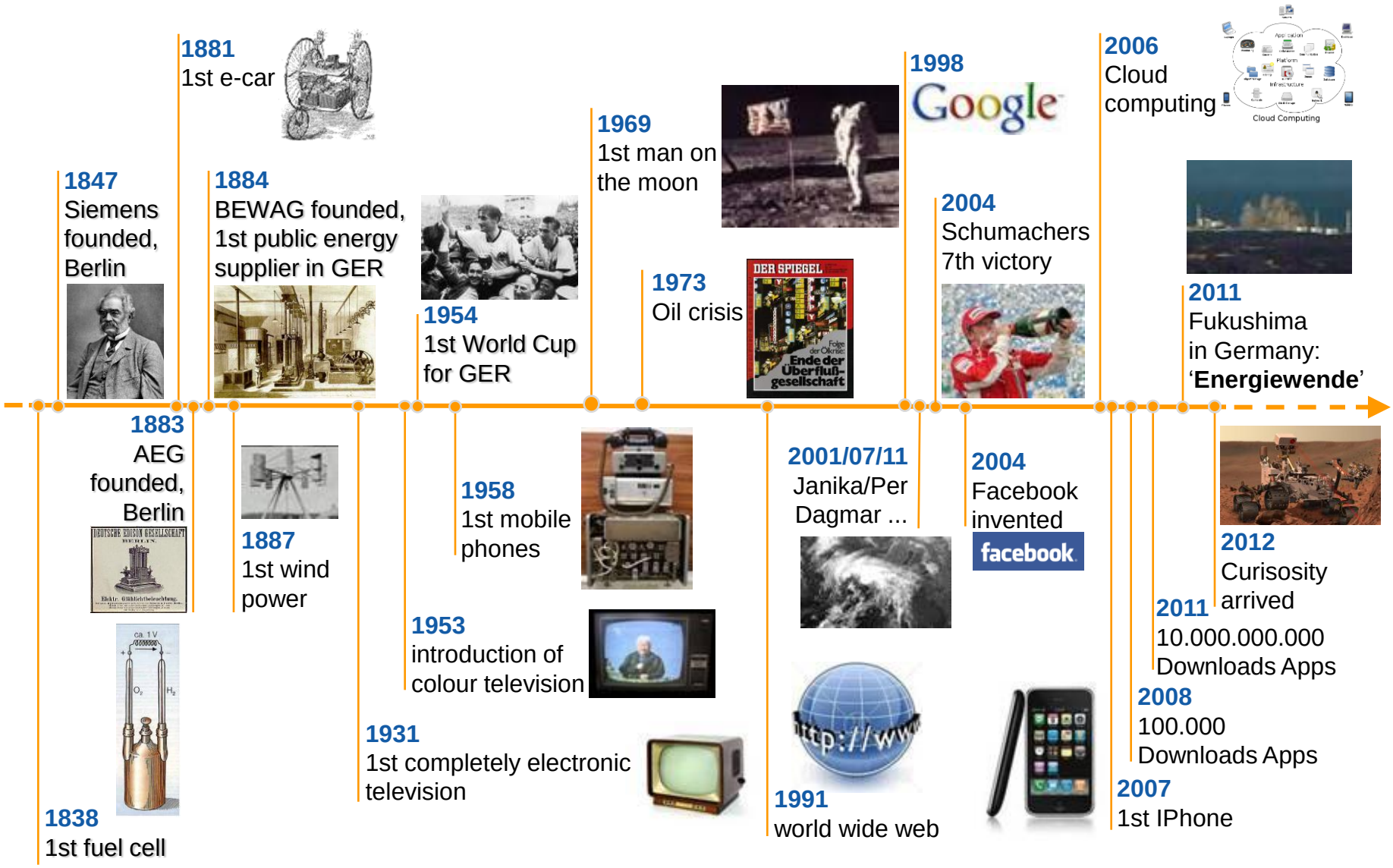
Integration of Smart Energy Solutions into Smart Grids -

Key Success Factors for a Sustainable City Development

Dr. Helmar Rendez
Head of BU Distribution

UN High Level Dialogue, June 20th, 2013

Some innovations have taken a little bit longer…



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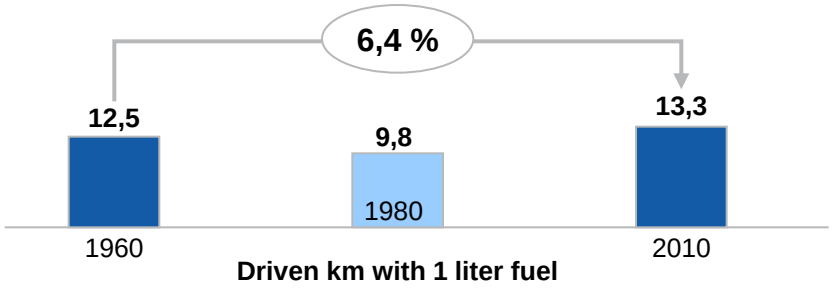
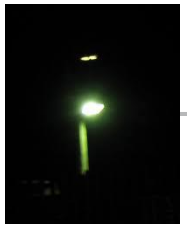
Efficiency increase in our daily life …

