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Smart eCar in its Infrastructure smart Traffic and smart Grid

- Mobility of the Future beyond 2020?

Smart Grids Week 2012
Bregenz, 24.5.2012

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

Smart eCar in smart Traffic Management and smart Grid Connection

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Will eMobility be the future?
Where is the business ?

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Will this happen ?
Where is the money ?

3 requirements :

1. same price or lower than ICE-car in LCC
2. no disadvantage in usage of range (max 150 km, commuter-car)
3. meet the requirements of global megatrends better than ICE

Global Megatrends strongly influence the future of mobility

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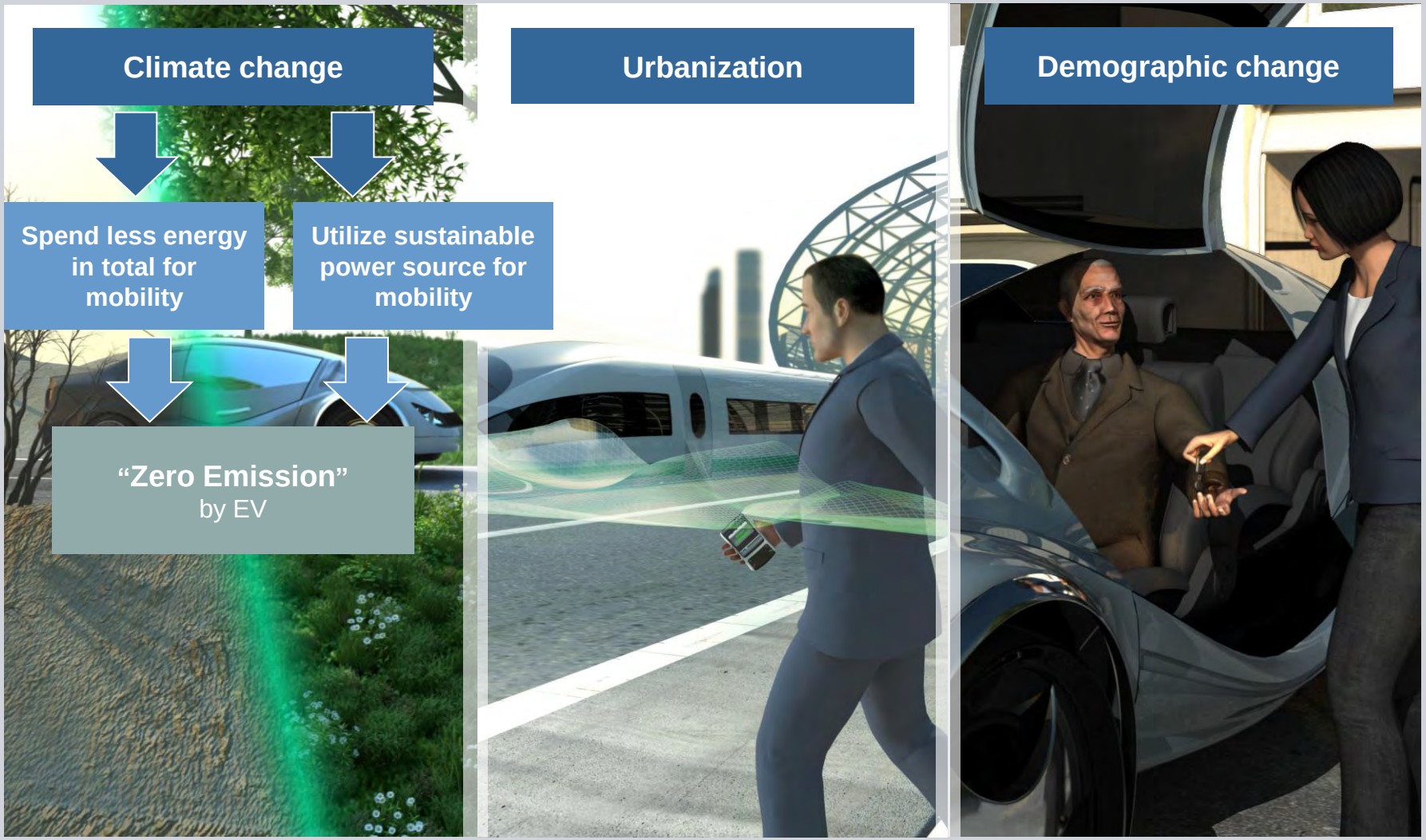

The electric car is changing the relation between automotive industry and utility

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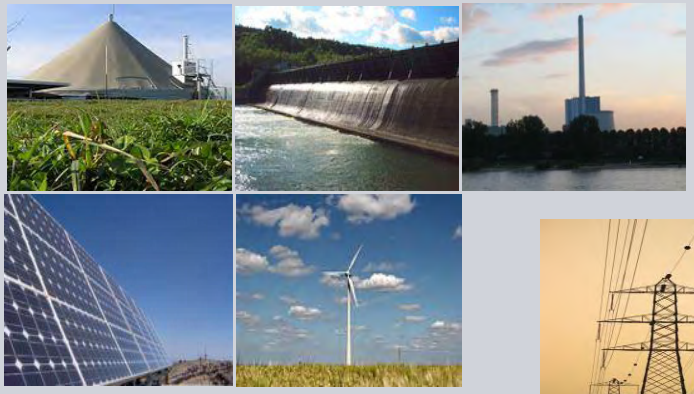
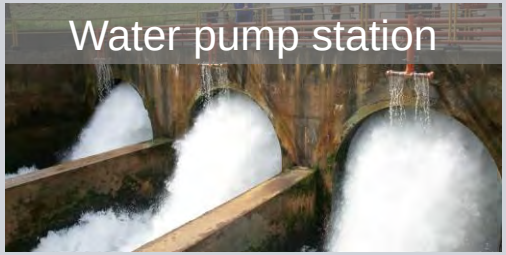


