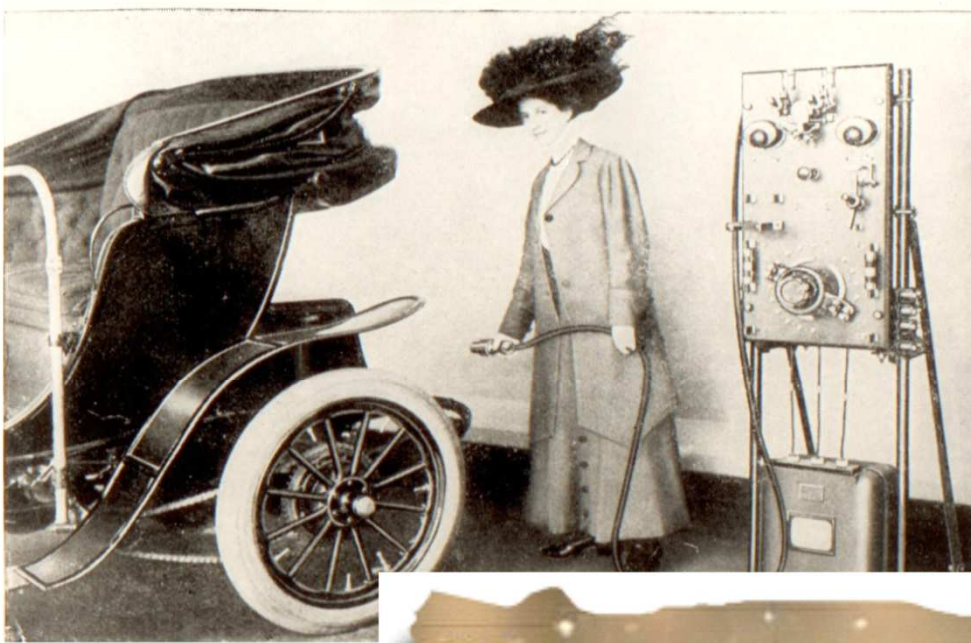


1° Congresso Paranaense de Veiculos Elétricos

Electric Vehicles – still a Vision ?

Cord-H. Dustmann

ITAIPU, 07.12.2011



1908

2008



December 07, 2011

Third EV wave within 40 years:

<i>Period</i>	<i>Driving force</i>
1970/80	"Oil crisis", we have unlimited nuclear power
1990/98	Air quality, Californian legislation
2009/??	CO ₂ , Peak Oil

Will it be different this time?