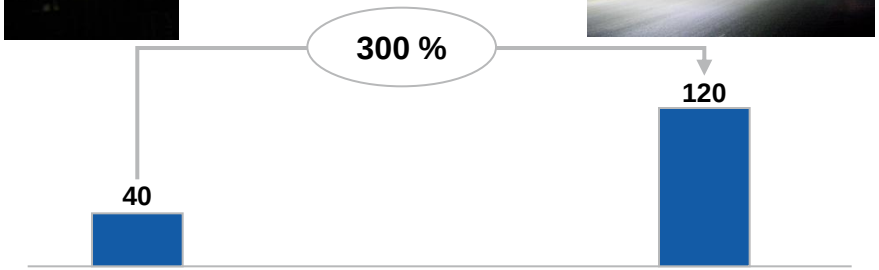
Cars



Driven km with 1 liter fuel

Street Lighting





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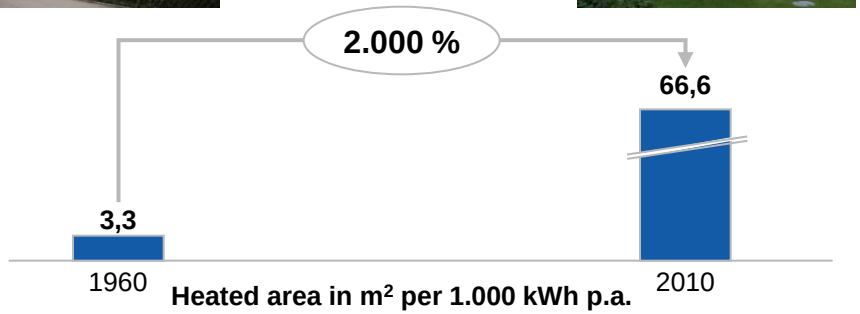
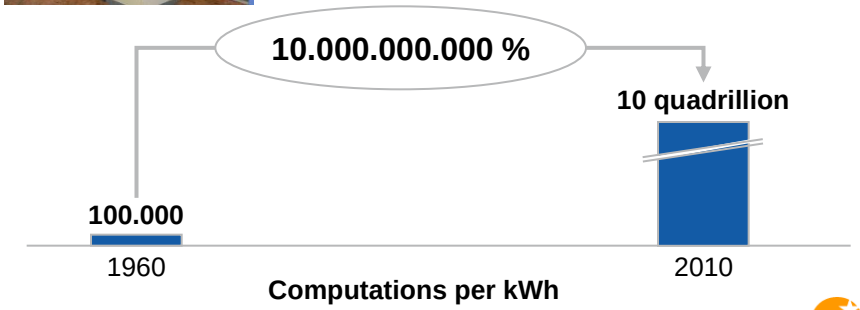
Home



Heated area in m² per 1.000 kWh p.a.

Computer Technology



Computations per kWh

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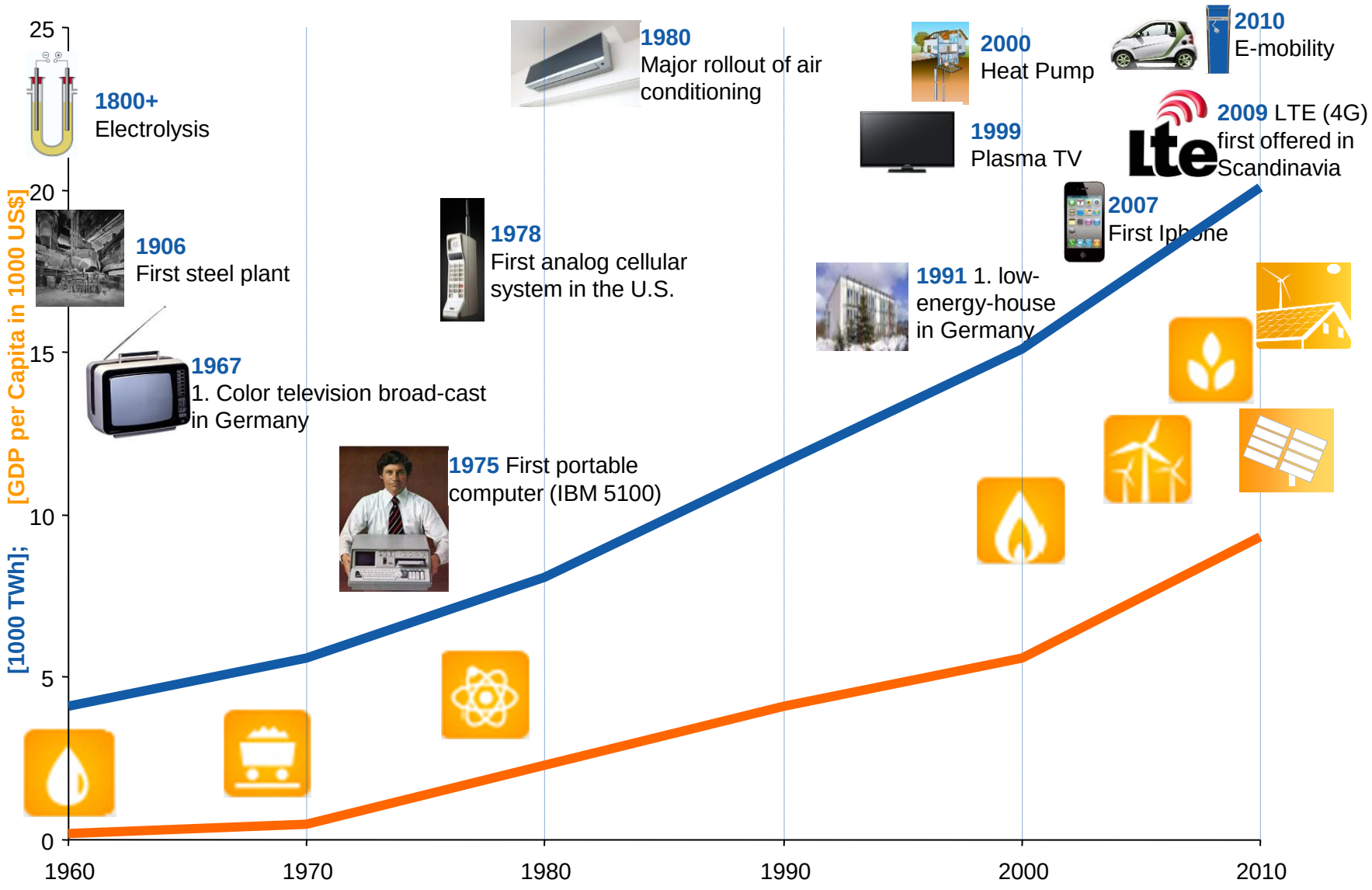
… but the future is electric!