Generation of energy

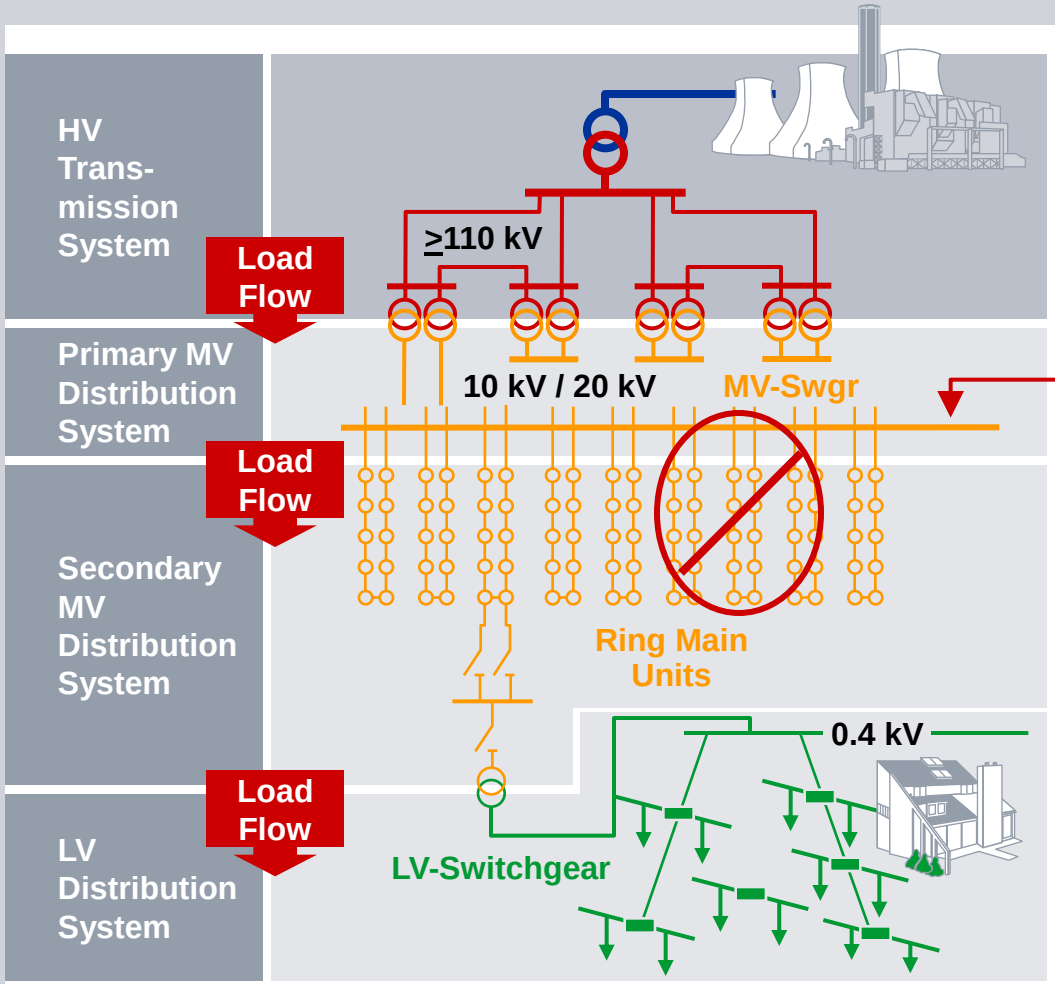
Intelligent energy distribution and transmission

Interaction



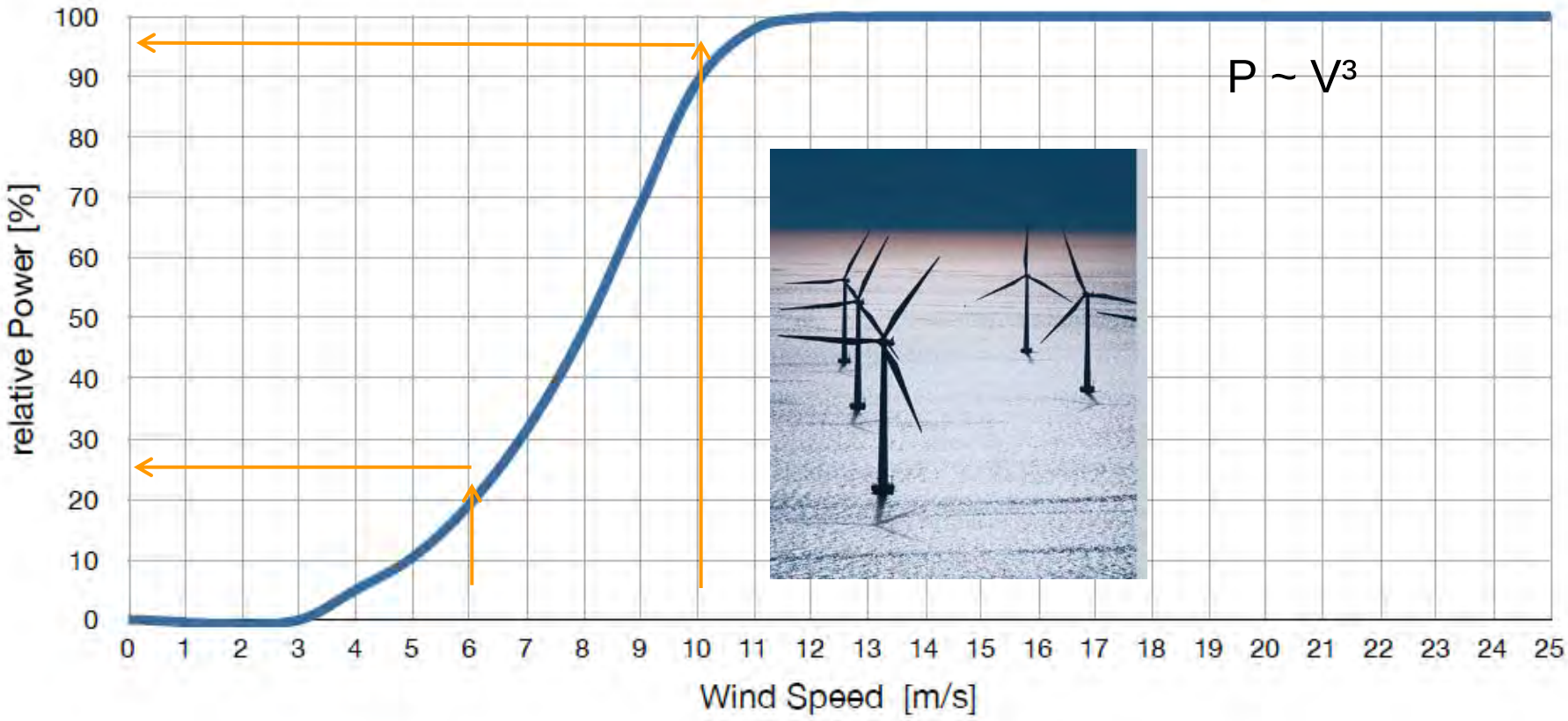
the **battery cost**
can be refinanced
while connected at parking
over LC of battery
with **business**
of **grid stabilisation**
in **power peak**

Power Distribution Solutions (current situation)

