



Bundesministerium
für Umwelt, Naturschutz
und Reaktorsicherheit

Electric Mobility, Renewables and Grid integration

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Nature Conservation and Nuclear Safety
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Framework:

National Development Plan

Electric Mobility

- is a joint activity by the Federal Ministries for Economics, Transport, Environment and Research



- was put up for discussion with industry leaders and stakeholder groups at a National Strategy Conference held in Berlin in November 2008
- was approved by the Federal Government in August 2009

Fields of Action



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Research and Development

- **Energy Storage:** Safe and affordable batteries providing strongly increased energy and power density as well as unsurpassed levels of lifetime and safety. A focus shall be put on recycling of raw materials.
- **Vehicle Technology:** Novel components, drive trains and vehicle concepts. Major topics are electric machines, power electronics, efficient auxiliaries and safety systems.
- **Power Grid Integration:** Vehicle based devices adapting the charging process to peaks of power availability (1st phase); ICT solutions for bidirectional charging enabling the use of vehicle batteries for buffer storage of fluctuating power supply from renewable sources (2nd phase)

Fields of Action



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Framework Conditions

- **Renewable Energies:** Electricity used for electromobility shall be completely derived from renewable sources to ensure that electric vehicles are true zero emission vehicles that help Germany to accomplish the targets the EU Renewable Energy Directive (10% of energy for transport from renewable sources by 2020). It may require additional generation of wind and solar power.
- **Mobility concepts:** demonstrations ,field operational tests
- **Charging infrastructure**
- **Standardization** of e.g. plugs to ensure interoperability
- **Regulations** for e.g. handling of batteries
- **Education, Training and Employment**

Implementation



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Phase 1 (Preparation of technology - 2009-2011):

Economic Stimulus Package

500 Mio. Euro R&D funding for electromobility

- R&D Network Electromobility (Fraunhofer Gesellschaft)
- R&D in battery cell technologies (BMBF)
- R&D ICT solutions for charging, billing and grid integration (E-Energy BMWi, BMU)
- R&D Vehicle technologies (BMWi)
- Field tests for passenger cars and vans (Berlin, BMU)
- Model Regions Electromobility (busses, bikes, charging spots - BMVBS)
- Safety test center for batteries (BMVBS)
- Pilot plant for battery recycling (BMU)
- Diesel hybrid busses (BMU)

Implementation



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Phase 2 (Scaling up - 2012-2016):

- Mass production of Li ion batteries
- Manufacturing of plugin hybrids and electric vehicles
- Established charging infrastructure
- **Electromobility linked to renewable sources**
- Incentives for early private owners
- R&D on advanced technologies
for energy storage, traction , control

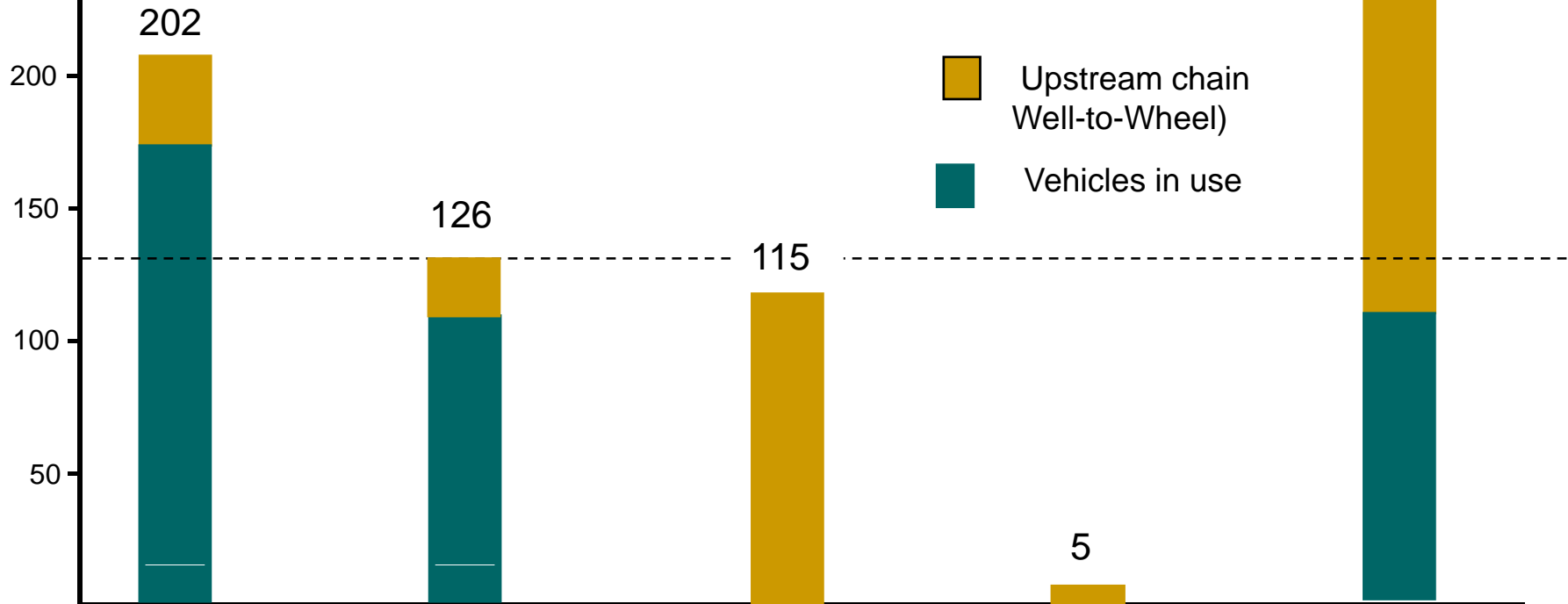
Phase 3 (Mass Market – 2017 – 2020):