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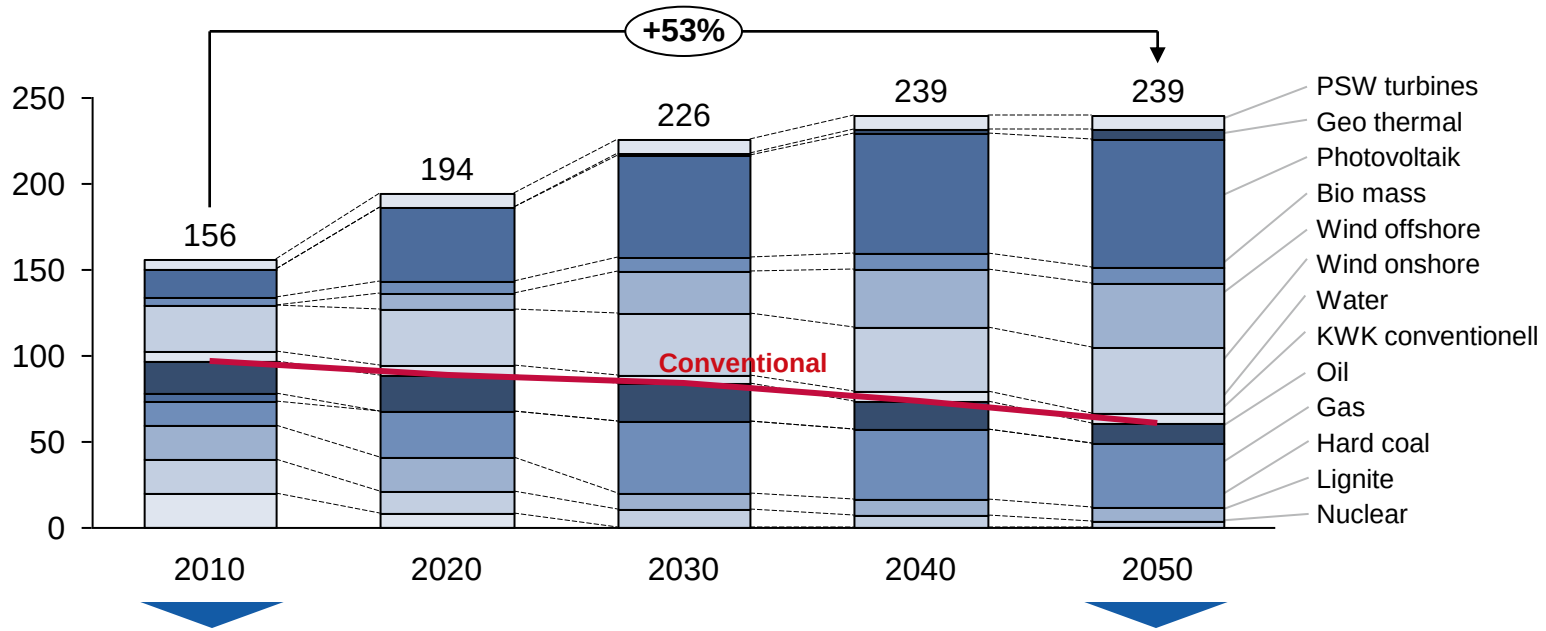
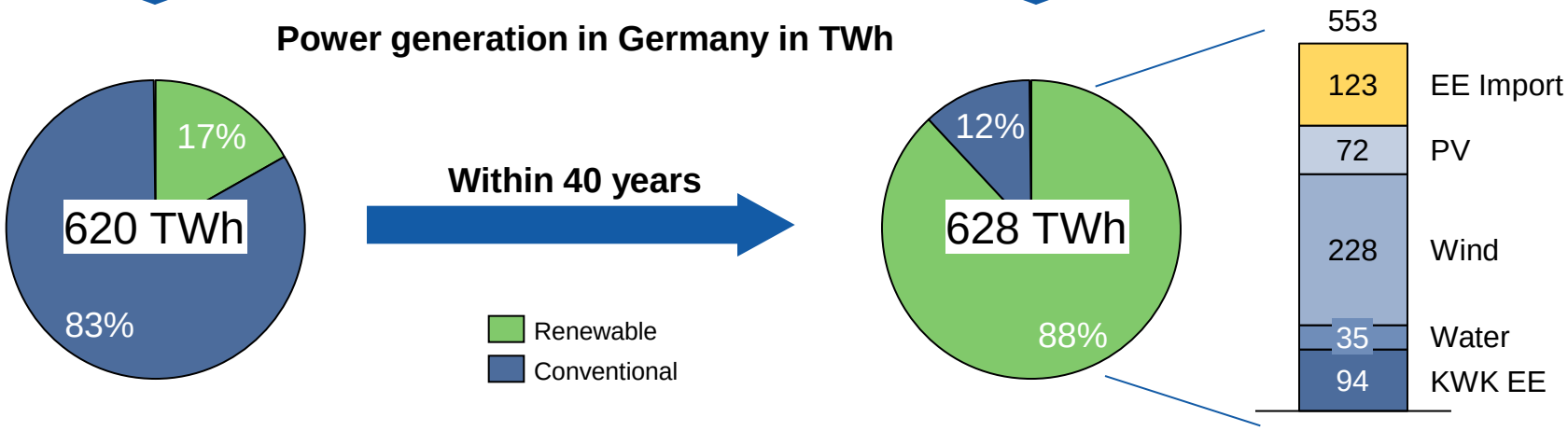
Change of the energy landscape in Germany – Going Green