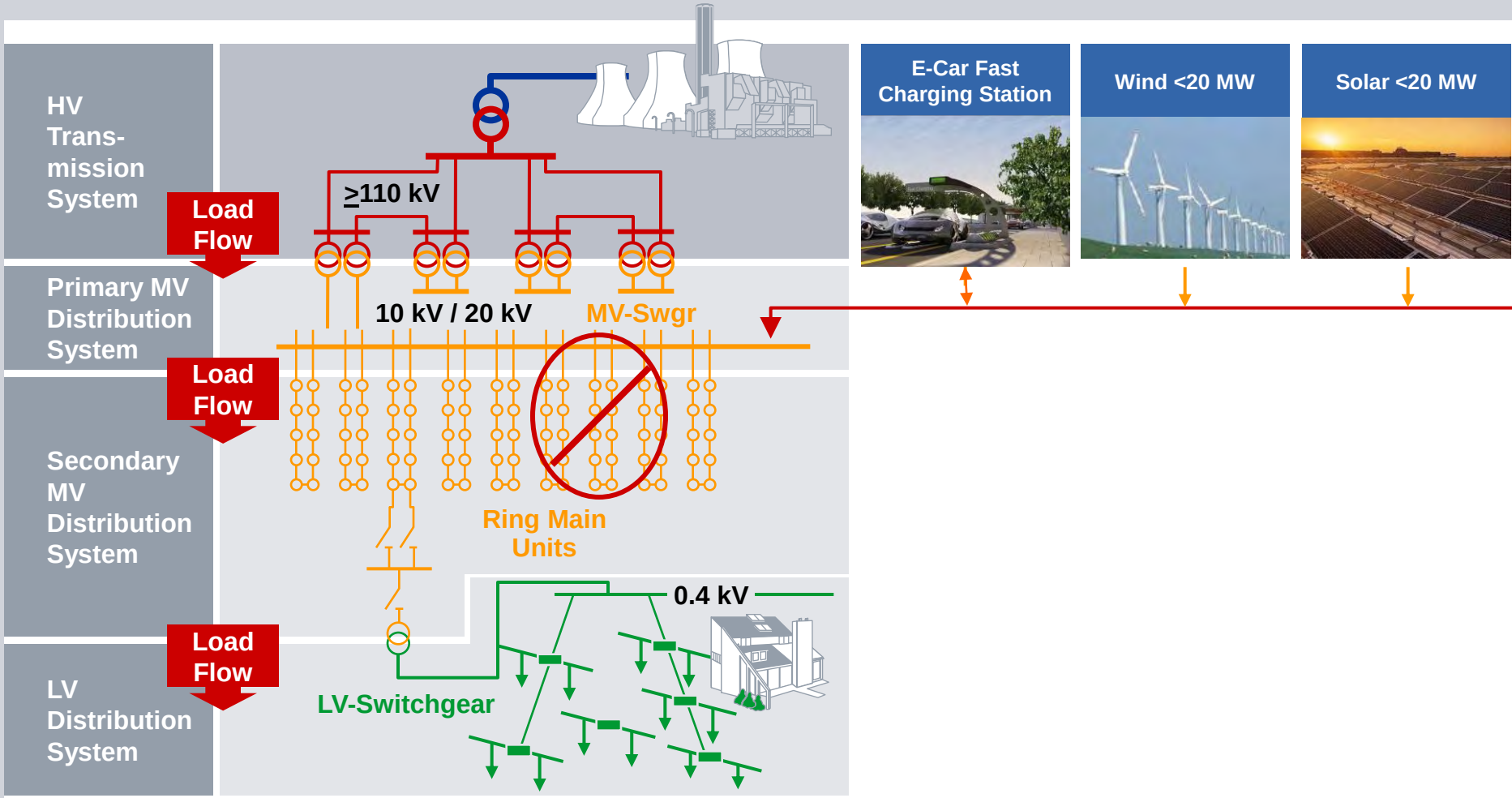


1) Combined Heat and Power

Where does the prognosis error comes from?

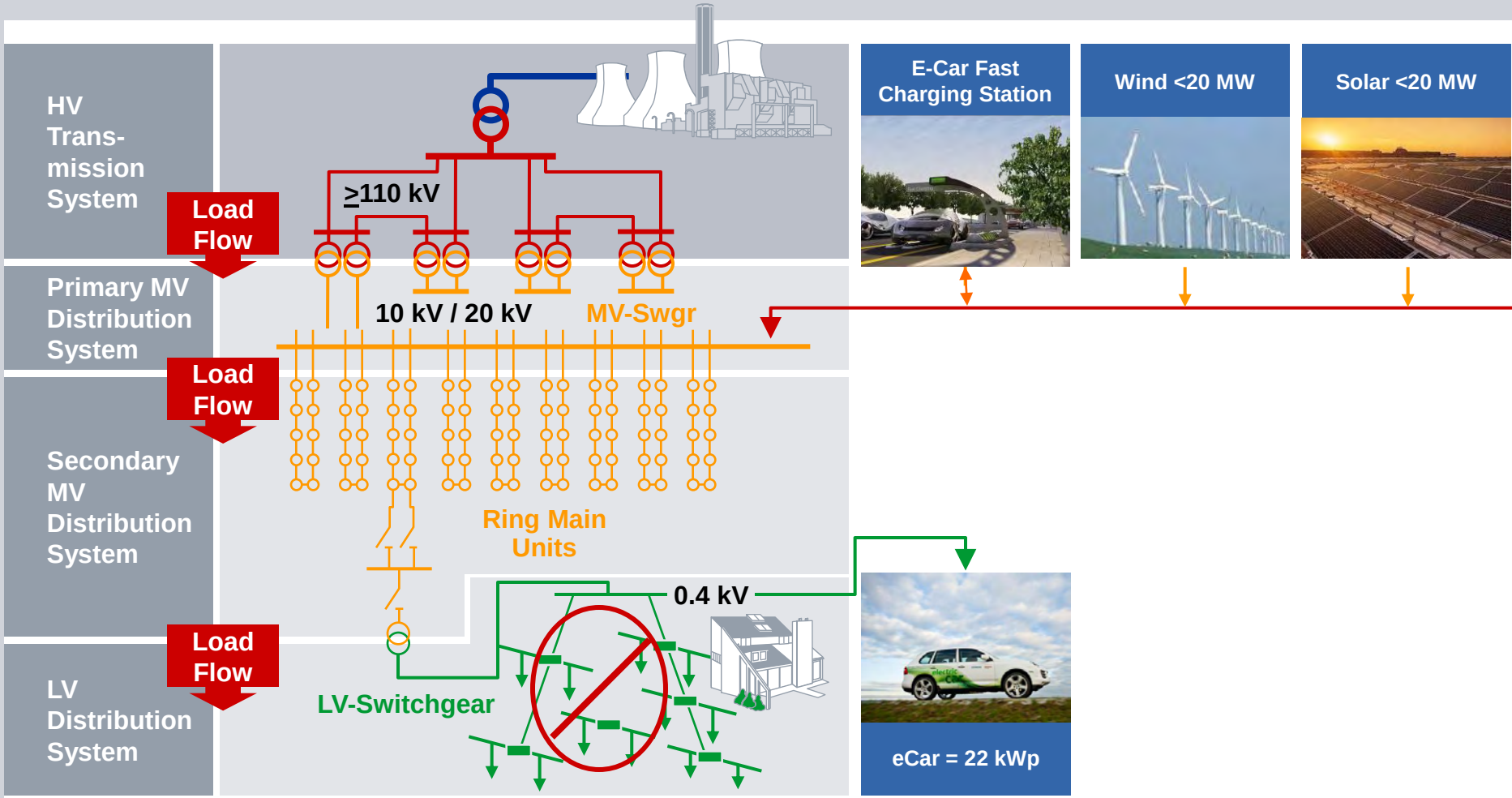


Power Distribution Solutions (current situation)