- Mass production of advanced energy storage systems
- Mass production of dedicated 2nd generation electric vehicle
- Full coverage with charging spots
- 1 Mio plugin hybrid and electric vehicles on the road



CO₂ emissions for different energy paths

CO₂
[g/km]



Passenger cars
– new vehicles D
2007¹⁾

Efficient diesel
engine 2010²⁾

Electric
vehicles with
electricity mix
D 2010³⁾

EVs with
electricity from
renewables
2010³⁾

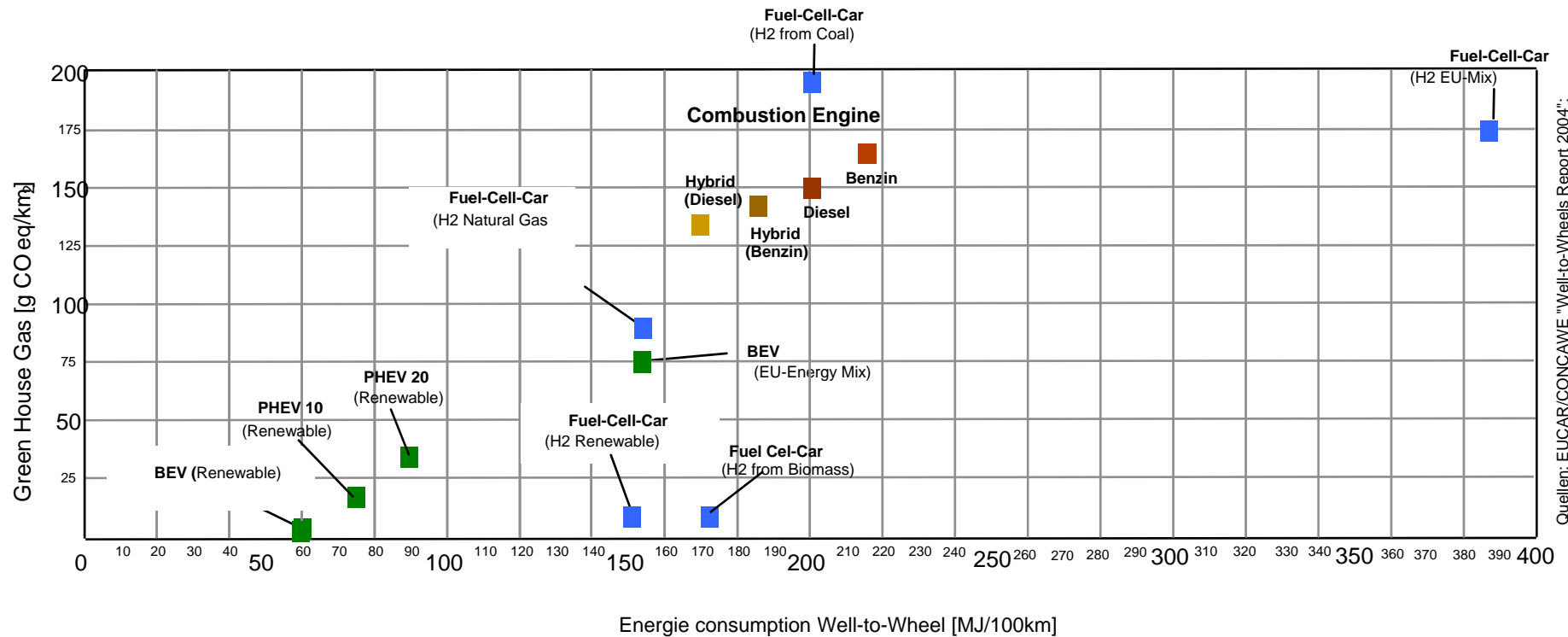
Carbon-based
diesel (CtL)