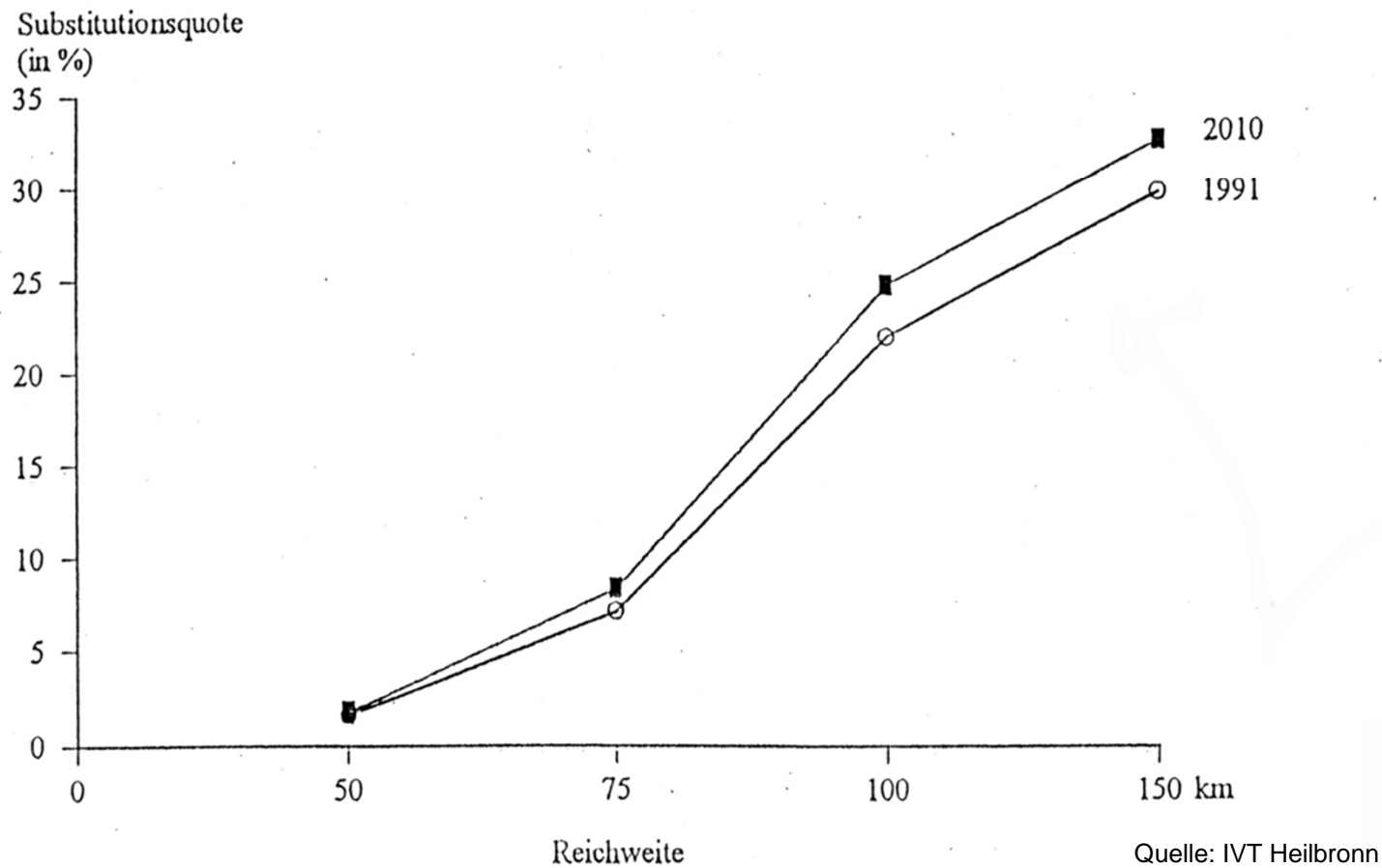
Yes, if it is done different this time:

- The individual demand for mobility is met (nearly) perfectly by the internal combustion engined car, the customer does not need Electric Vehicles
- EV "Problem 1" Range, real or emotional
- EV "Problem 2" Recharge duration, really?
- Price, could battery rental help?

The Electric Vehicle is different, not just another car type. It is a house appliance, not for traveling

Mobility Study in Germany 1990:

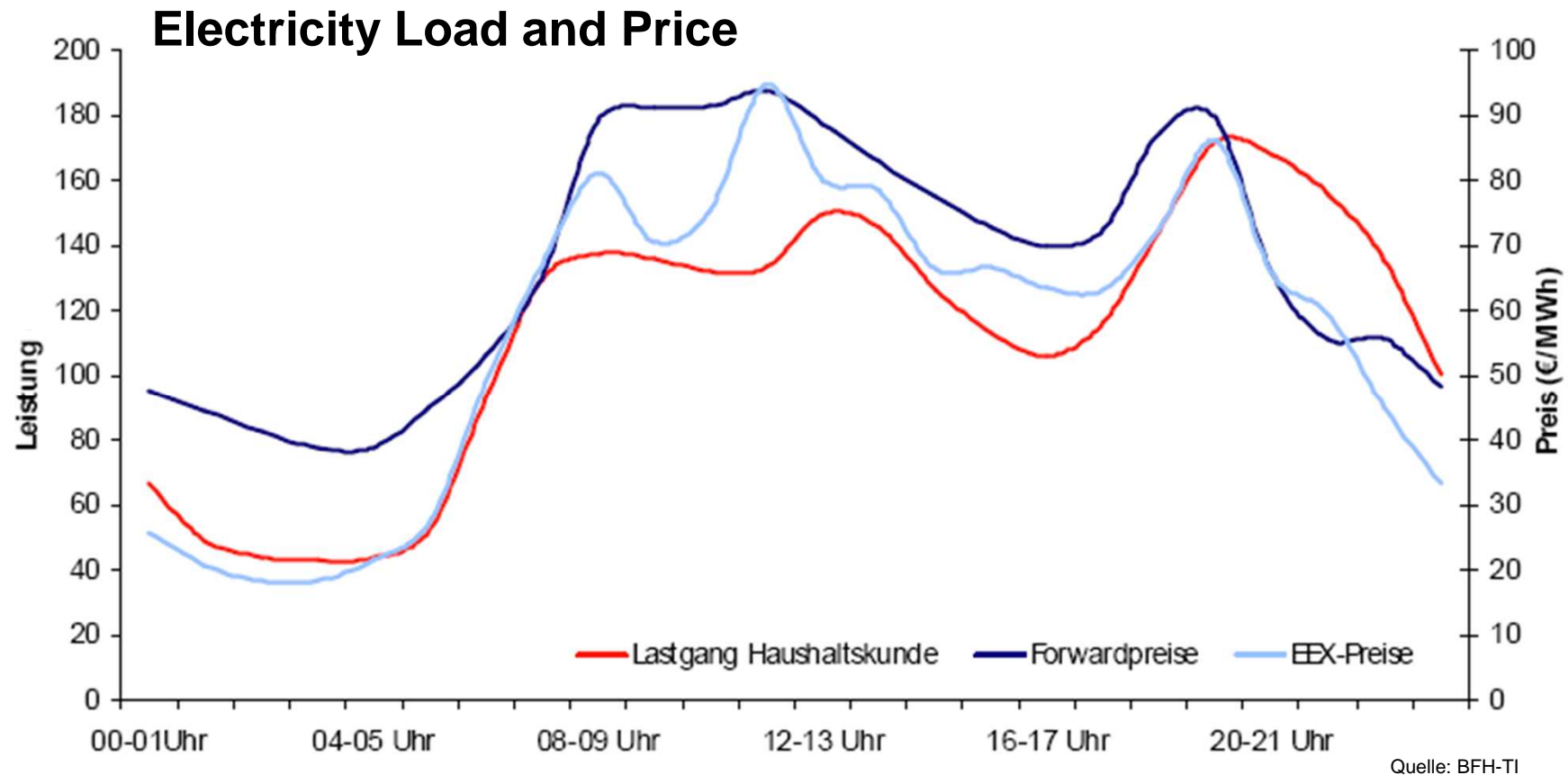
Abbildung 3.6: Anteil der durch Elektroautos substituierte Pkw aus privaten Haushalten in Abhängigkeit von der Fahrzeugreichweite



Yes, if it is done different this time:

- The individual demand for mobility is met (nearly) perfectly by the internal combustion engined car, the customer does not need Electric Vehicles
- EV "Problem 1" Range, real or emotional
- EV "Problem 2" Recharge duration, really?
- Price, could battery rental help?

The Electric Vehicle is different, not just another car type. It is a house appliance, not for traveling



