The eCar as a brick in future energy distribution systems

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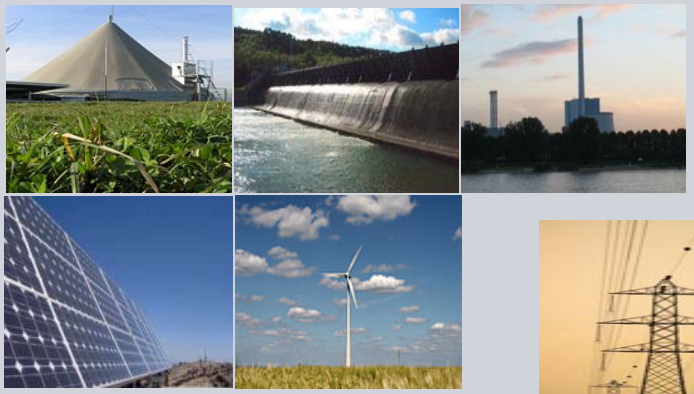
TUM – Energy-Symposium
München, 10. February, 2011

Corporate Technology
Prof. Dr.-Ing. Gernot Spiegelberg CT T P

Electrical vehicles will become – a part of the infrastructure



energy generation

intelligent energy transmission and distribution

Interaktion

hydrogen
thermical storage
flywheels
compressed air
waterpump stations

intelligent and green mobility

Leitmarkt eMobility Germany ?
What is the business ?

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Will this happen ?
Where is the money ?

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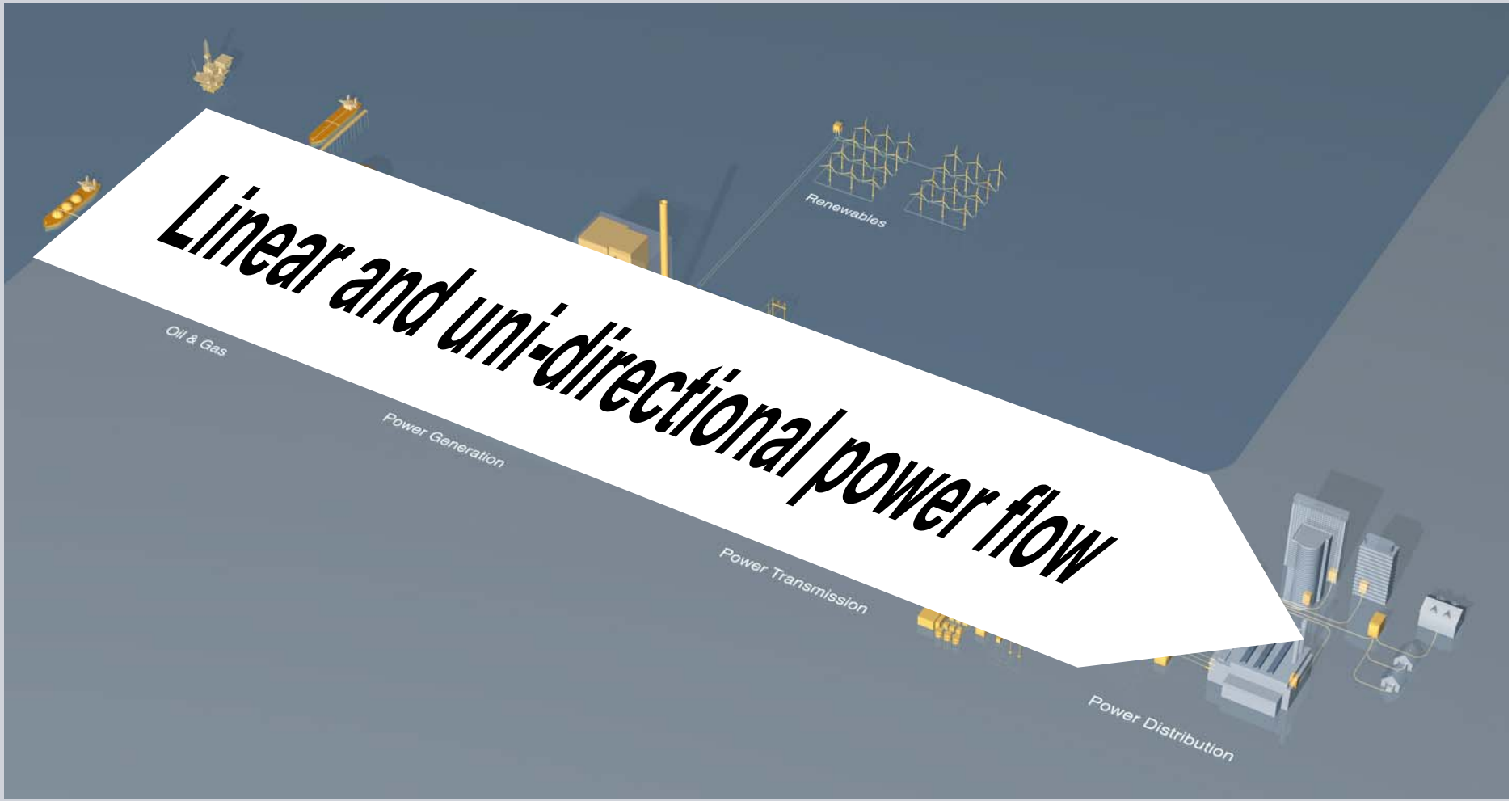
Short term story of eCar in infrastructure

Traditional energy conversion: Linear and uni-directional



Power Distribution Solutions (current situation 1 step problem)

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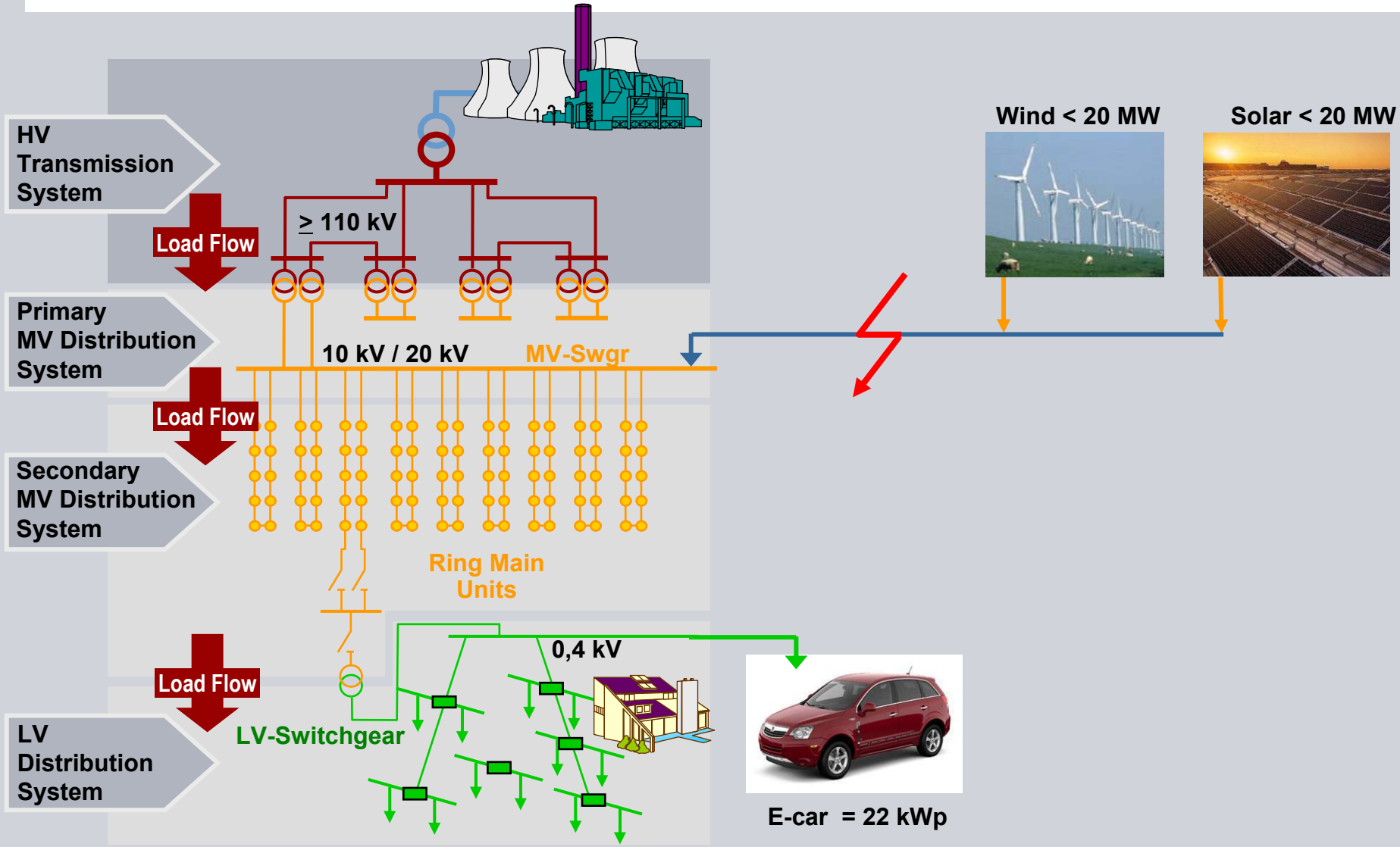