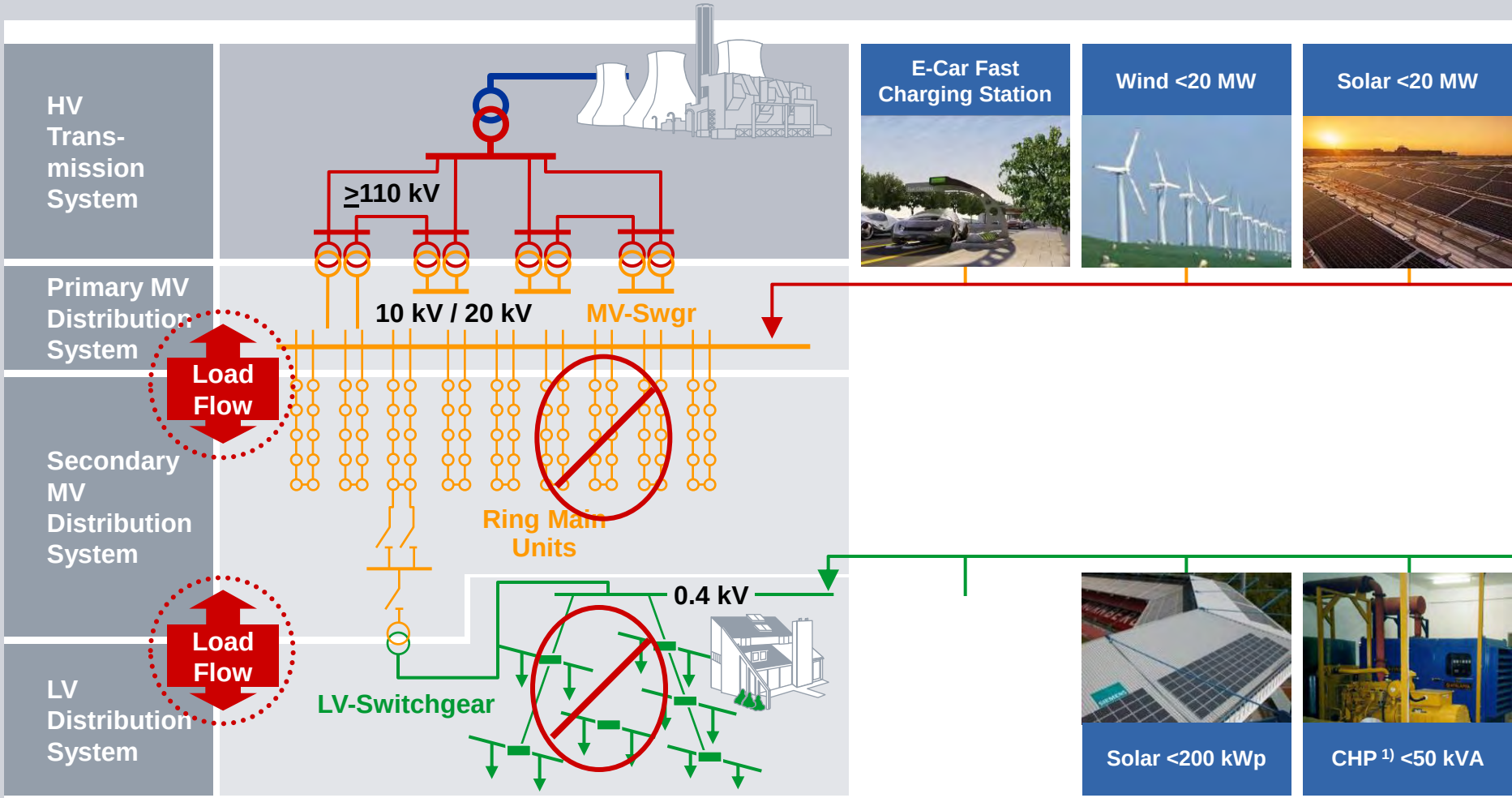
1) Combined Heat and Power

Power Distribution Solutions (current situation)



1) Combined Heat and Power

Power Distribution Solutions (future smart grid)



1) Combined Heat and Power

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

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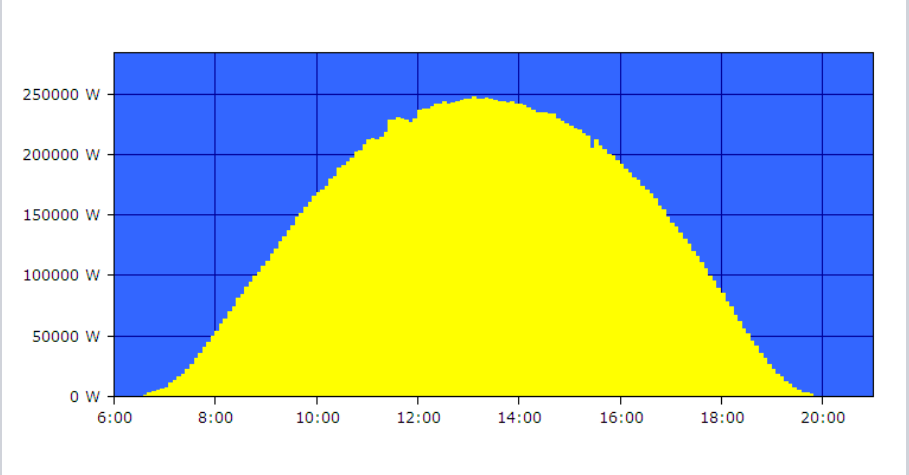
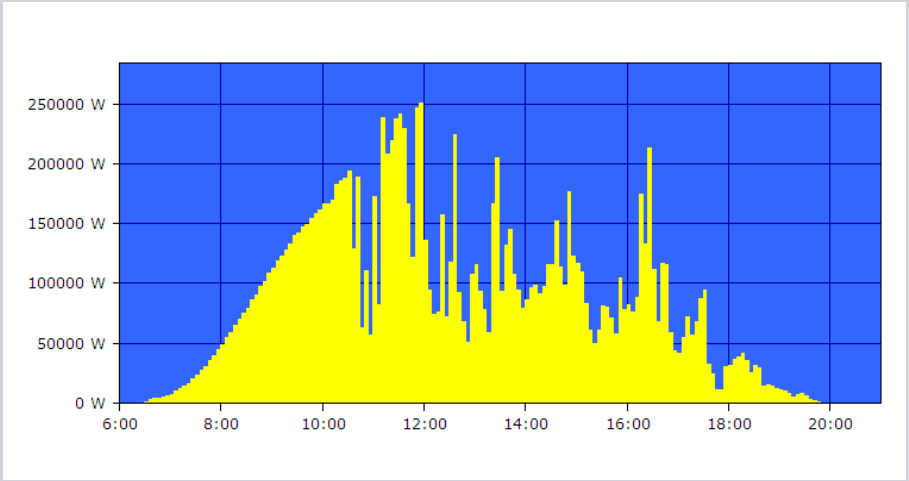
Sunny day in April: 1.9 MWh