1 mio EV \approx 3 GW at the "wrong" time are a problem

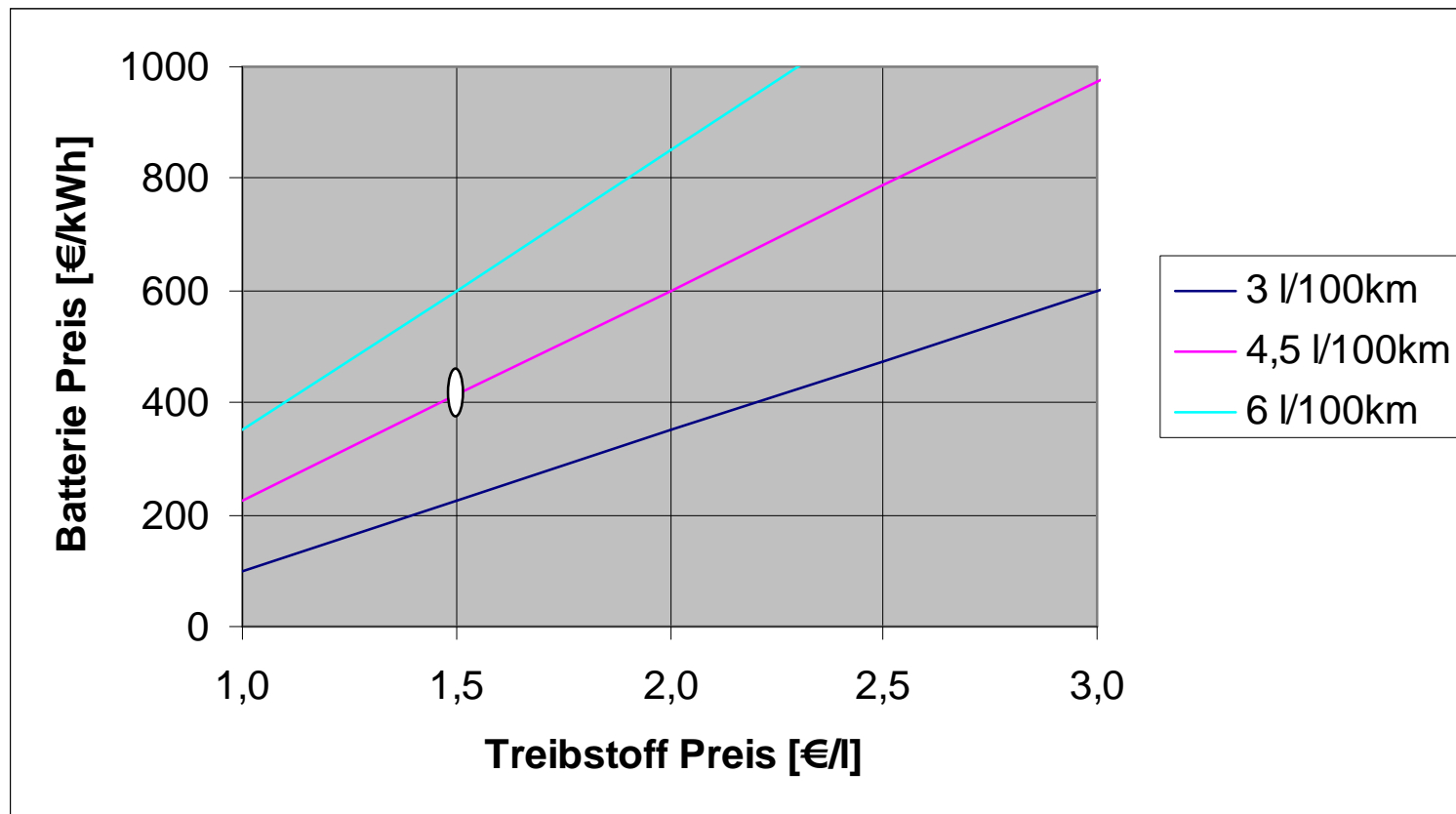
1 mio EV \approx 3 GW at the "right" time are a business