Change in energy generation
til now only 1,5% of possible renewable installed

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Where does the prognosis error comes from?

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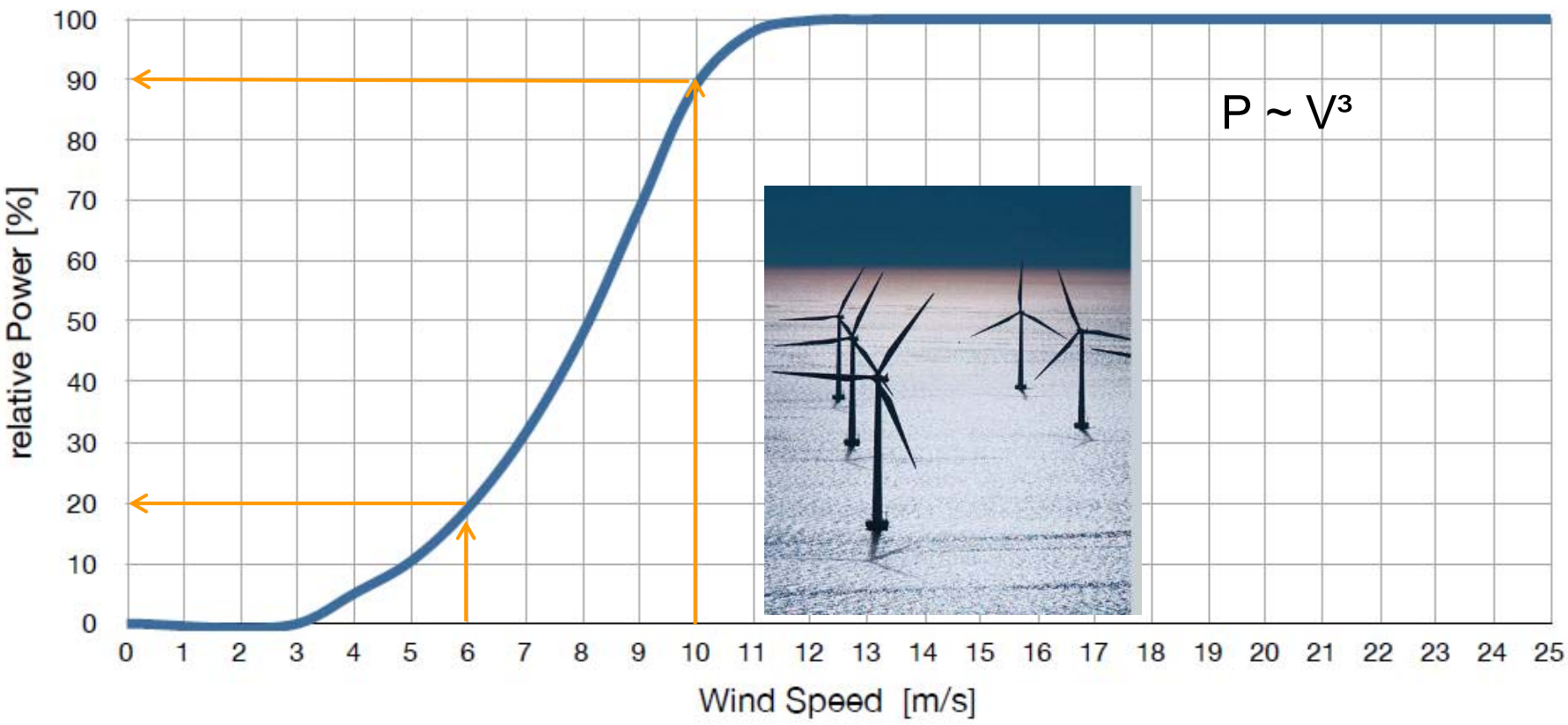
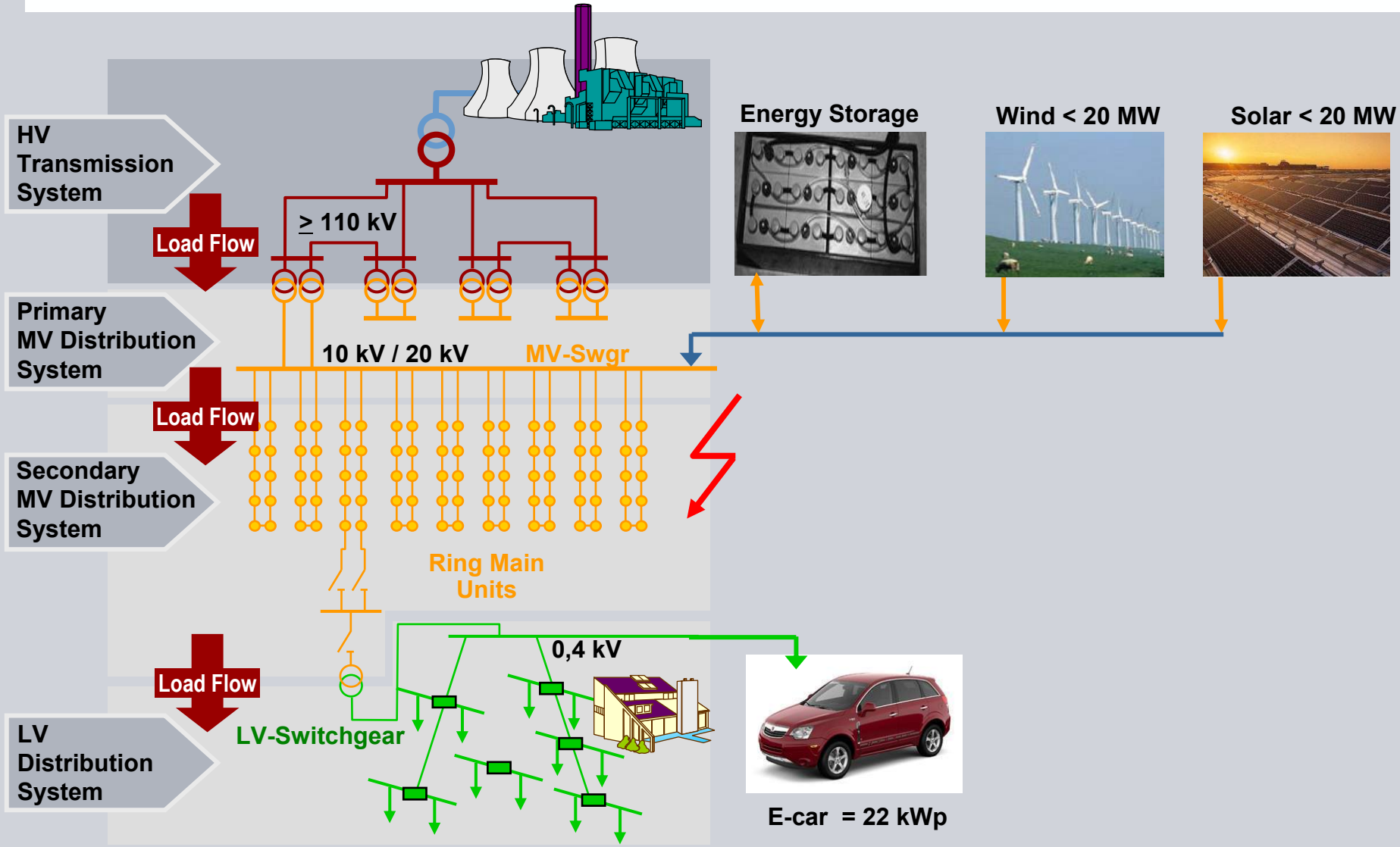
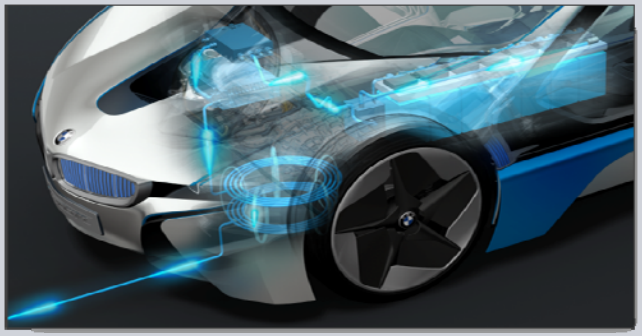
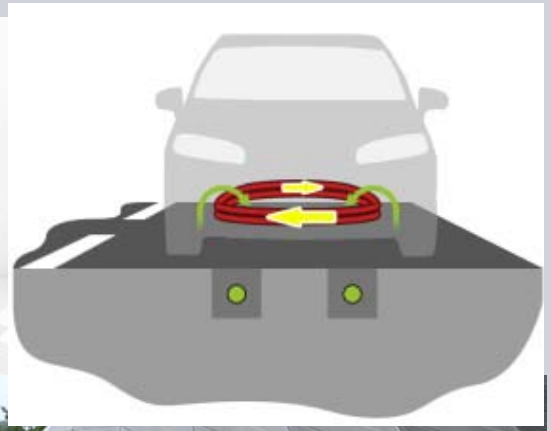