Total power generation installed capacities in Germany in GW



Power generation in Germany in TWh



Quelle: DENA, BDEW (based on BMU-Leitszenario 2009)

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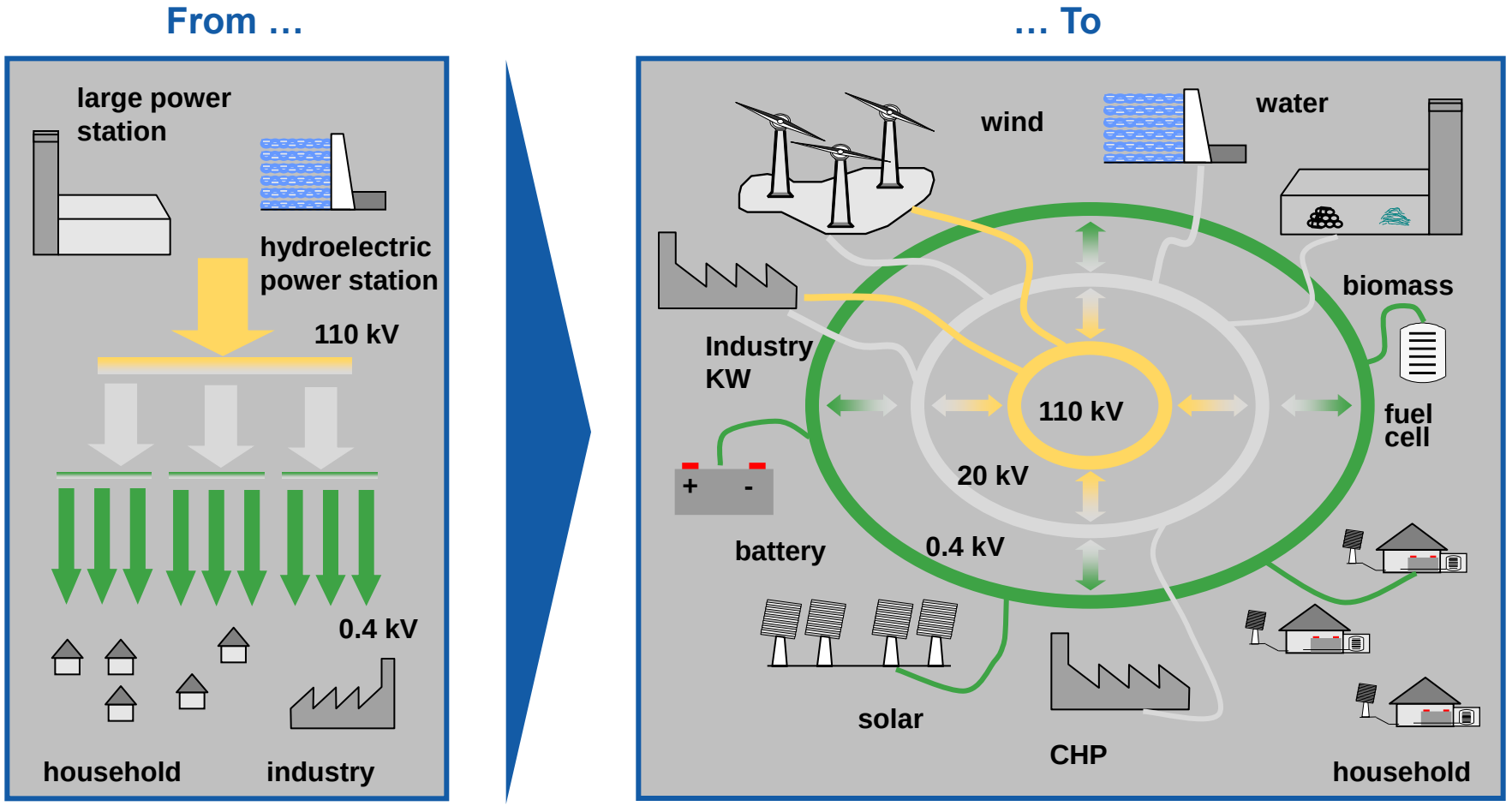
The new energy landscape – Opportunities and challenges