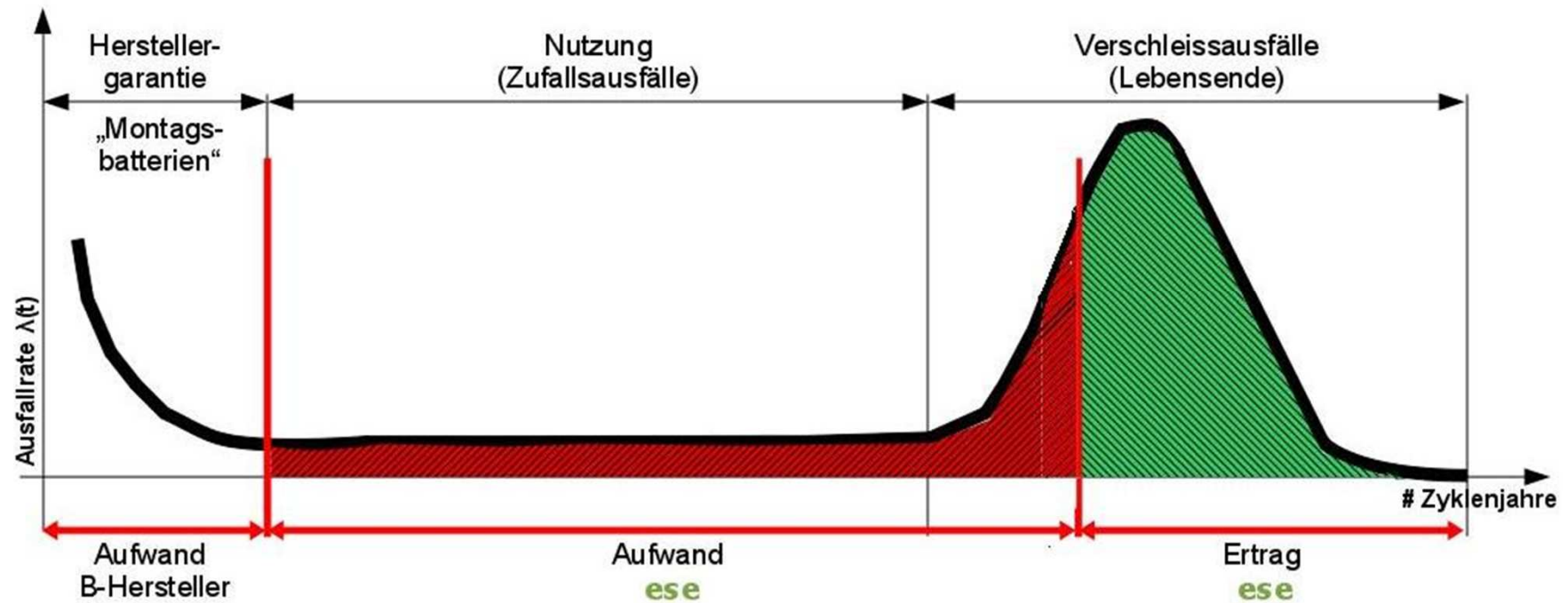
Yes, if it is done different this time:

- The individual demand for mobility is met (nearly) perfectly by the internal combustion engined car, the customer does not need Electric Vehicles
- EV "Problem 1" Range, real or emotional
- EV "Problem 2" Recharge duration, really?
- Price, could battery rental help?

The Electric Vehicle is different, not just another car type. It is a house appliance, not for traveling