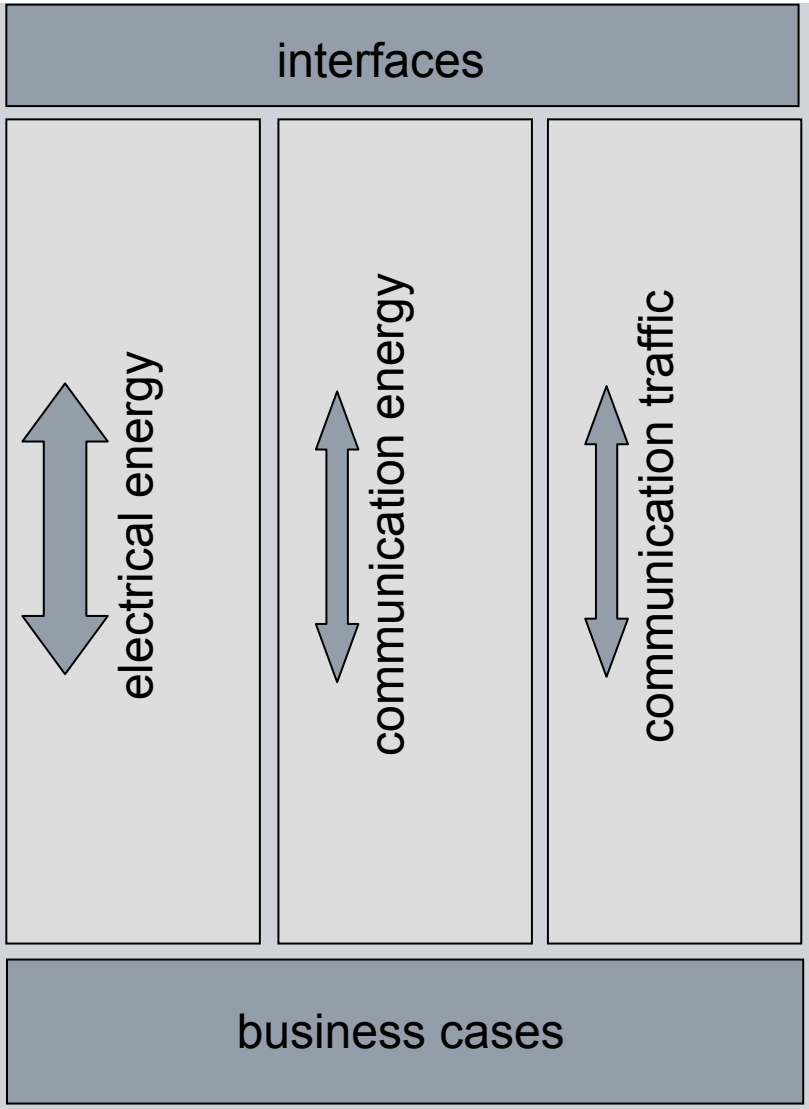
Power Distribution Solutions (current situation)



