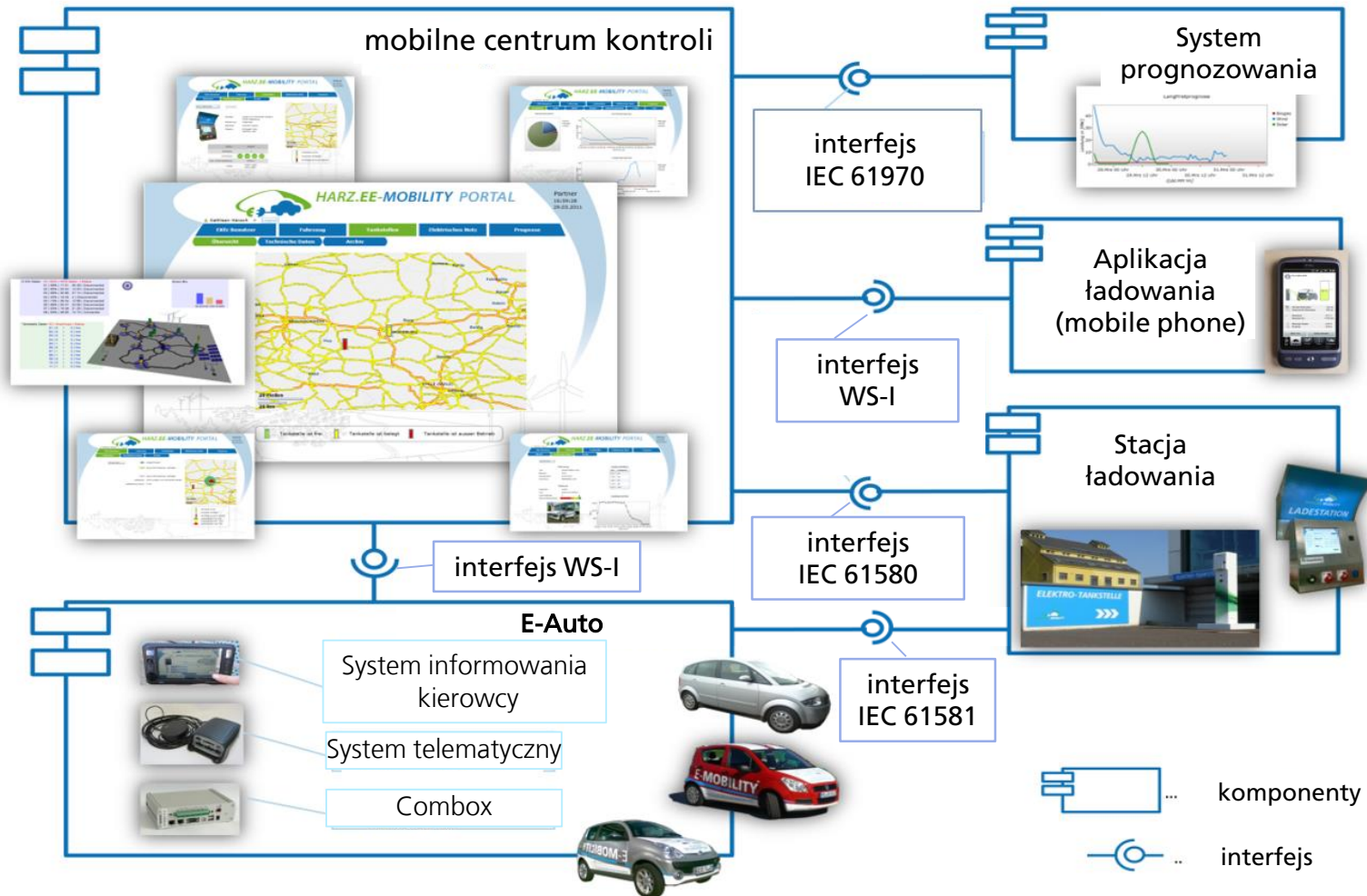
Levels of the E-mobility system – level 3

Information infrastructure

- Providing information from and to interfaces of all components in the Harz.EE-mobility system



Architecture and components of the system



Harz.EE-mobility Results and pilot test

Harz.EE-Mobility: Mobil durch Wind und Sonne

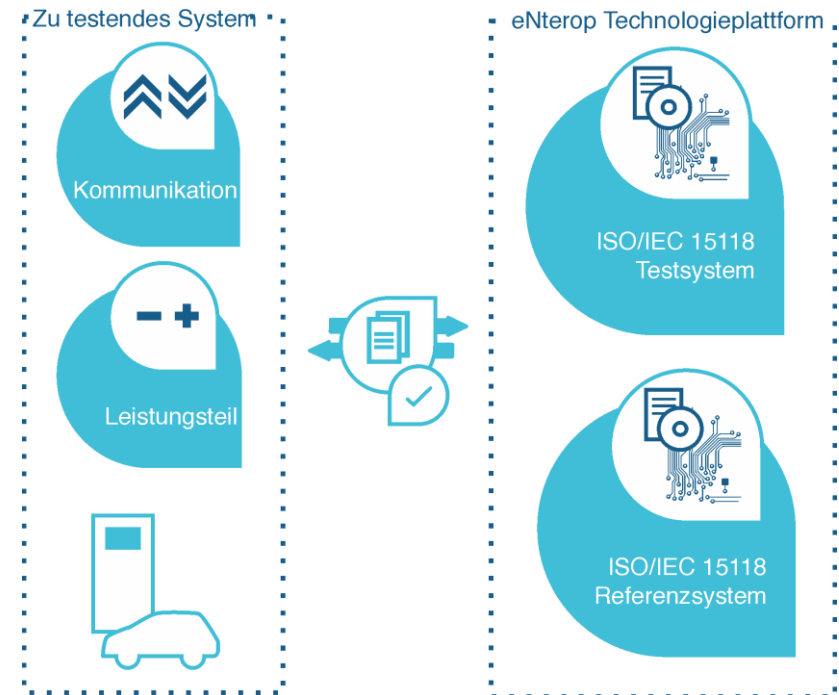


vodafone

Reference project eNterop - Standardization for e-mobility



- Development of open source reference implementation of standard ISO/IEC 15118
- Development of automated test system for conformity investigation and standard product development
- Technology transfer and supporting of SMEs
- Input to standardization bodies (DIN, DKE, NAAutomobil) und zu internationalen Gremien (ISO, IEC)



Summary

- Changes in distribution networks, RES and electro-mobility
 - Potential of electric vehicles
 - Electro-mobility as a system and its components
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- Ensure user mobility
 - Climate protection
 - Electro-mobility as an active element of the power system
 - Providing services and supporting the system

Thank you for your attention!

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