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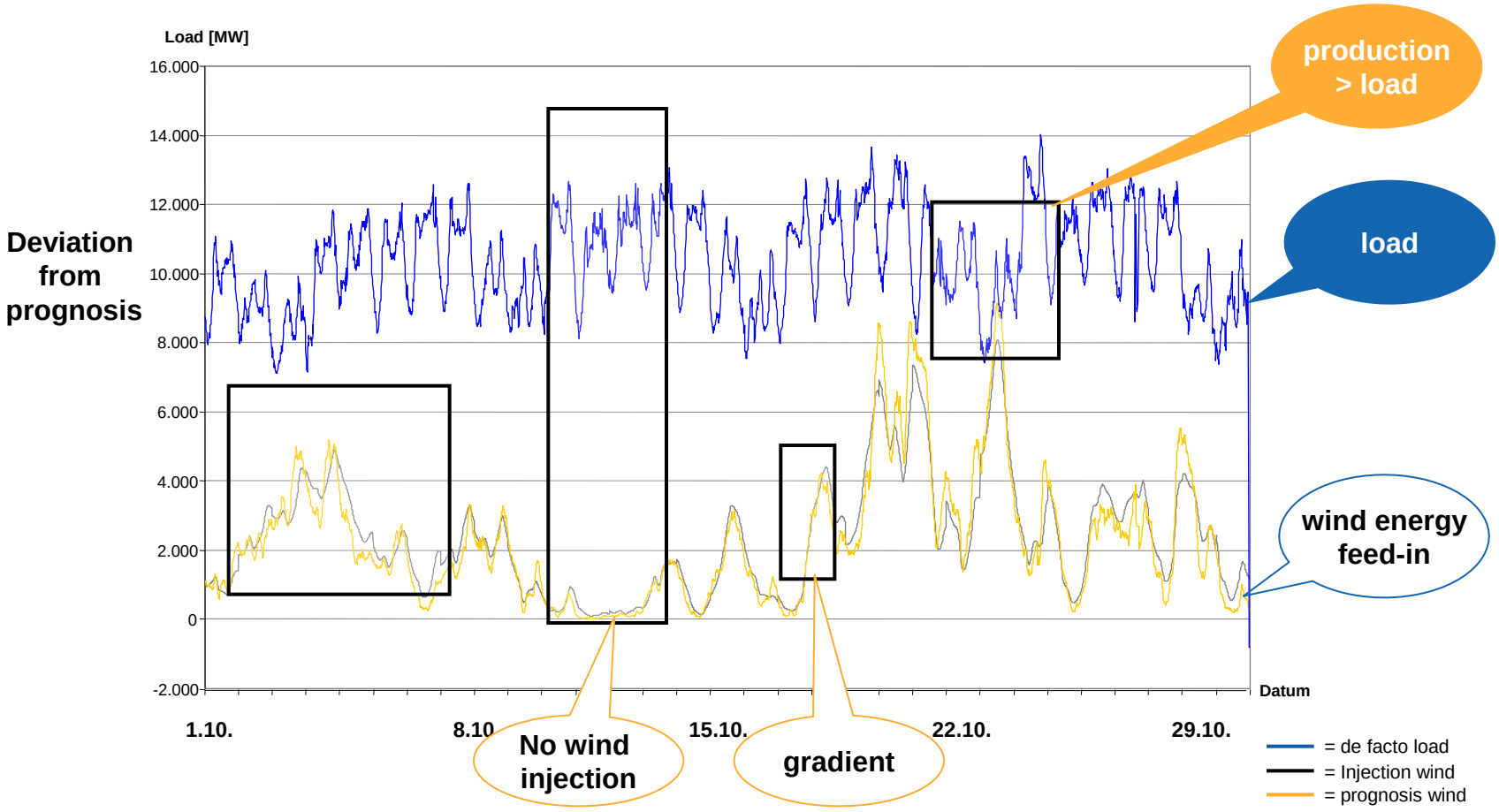
Integration of fluctuating energy vs security of supply



Grid load, wind energy prognosis vs. wind energy production in Eastern-Germany – Development shown in the transmission grid of 50Hertz (01.-31.10.2010):