Charging interfaces







Sources: BMW, Siemens

Presentation of the Ruf Roadster with charging spot and charge management

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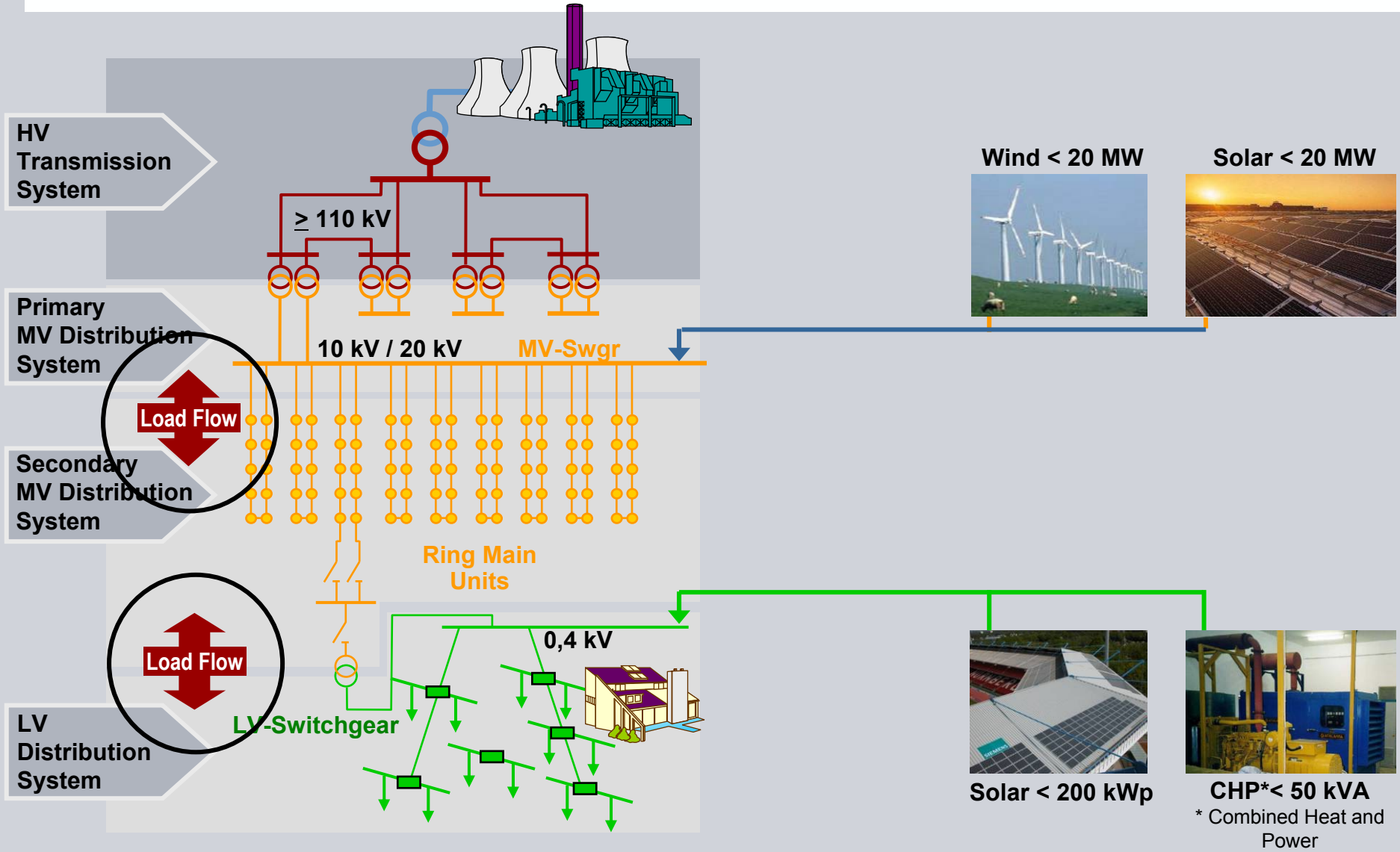
Long term story of eCar in infrastructure

Power Distribution Solutions (future smart grid)



Electricity production of a 314 kWp PV-installation near Erlangen, Germany

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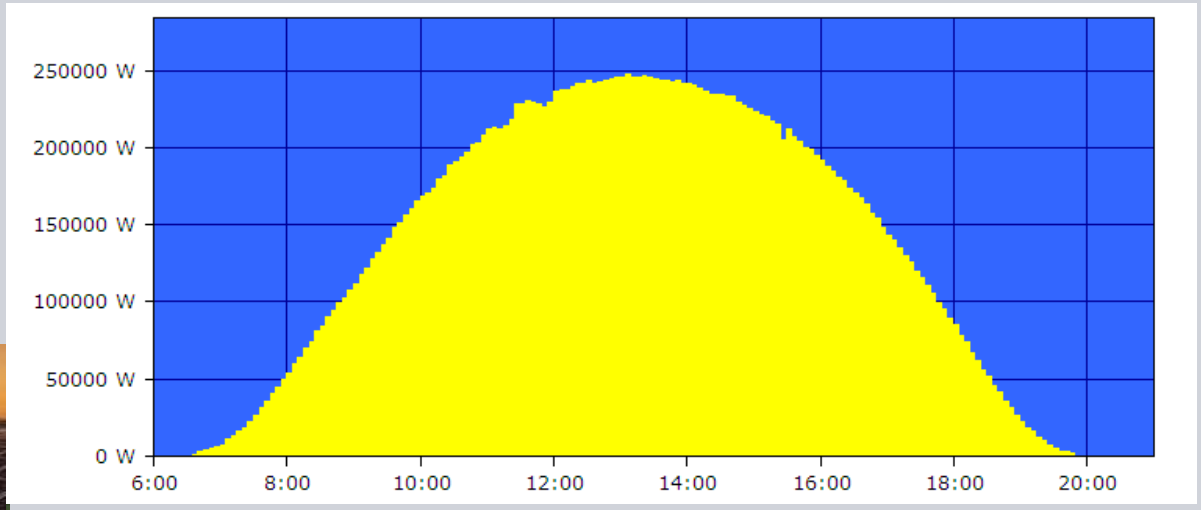
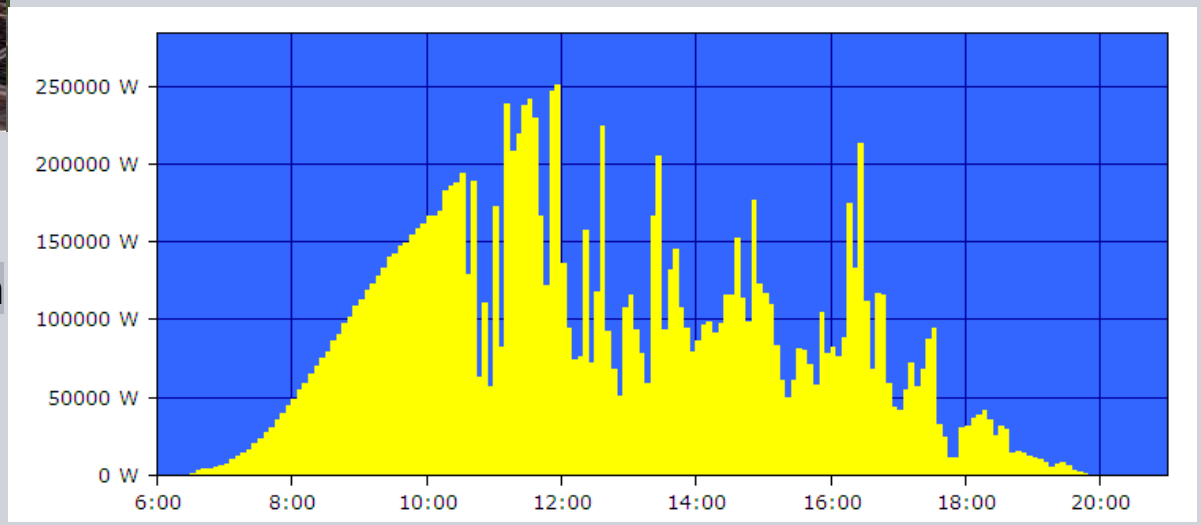
Sunny day in April: 1,9 MWh