1. Vehicle price without battery = Price of an ICE vehicle
2. Electricity + Battery Rental Cost = Fuel Cost





The owner takes the not known risk of his individual battery

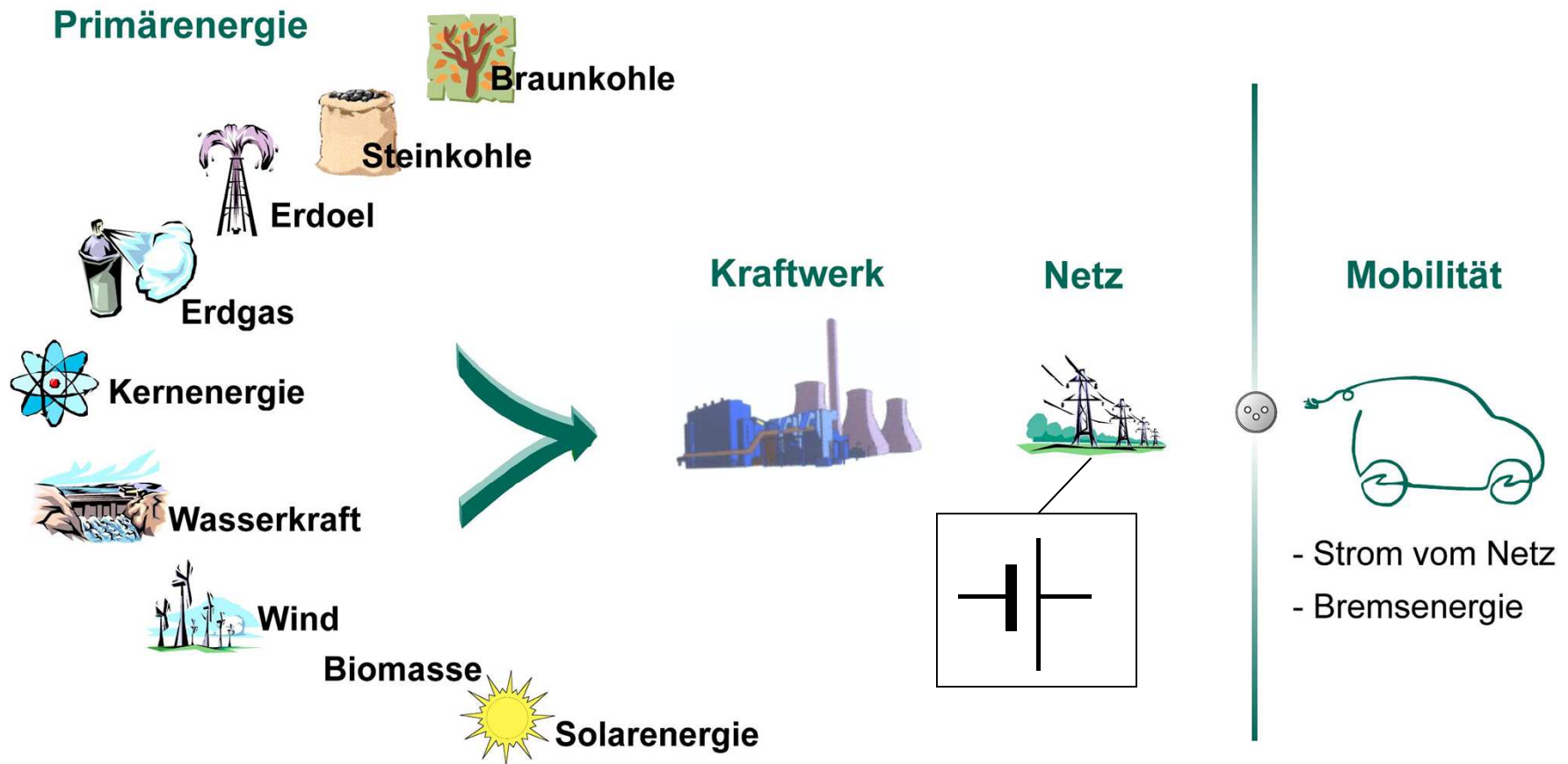
The battery rental company can calculate with the known statistical battery

Electric Vehicles are different:

- Technical
 - a) Source of Energy
 - b) Drive train
- Spectrum of usage
- Design
- Cost

Are OEM able to manage this change or new structures are required?

An der Steckdose "tanken"