1) Source: KBA, conventional fuel

2) Consumption: 4 l/100 km, conventional fuel

3) Electricity needed: 18 kWh/100 km

Well-to-wheel comparison of different car concepts



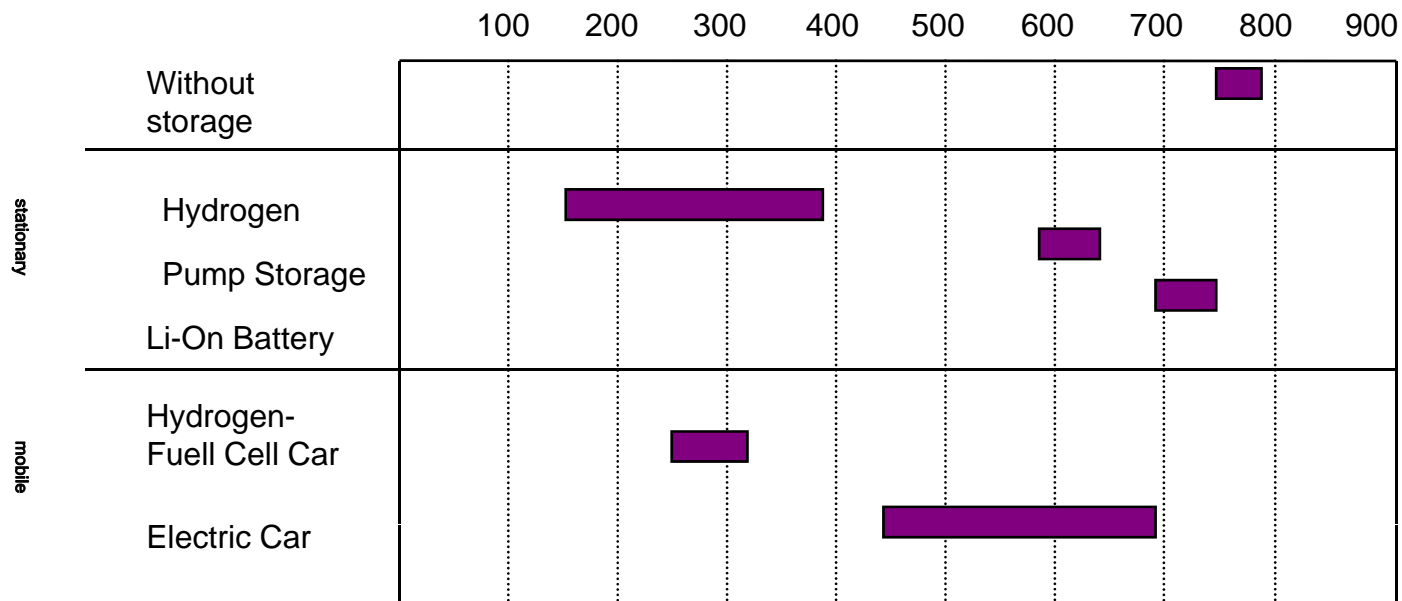
Quellen: EUCAR/CONCAWE "Well-to-Wheels Report 2004";
 Optiresource, 2006 Referenzklasse: VW Golf

*GHG: Green House Gas



Storage Efficiency

Greenhouse Gas savings for 1 kWh of electricity stored (g/kWh)