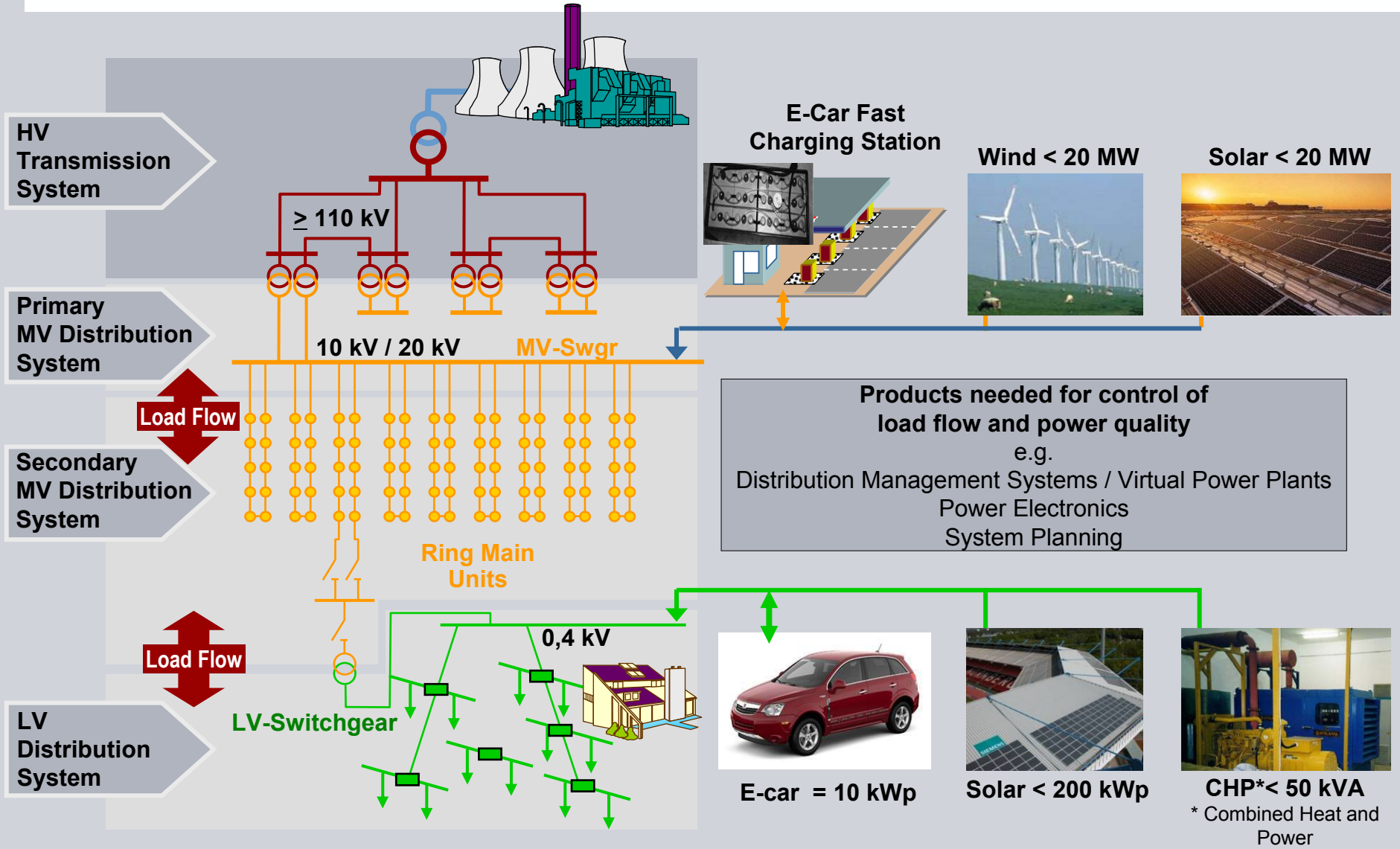


Cloudy day in April: 1,2 MWh



Source: Michael Weinhold & friends

Power Distribution Solutions (future smart grid)



eCar and infrastructure

Electricity market

Bi-directional connection to grid

Residential energy monitoring

eCars and their infrastructure have to be considered as an integrated system:

- **eCars need an infrastructure for charging**
- **Growing share of renewable power challenges grid stabilization**
- **The eCars could stabilize the grid as movable batteries**
- **Information and communication technologies will enable the interaction between the eCar, connecting buildings and the power grid**

4S project : combines smart traffic and smart mobiles with smart electrical energy

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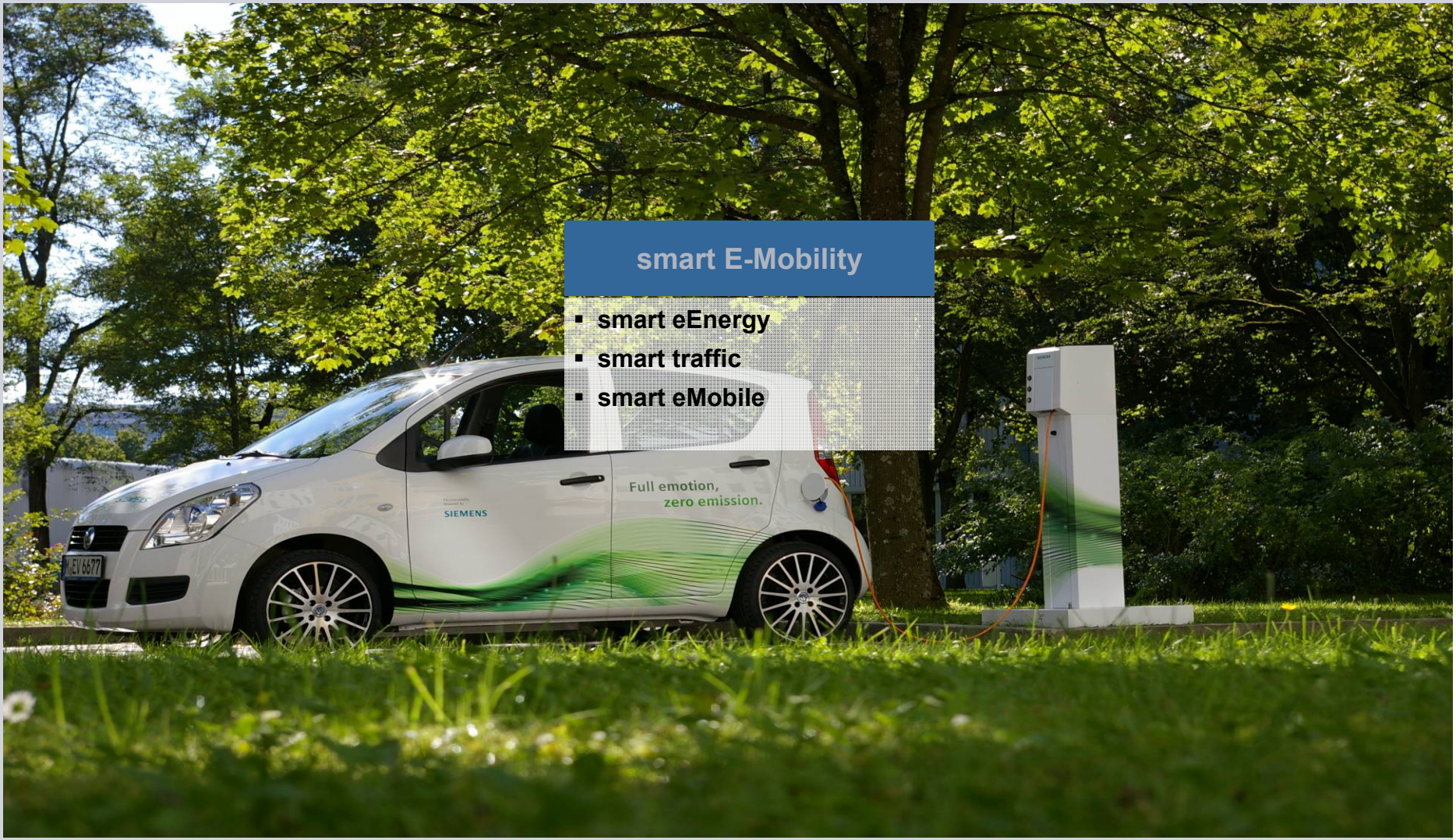