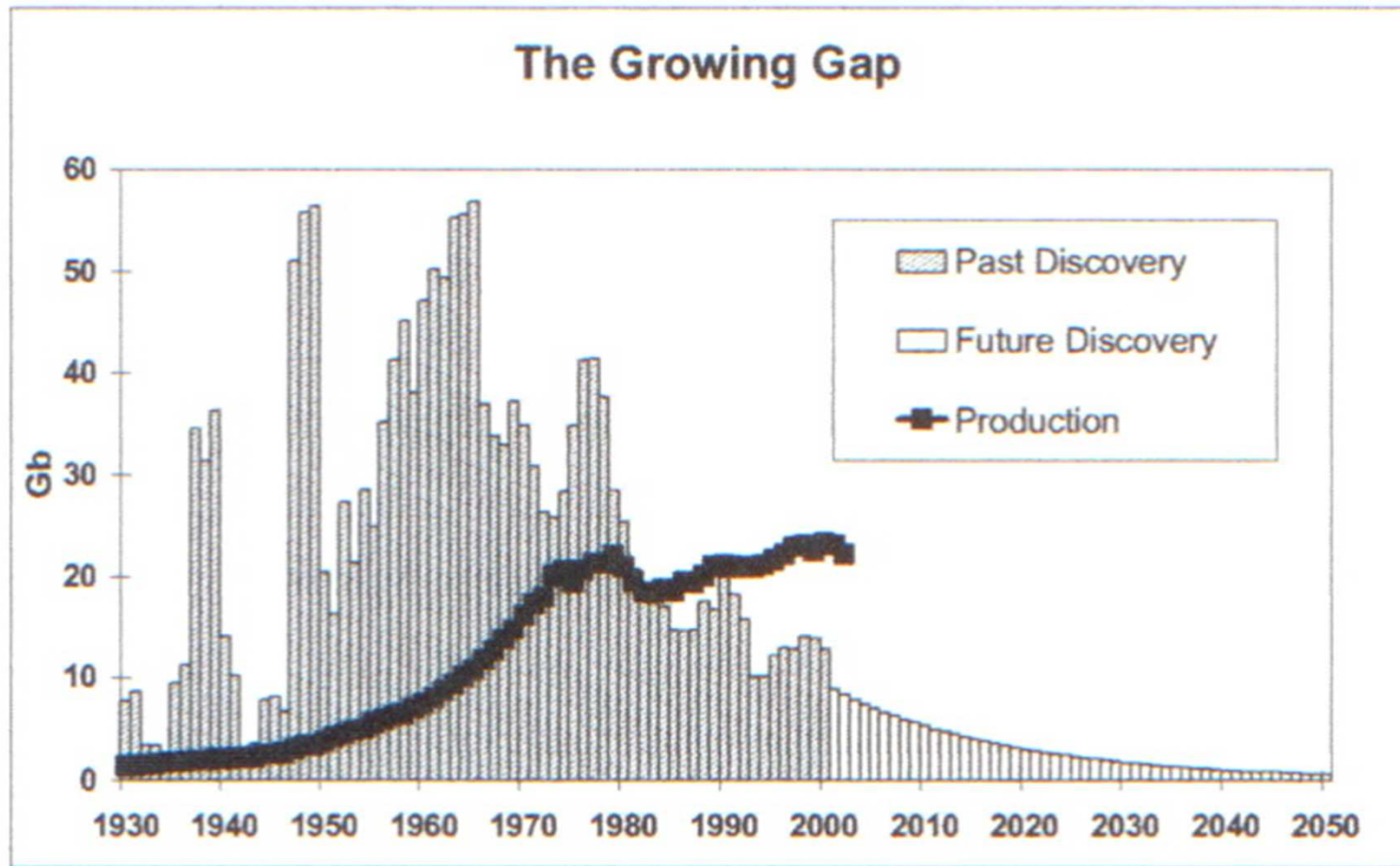


Figure 1 Discovery trends with past production and extrapolated future discovery

"Peak Oil" ist unvermeidbar

Electric Vehicles are different:

- Technical
 - a) Source of Energy
 - b) Drive train
- Spectrum of usage
- Design
- Cost

Are OEM able to manage this change or new structures are required?

Drive train

ICE

- Engine
- Carburetor/Injection
- Fuel tank
- Clutch
- Exhaust pipe
- Gire box,manual/automatic
- Starter
- Generator
- Cooling water & Oil

Electric

- E-motor with fixed transmission
 - DC/AC Inverter
 - DC/DC Converter
 - Cooling Water
 - Vacuum pump
-
- Battery 300 – 400 VDC
-
- Battery charger AC/DC

- Differential etc
 - 12 V Battery
- Hydraulic brake system
 - Heating system
- Safety

Electric Vehicles are different:

- Technical
 - a) Source of Energy
 - b) Drive train
- Spectrum of usage (universal versus urban)
- Design
- Cost

Are OEM able to manage this change or new structures are required?

Electric Vehicles are different:

- Technical
 - a) Source of Energy
 - b) Drive train
- Spectrum of usage (universal versus urban)
- Design
- Cost

Are OEM able to manage this change or new structures are required?



Top-Down Strategy ?
Improves Image, but
remains a niche



1998

Conversion



Practical use but is
regarded as old in the
meantime

December 07, 2011



VW e - up



Mitsubishi iMiEV +
Peugeot Ion

Start to be available, but very expensive

Will the price be reduced to market acceptance ?

Electric Vehicles are different:

- Technical
 - a) Source of Energy
 - b) Drive train
- Spectrum of usage (universal versus urban)
- Design
- Cost

Are OEM able to manage this change or new structures are required?

Are OEM able to manage this change ?

What is the position of traditional utilities ?

or

**Will new structures/companies grow up from this
change ?**

Utilities are faced with an important structural change for the next decades. Until now central electricity production followed the demand, whereas in future renewable energies will be introduced which are variable and require buffer storage.

**EV are standing 90% of the time and can be connected
to the grid**

Synergy: V2G = vehicle to grid

S2G

Renewable Energies + Electric Vehicles =

Mobility without CO₂

A Real Vision