Source: 50Hertz Transmission

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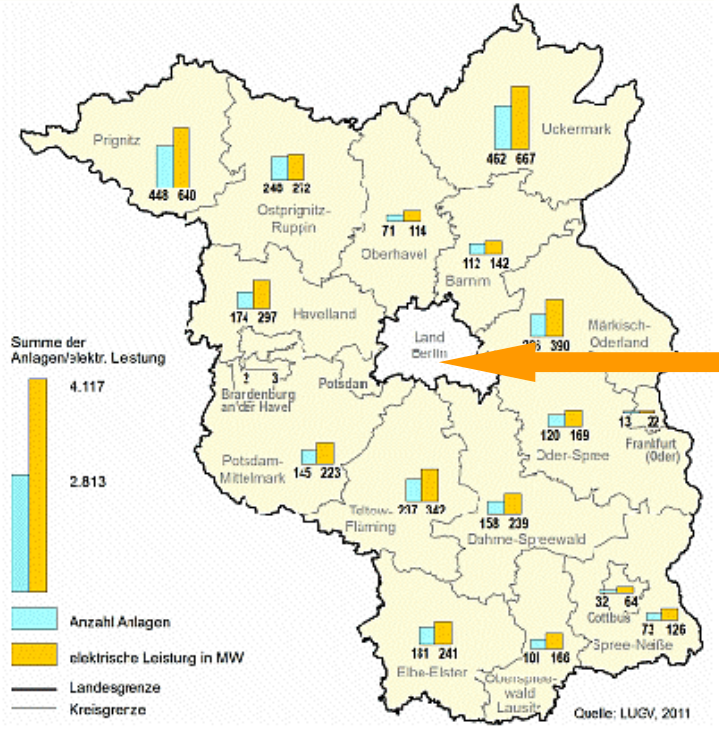
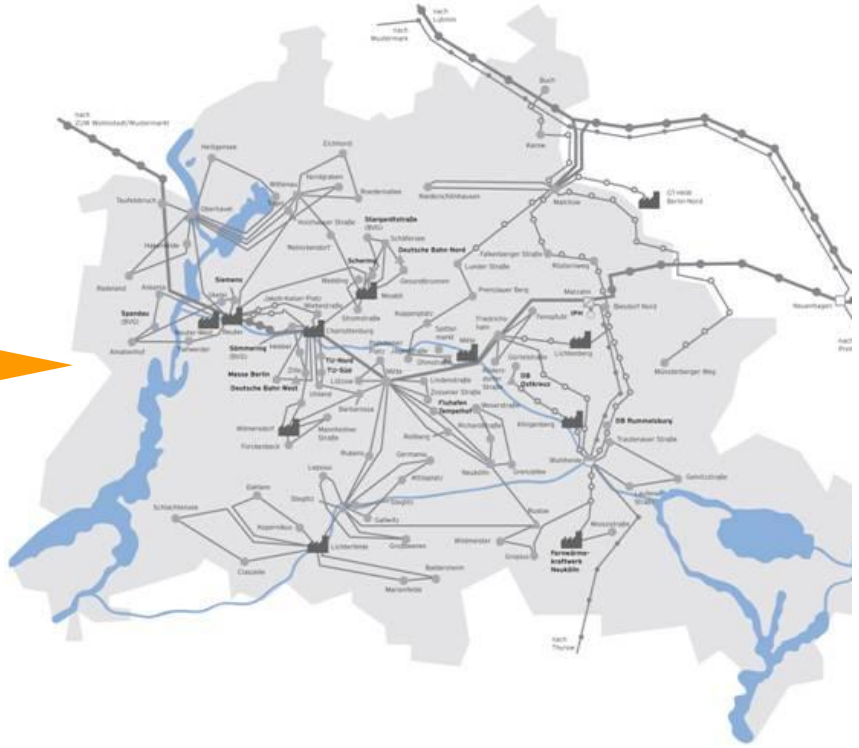
‘Energiewende‘ – Different challenges and responsibilities

Rural grid operators (e.g. Brandenburg)



Metropolitan grid operators (e.g. Berlin)



Intelligent integration and transport

Intelligent management and usage

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Sustainable City Development – Berlin at a glance

1. Smart Grids
2. Visualisation & Transparency
3. Smart Storage
4. Smart Solution: Virtual Power Plant
5. E-Mobility projects

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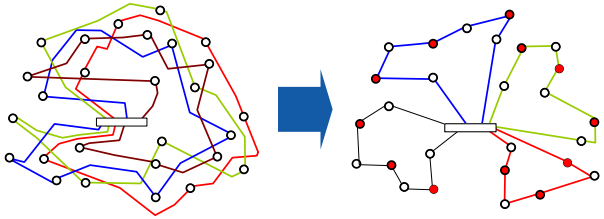
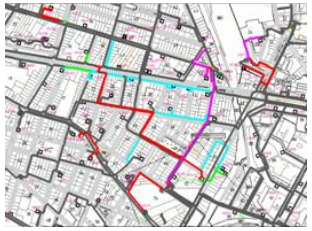
Smart Grid – automatisation enables integration of renewables based on increased reliability

- **Security of elecitrity supply** is of increasing importance
- **Grid maintenance + grid intelligence** is the key of further development
- Increasing production from **volatile renewables**

- **Automatisation** of grid stations (transformer stations) is one major driver



- **Increased reliability** based on cable replace-ments is crucial



Stromnetz Berlin invests 1.400 Mil. € in the forthcoming years to optimise both: reliability and integration of renewables