Smart eCar : driven by global mega trends
the mobiles fulfill the challenges

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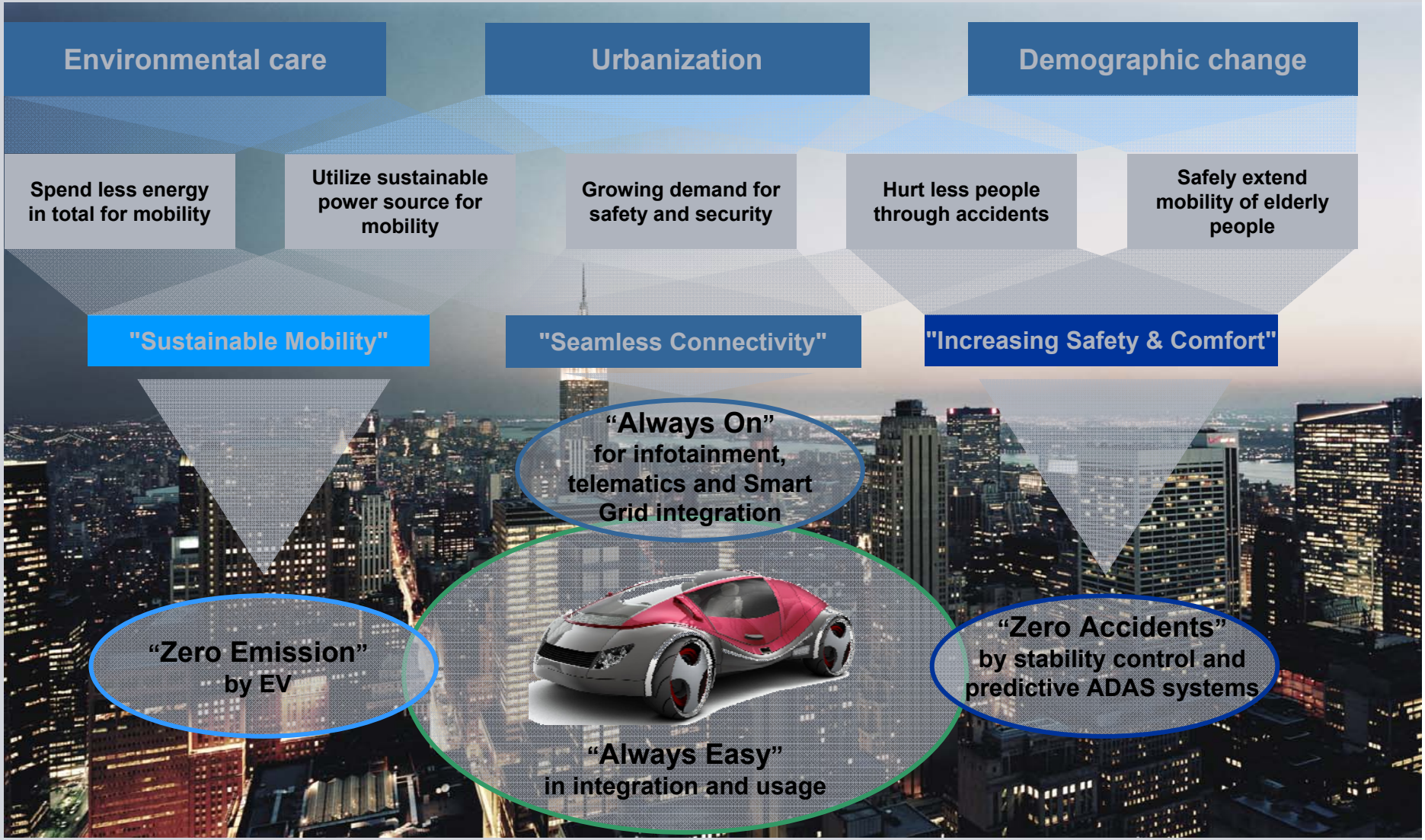

Mobility from Siemens in automotive

Siemens Elektromote 1882

Siemens Victoria 1905

More functionalities need more technology in future cars

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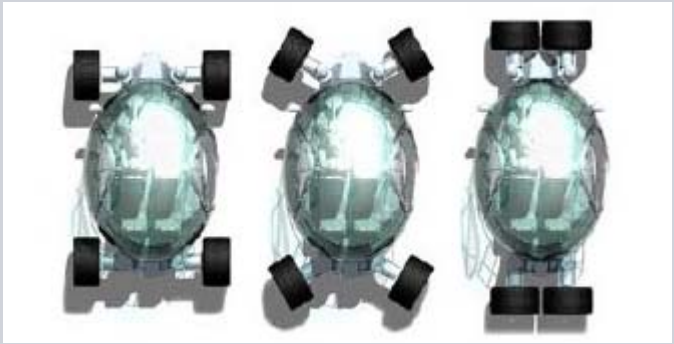
AUTOnomy “skateboard” chassis

Robot Wheel



re-think the fundamental core architecture of mobility

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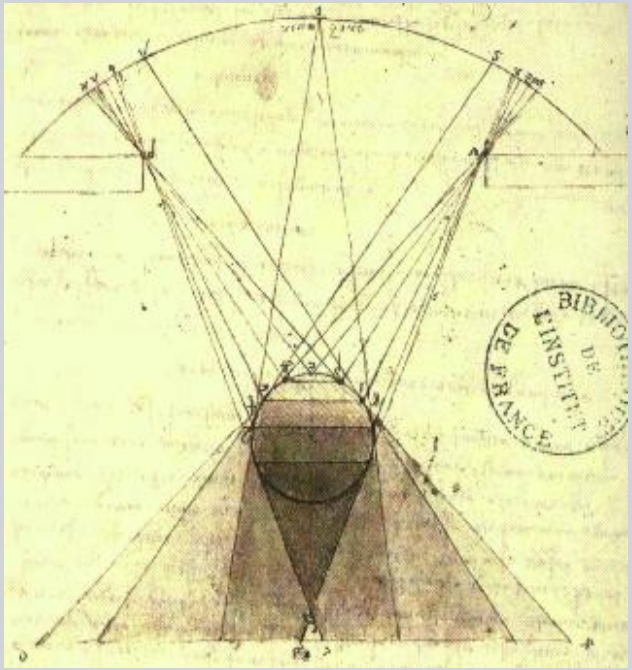
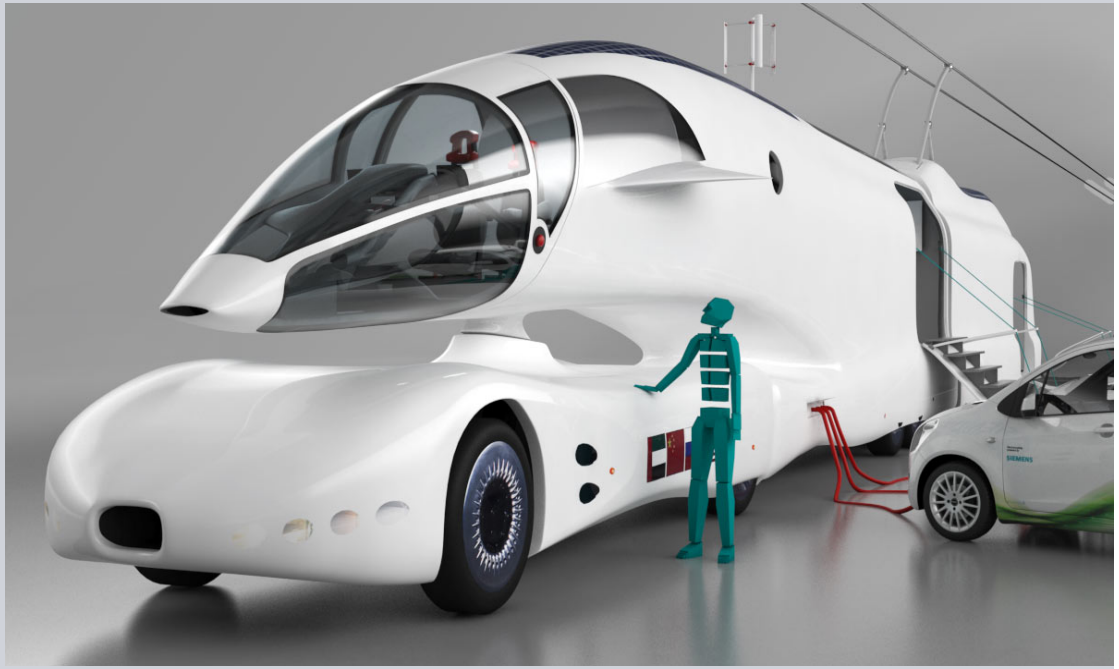
The real car is looking like this ….. ?