R&D: E-Energy Projects of BMU and BMWi



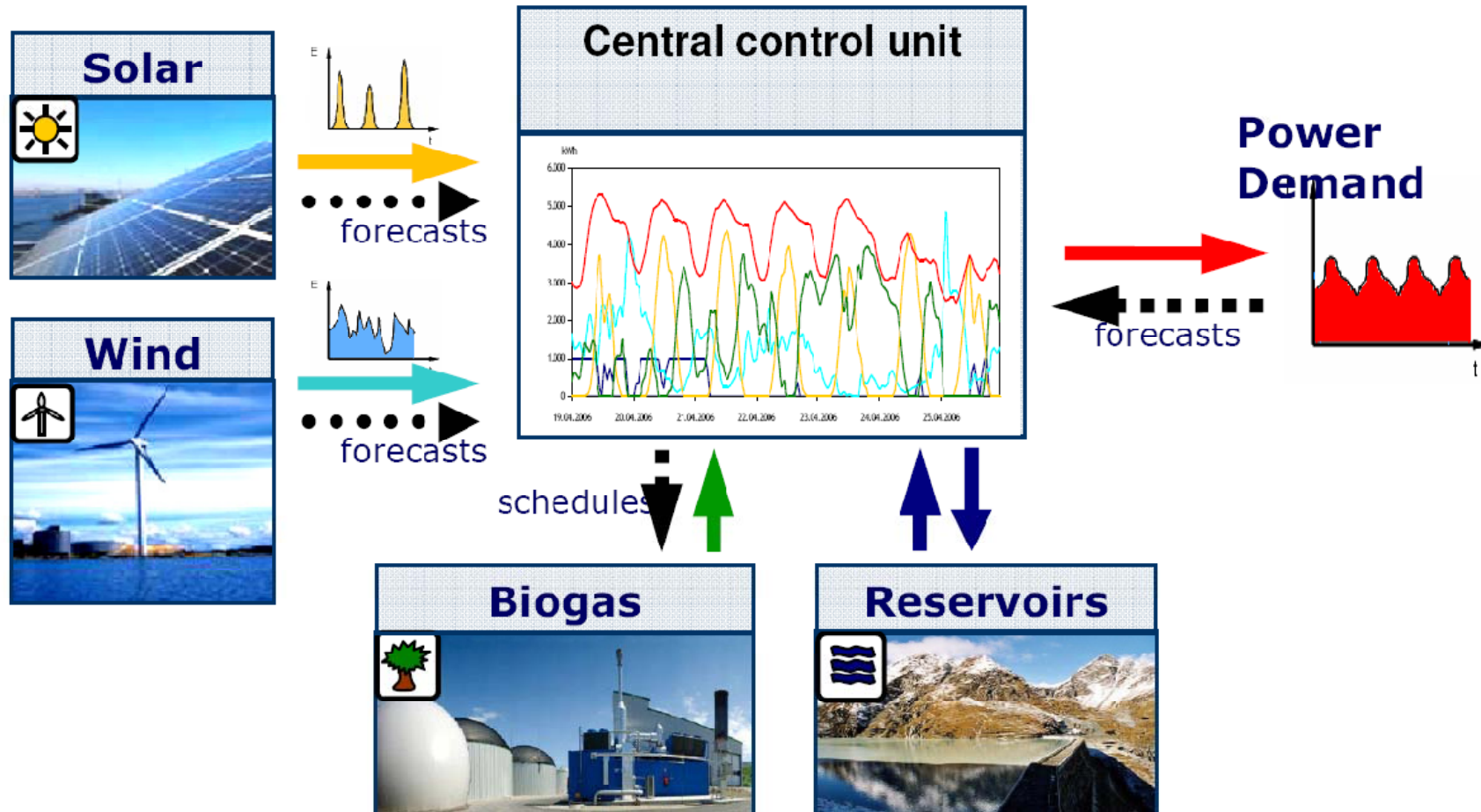
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- 8 Model Regions
- Funding of 57 Mio. € from 2009-2011
- Aim is to develop and test key technologies and services for integrating electric and hybrid vehicles into existing energy and transport grids with the help of modern information and communication technology.
- ICT-based charging, control and billing infrastructures
- potential of electric vehicles as mobile energy storage devices
- ICTcontrolled charging and discharging of vehicle batteries depending on electricity supply and demand
- potential of electric vehicles to provide storage and grid services for power supply to private households in peak load periods (smart home)

Combined Power Plant



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Incentives



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- **Renewable Energy Sources Act (EEG)**
- **priority connection** of electricity from renewable energies to the electricity supply grids
- a **consistent fee** for this electricity paid by the grid operators
- Section 64 (1): Measures for improved integration of electricity from renewable energies
- **Bonus fee** for a Combined Power Plant (eg wind + storage), if it balances out the natural fluctuations of renewable energies
- EV are the most efficient *short term* storage option. However, it will be a real challenge to organise



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Thank you very much!



For more information see:

www.bmu.de/verkehr/elektromobilitaet/doc/44795.php