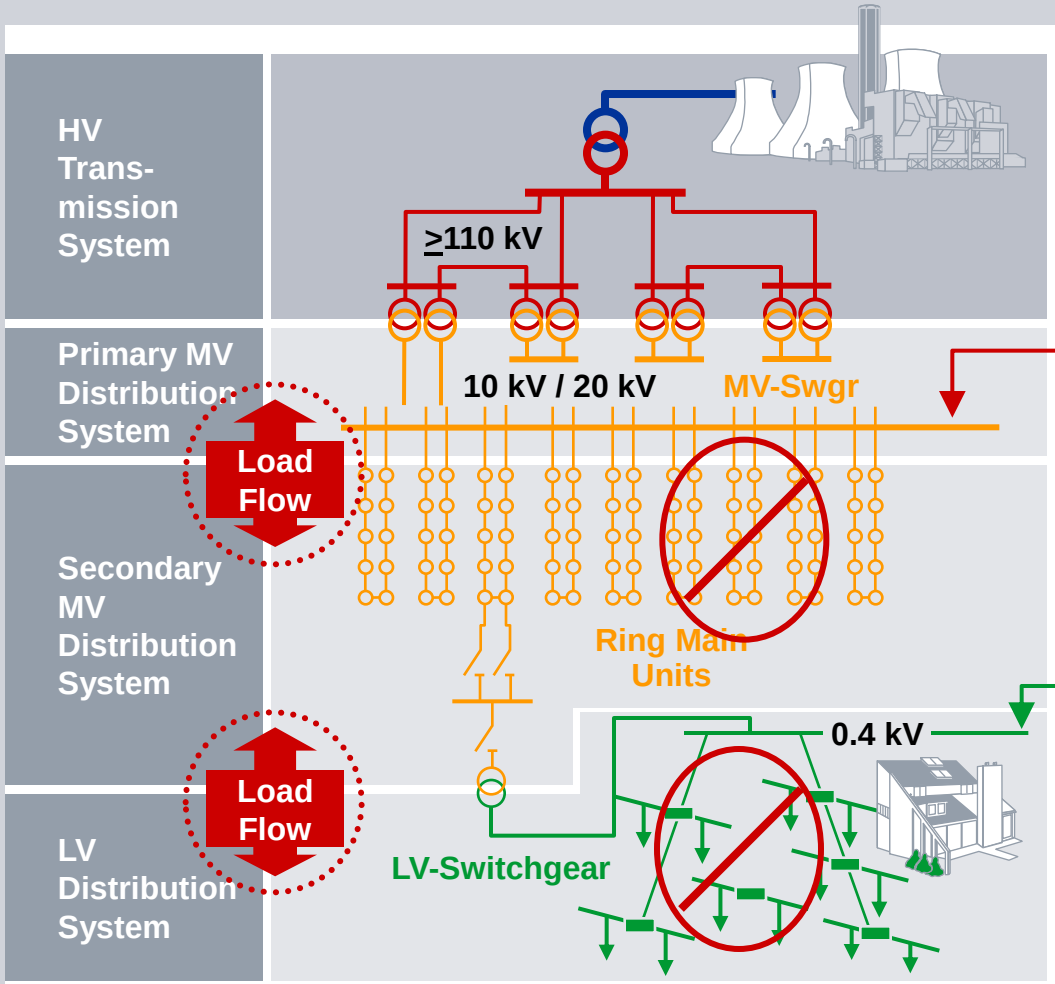


Cloudy day in April: 1.2 MWh

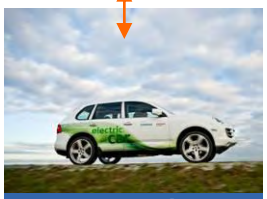


Source: Michael Weinhold & friends

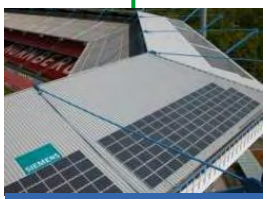
Power Distribution Solutions (future smart grid)



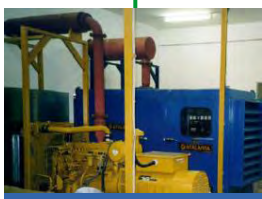
Business-model :
serve the **power-peaks**
in low-voltage grid
with ecar´s batteries



eCar <10 kWp
eCar Charging Spot



Solar <200 kWp



CHP [1] <50 kVA

1) Combined Heat and Power

Electric car and infrastructure

Siemens *TIEM* approach – *T*otal *I*ntegrated *eM*obility

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 inter-action between eCars, buildings and power grid

Electromobility Infrastructure for “smart grid connection”

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AC Wall Box	AC Charging Point	AC Park and Charge	AC Satellite System
			
DC Charging System	**Swapping Station**	**Inductive Charging**	**Software & Services**
			

Integrated Electromobilty by Siemens

Global Megatrends strongly influence the future of mobility

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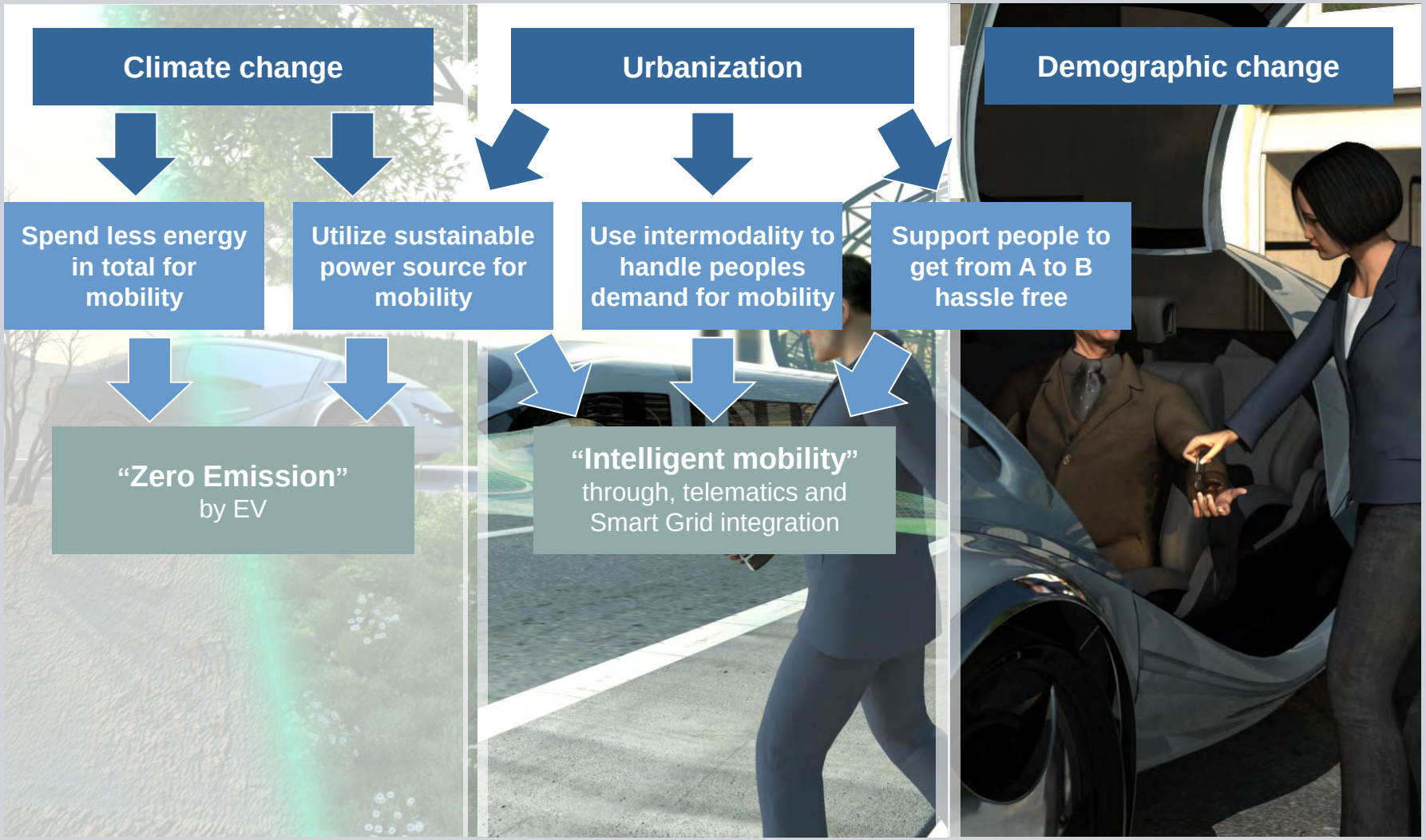