Project „Diesel reloaded“ at IAS TUM





contents

“Science eMobile”

“Science eShow”

New HMI with optimized information flow and sidestick control with new 4 module system architecture

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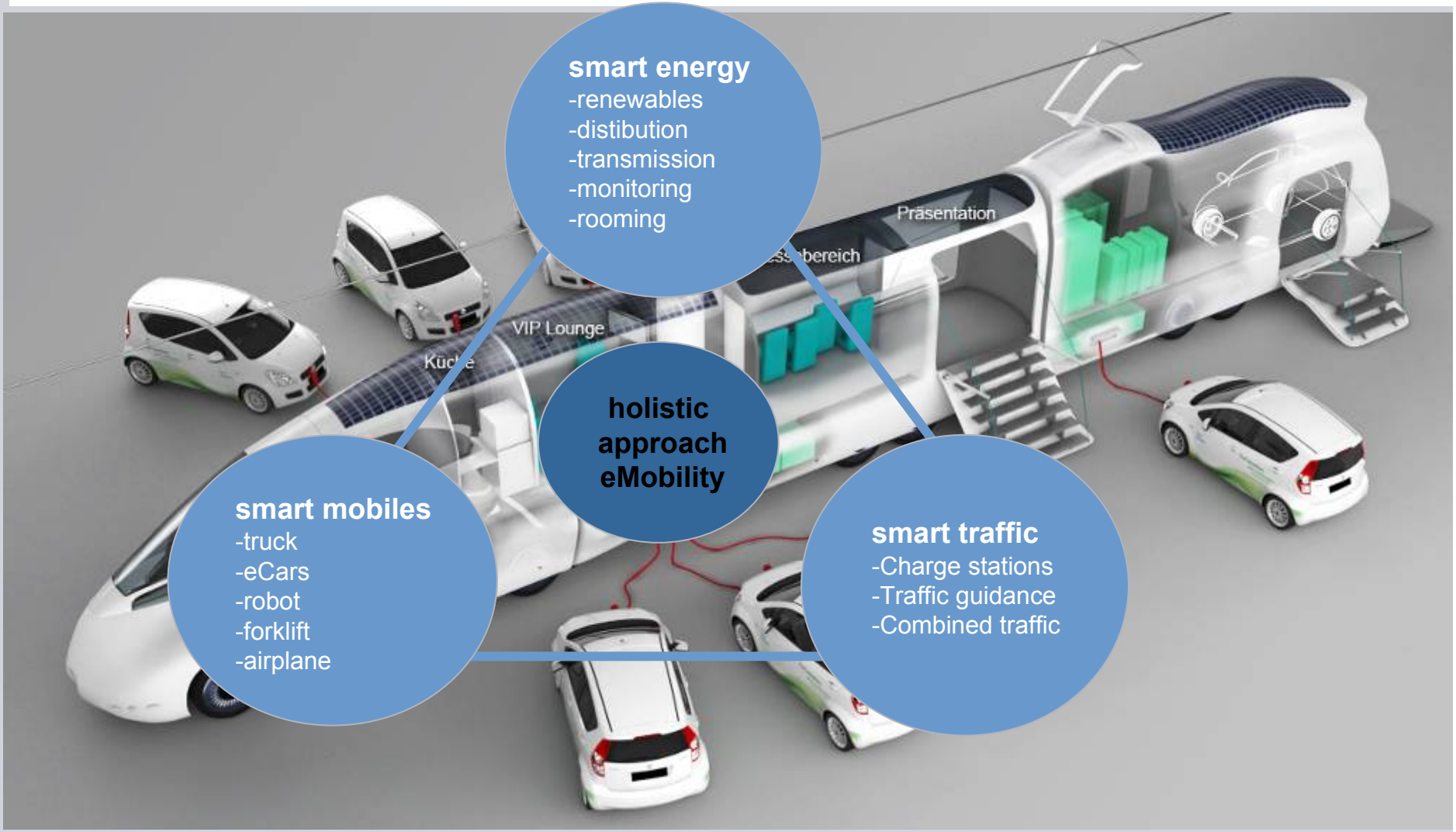
Common rolling exhibition eMobility