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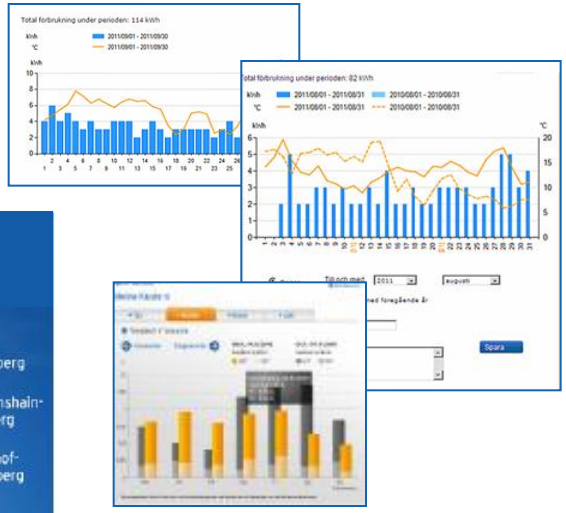
Transparency – a first step towards behavioral changes and increasing Energy Efficiency



Renewable energy in the Berlin grid

Choose your energy source

Vattenfall runs the largest smart meter project in Germany (Berlin, Märkisches Viertel)

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Energy storage – Balance of volatile generation

Vattenfall operates a 2 MW battery in Berlin

	Degree of maturity	Degree of efficiency	Capacity GER	Outlook
Pump storage	●	●	◔	↘
Compressed air storage	◑	◑	◑	→
Mega batteries	◑	◕	◕	→
Power-to-Heat	◕	●	◕	↗
Power-to-Gas	◑	◔	●	→
E-Mobility	◔	●	◔	→
Virtual Power Plant	◕	●	●	↑
…				

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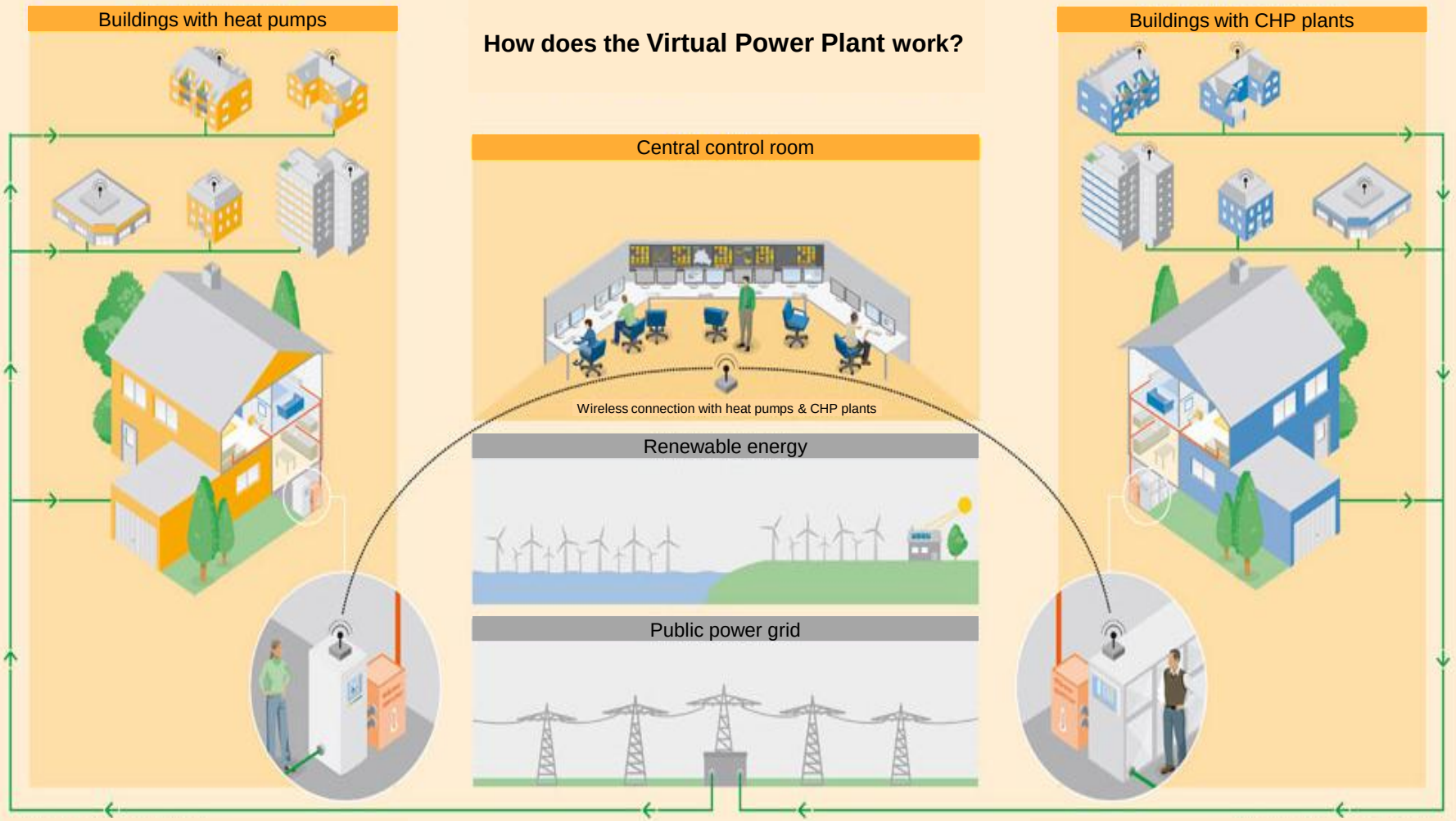
Vattenfall´s Virtual Power Plant – Connecting wind, power & heat