Smart Traffic: integrated traffic concepts

Solutions to increase traffic and energy efficiency

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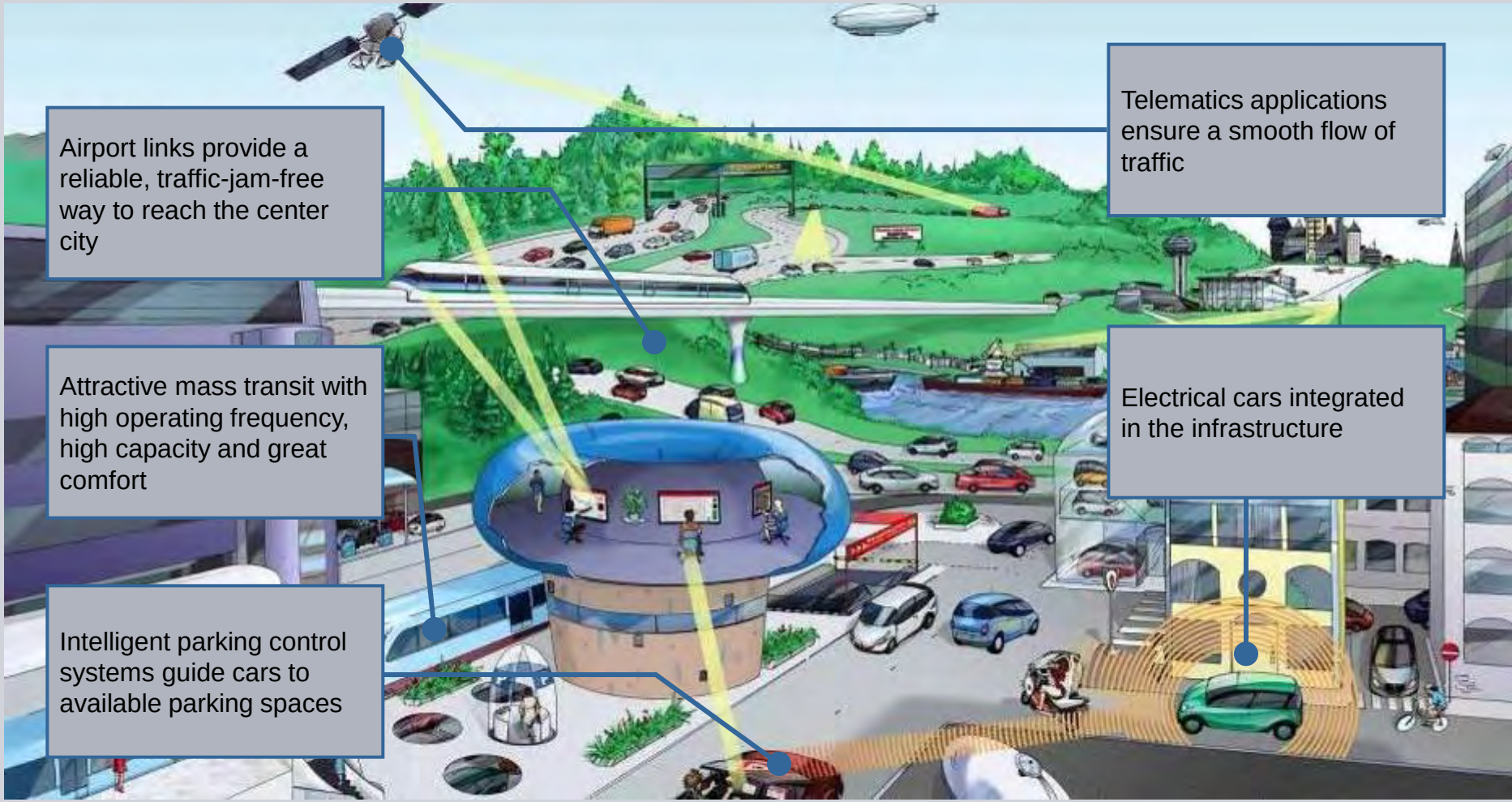


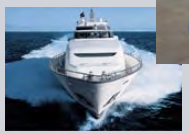
Easy request of personalized mobility service

PDA
request

increasing comfort

willness to pay price

increasing speed



Mobility services
will combine
several mobility concepts
to secure the best offer

mobility solution = f (price, comfort, speed)

passengers

goods

Complete Transportation combined know how for intelligent infrastructure solutions „smart traffic“

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Urbanisation

Outdated infrastructure

Competition of the cities

Complete Transportation – Intelligent Traffic Systems

Urban	Interurban	Electronic Tolling	Services
Urban traffic management	Highway traffic management	Open road tolling	"Service for sure"
			
Urban Traffic Control	Tunnel Traffic Control	Congestion Charging	Customer Support Center
			

Electromobility

Project 4Sustain-eMobility@Siemens (4S)