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Thanks for your attention

Regarding evolution via disruption

smart eCar

todays electronics

parallel hybrid

first electrics

combustion engine

disruption

evolution

mechatronics

information processing

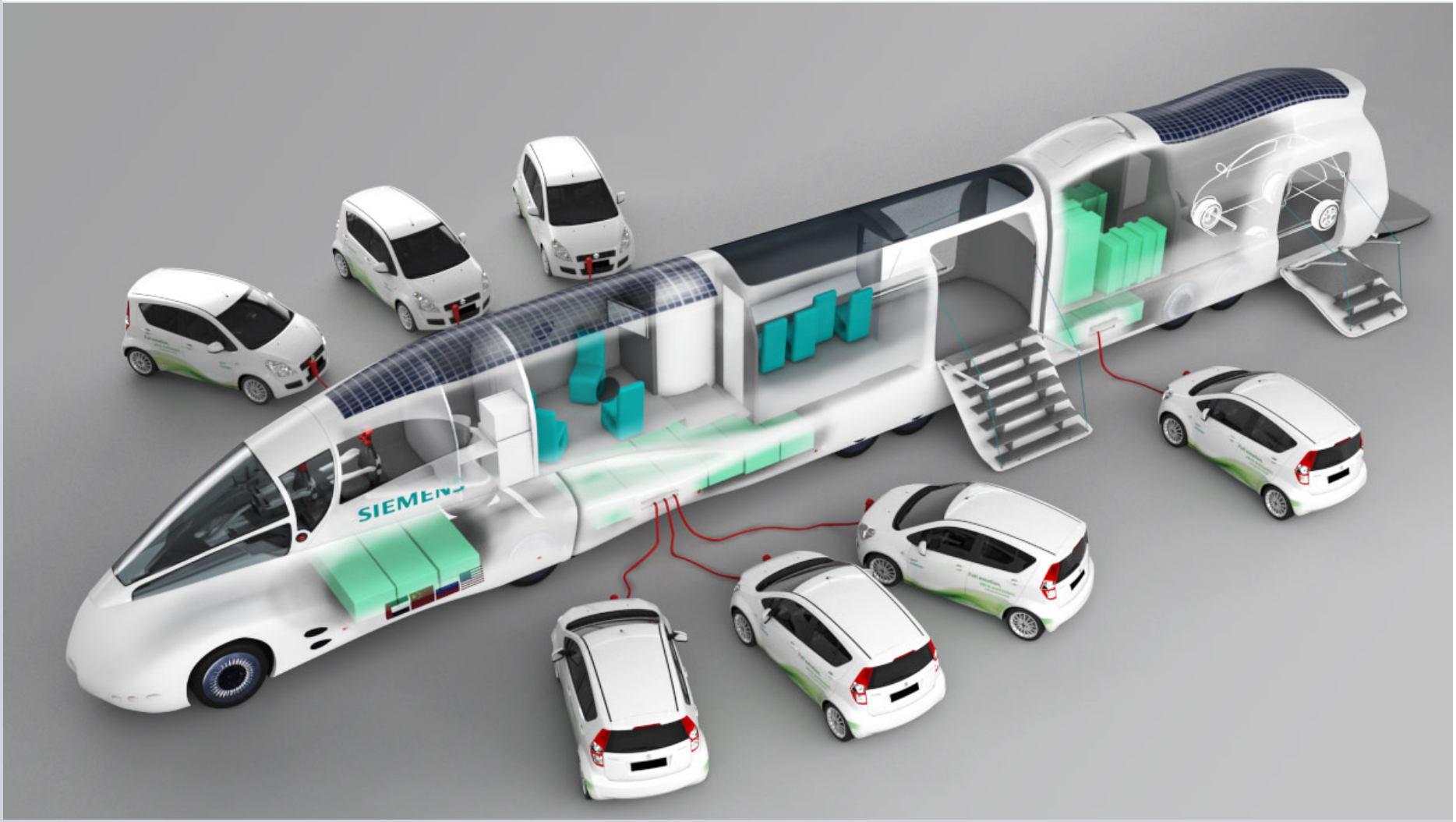
mechanics

Development and Roadshow of new mobility technologies eCar and infrastructure

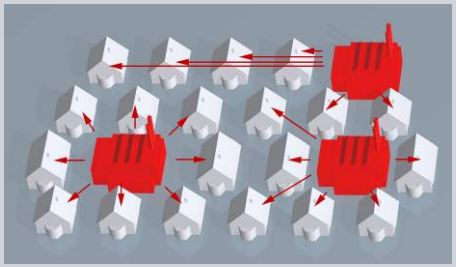
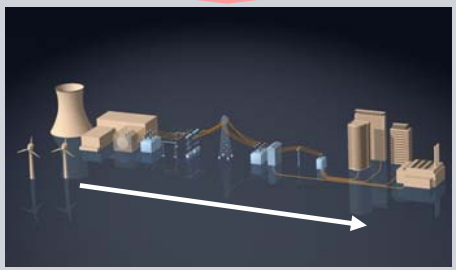
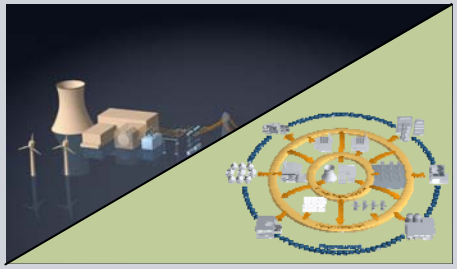
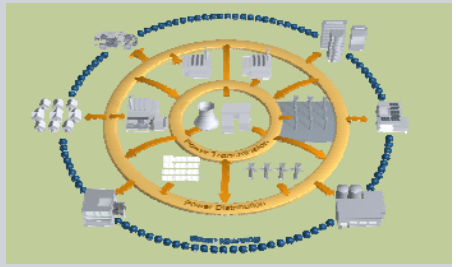
inside car : electrical drivetrain, HMI and system architecture,

outside car : energy generation, transmission and bidirectional connection to grid

Showtruck for eMobility with electrical drivetrain, new HMI, energy flow and showroom



The “New Electricity Age”

19th Century	20th Century	Early 21st Century	End of 21st Century
Electrification of society “Age of Coal”	**Extensive generation of electrical energy** “Age of fossil fuels”	**Shift to new age of electricity** Challenges require rethinking: 1.) Demographic change 2.) Scarce resources 3.) Climate change	**The new age of electricity** Electricity will be ***the*** energy source for most applications in daily life. ➔ Integrated energy system with power grid as backbone
Unsustainable energy system	**Unsustainable energy system**		**Sustainable energy system**
			
“Generation and load closely coordinated” Supply island with stochastic load	**“Generation follows load”** Integrated network, central generation, load stochastically predictable, unidirectional energy flow	**“Energy system shifting”** Increasingly decentralized, fluctuating generation “consumer” becoming “prosumer”	**“Load follows generation”** Central + decentralized generation, intelligence with ICT bi-directional energy flow
Fossil energy source, hydro	**Fossil energy sources, hydro, nuclear**	**Fossil energy sources, hydro, nuclear, biomass, wind, solar**	**Renewable energy sources** **(solar, wind, hydro, biomass),** **“clean” coal, gas, nuclear**

No environmental concerns ► ► ► ► ► ► ► **Environmental awareness**

Siemens runs a testfleet with empoyees in holistic approach

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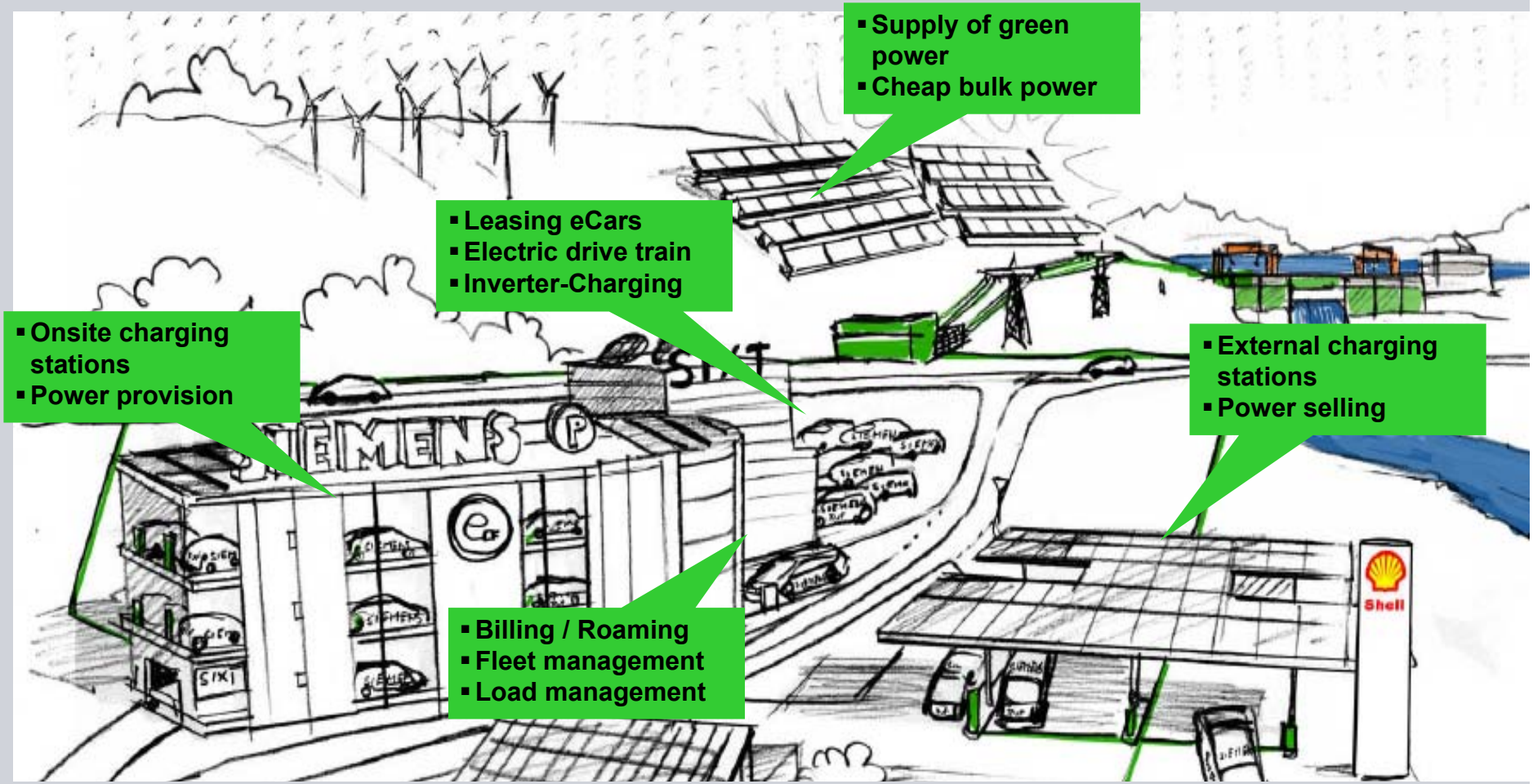
4-S: clean mobility fleet of ap. 100 eCars with energy- and IT-infrastructur. Run, test, observation and optimisation of the system (learn phase).



Long term orientation of eMobility business is ensured by common holistic and finally tested product portfolio

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next generation proposal
holistic product portfolio

development of selected
product portfolio in sectors

Common premarket testing of
holistic product portfolio

Ready for market eMobility
holistic product portfolio