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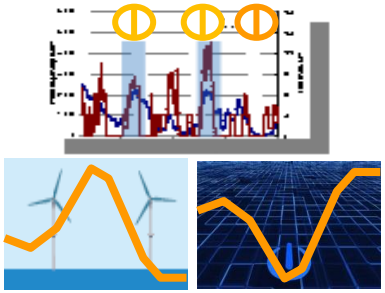
Vattenfall Berlin – We make Electric-Mobility happen!

Private & Corporate

Vattenfall & Volvo JV

Charging Infrastructure



Managed Charging (Wind-to-vehicle, vehicle-to-grid)

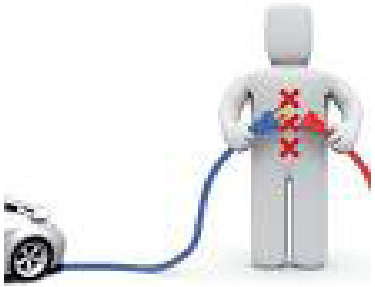
Vattenfall MINI-E-Study

Public

Showcase Berlin

Fast Charging

Pilot Inductive Charging for Public transport



Charge Point & Tender Berlin

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Home offer in NL, GER & SWE (e.g. for Volvo cooperation)

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Public Charging Networks implemented in three urban markets

Charge networks implemented

- Commercial Operations in NL
- Large test networks in Berlin & Hamburg

> 250 charging points Amsterdam

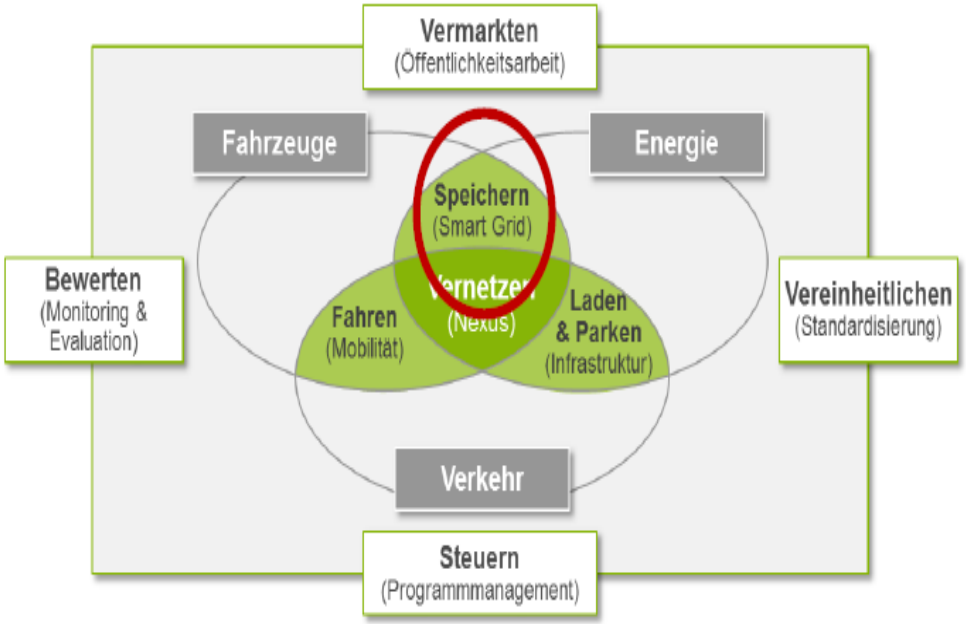
> 80 Charging Points Berlin

> 60 Charging Points in Hamburg

Service Offering:

- Personal RFID access card
- Access to Nuon/Vattenfall charging infrastructure
- Access to third party public infrastructure

Show room E-Mobility



- Coordination by Berlin **Agency for Electromobility (e-mo)**
- **32** main **projects** with **150 partners**
- Project volume: **rd. 100 mio. €**
- **4000 vehicles**
- 100 charging stations today – **800 charging stations** until **2015**

- IPIN - Integrationsplattform Intelligente Netze (D1)
- SMART – Capital Region – Netzkonzept für die Hauptstadtregion, Lastverhalten eines CO_2-minimierten Fuhrparks (D2)
- Micro Smart Grid EUREF (D3)

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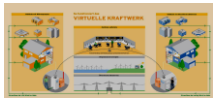
Distributing electricity for everyday life – Today and tomorrow

Milestones of the upcoming 20 years

2012 | 2015 | 2020 | 2025 | 2030



Virtual PP

Power-to-Heat

Smart Grids in Europe

Mega-batteries

Trans-Mediterranean supply of renewable energy via Desertec Project

Roll-out Smart Meter

IGCC-CCS

Fuel cells used in everyday life

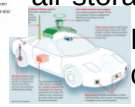
Demand Side Management

Tariffs based on capacity needs

Power-to-Gas

Inductive Charging

Compressed air storage



Driverless cars

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