smart eMobility

smart grid connection | smart traffic | smart eMobiles

Global Megatrends strongly influence the future of mobility

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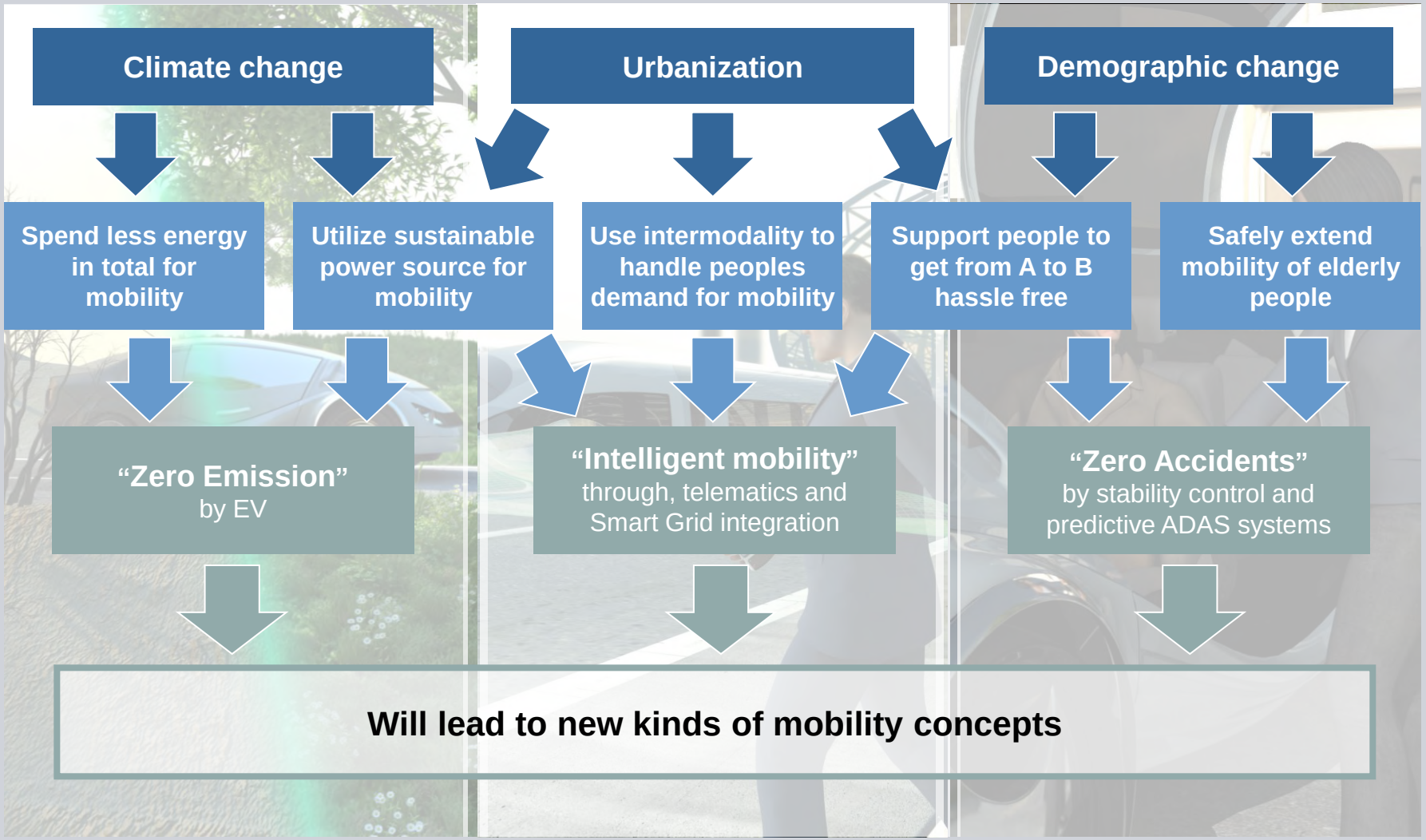
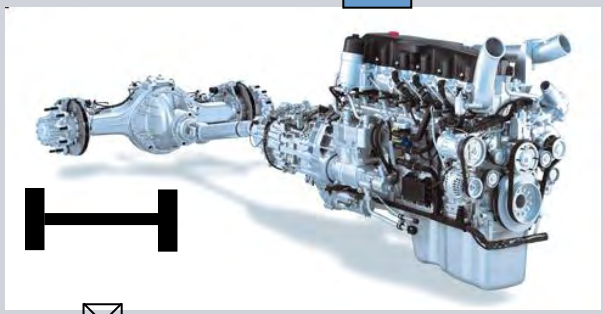
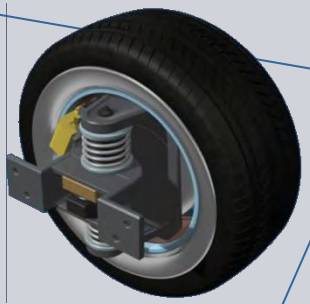


Integrated drive train

Fully new vehicle design concepts

Locally drives concepts





Putting into operation and Test of Complete Drive System on Siemens Test Bench

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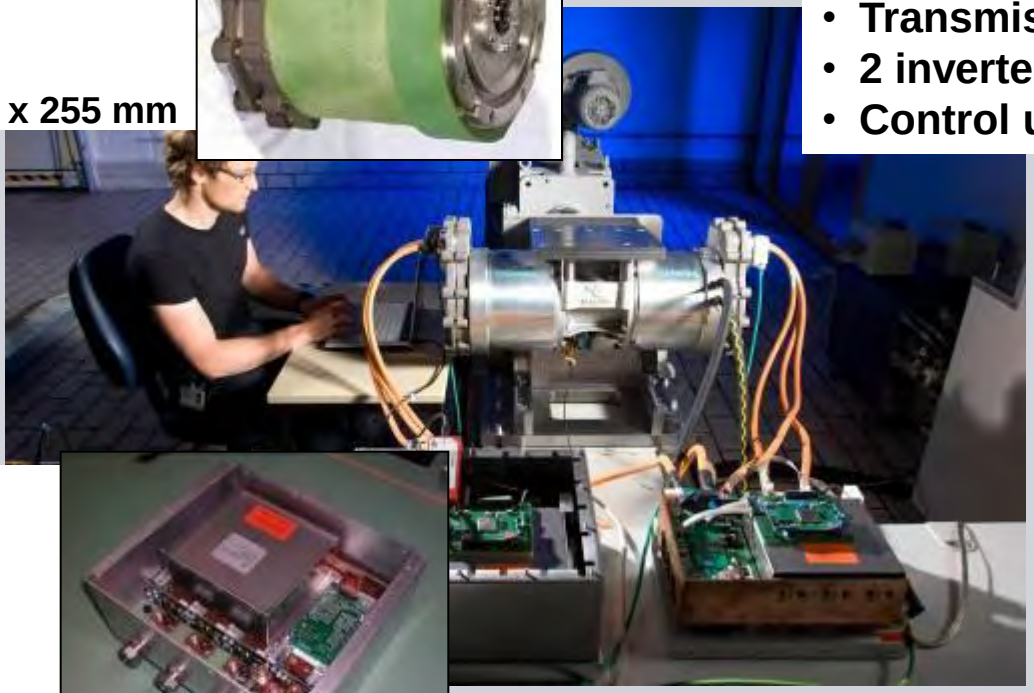
- Peak Power : 125 kW
- Continuous Power : >50 kW
- 9,000 rpm
- Weight: 52 kg
- Dimension: 280 mm x 255 mm

Drive System consists of:
- Transmission
- 2 inverters, 2 motors
- Control unit



- Voltage: 590 V–840 V
- Power: 125 kW
- Cooling: 60 °C
- Weight: 15 kg
- Efficiency: ~96%
- Power density: 10 kW/Kg
- Dimensions: 280 x 350 x 150 mm

Electrical drivetrain with electronical torque vectoring

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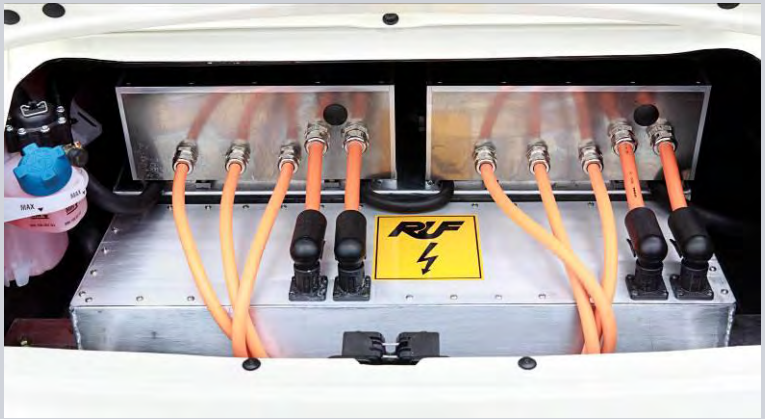

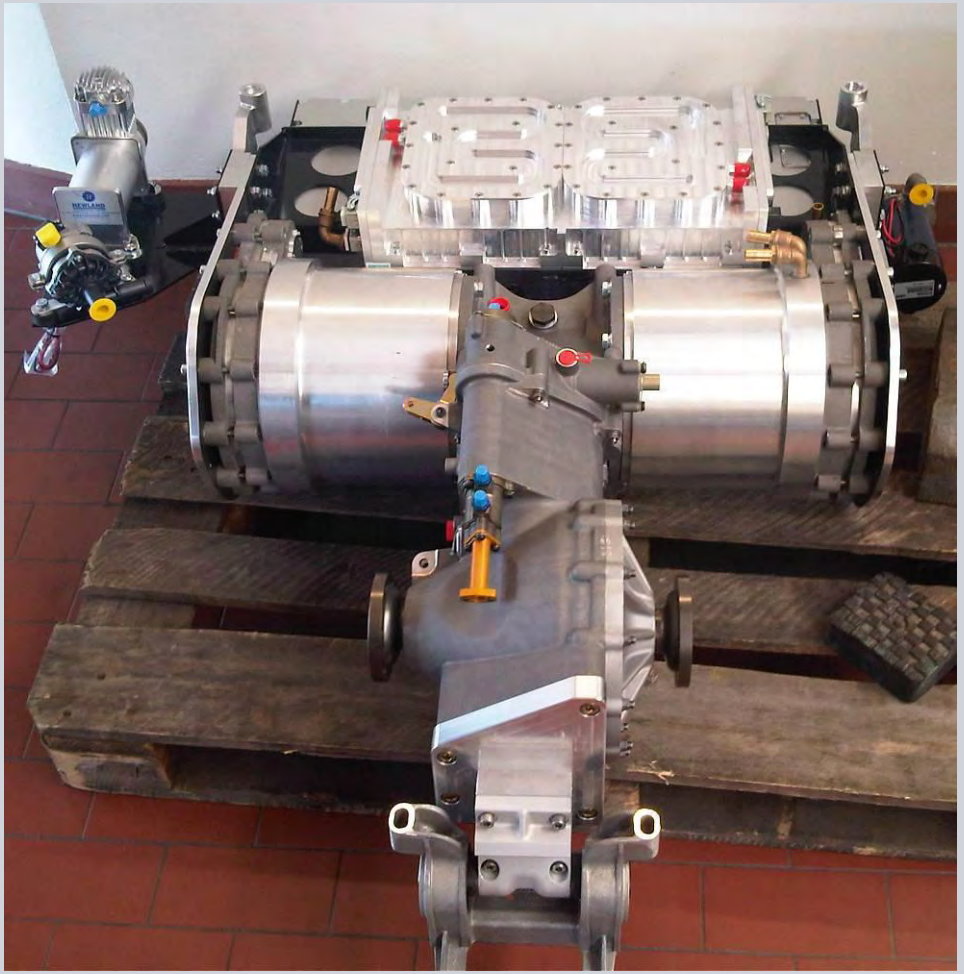

Vehicle with wheel hub motors and w/o mechanical brake on rear axle on testbench to calibrate and measure brake blending

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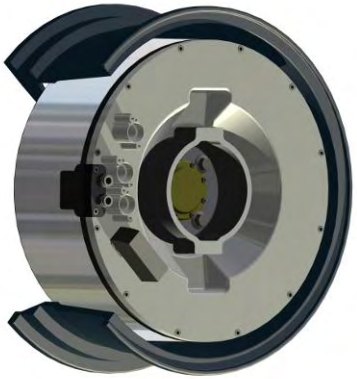

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This is amaising new fun to drive (not feasible for family)

More functionalities need more technology in future „smart eCars“

One main actor in the game .....

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..... special e-cars with advantages

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The real car is looking like this ….. ?

Low Cost

will be made by

high technology,

not

low technology

The Project Roadshow of Innovations with Innotruck “Diesel reloaded”

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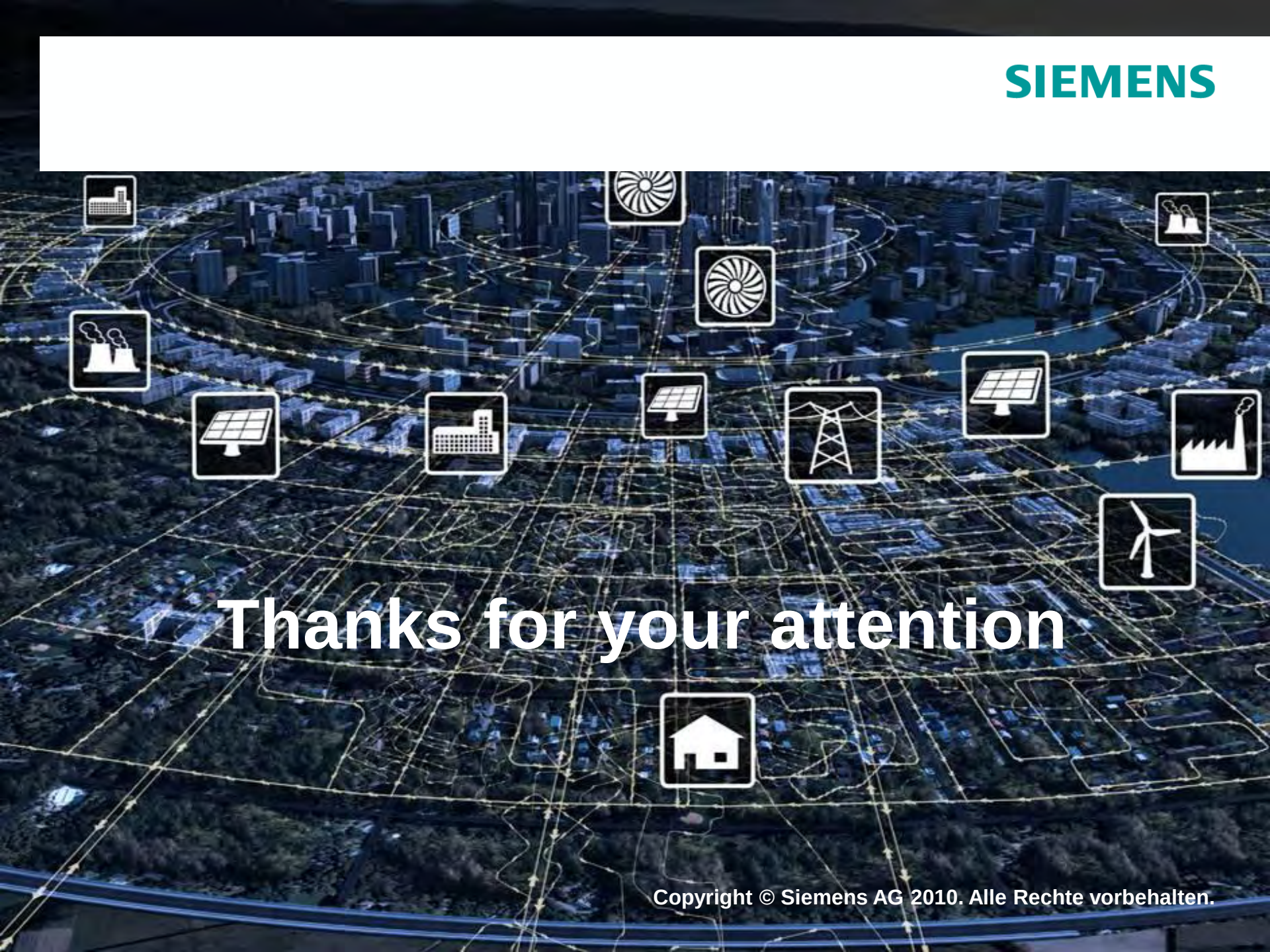
Technische Universität München

IAS TUM Institute for Advanced Study

Some impressions of Innotruck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Communication and power supply are the backbone to increase quality of life for people in the smart eCity

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