



Clean Energy Partnership CEP

A public-private partnership preparing for commercialization

A lighthouse project within the National and Hydrogen Fuel Cell Technology Innovation Program (NIP)

Dr. Hartmut Behr
Director Sepecial Projects
TOTAL Deutschland GmbH

Auto Mobil International, Leipzig, March 31st 2009



Why Hydrogen?

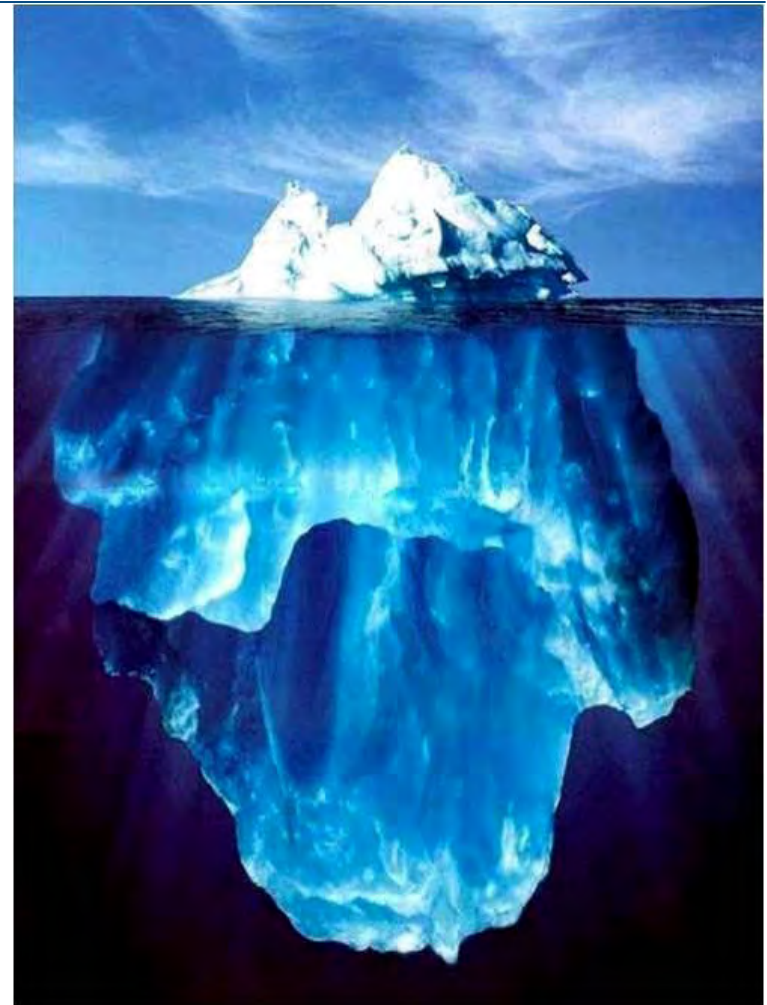
- *Hydrogen is a clean energy source which is odourless, invisible and non-toxic*
- *The availability of hydrogen in bound consistency is almost unlimited. Through the use of energy together with electrolysis or steam reforming hydrogen can be separated from its compounds*
- *Hence hydrogen can be made from renewable energy sources by using electricity*
- *Hydrogen allows the utilisation of sustainable energy within the public transportation field*
- *The usage of hydrogen does not produce any carbon dioxide emissions*





The fuel of the future

- *Reduce emissions*
- *Increase energy efficiency*
- *Safeguard commercial viable options*
- *Ensure energy supply through diversification*





CEP – A lighthouse project within the NIP

- *Common approach across branches, research and action for an emission-free future of cars and busses*





National Innovation Programme Hydrogen and Fuel Cell Technology

Market preparation:

- *200 M€ public funding focus R&D
BMW (Federal Ministry of
Economics)*
- *500 M€ public funding focus demo*
- *BMVBS (Federal Ministry of
Transport, Building and Urban
Affairs)*
- *700 M€ private contribution*
- *1.400 M€ total budget*
- *2007-2016*





CEP – strong partners of all industrial sectors

The German federal Government

Energy and Technology:

Linde

Shell Hydrogen

StatoilHydro

TOTAL

Vattenfall Europe

Car manufacturers:

BMW

Daimler

Ford

GM/Opel

Volkswagen

Public transport companies:

Berlin: BVG

Hamburg: Hochbahn



Partners energy and technology

- Linde
- Shell Hydrogen
- StatoilHydro
- TOTAL
- Vattenfall Europe





Partners mobility

- *BMW*
- *Daimler*
- *Ford*
- *GM/Opel*
- *Volkswagen*



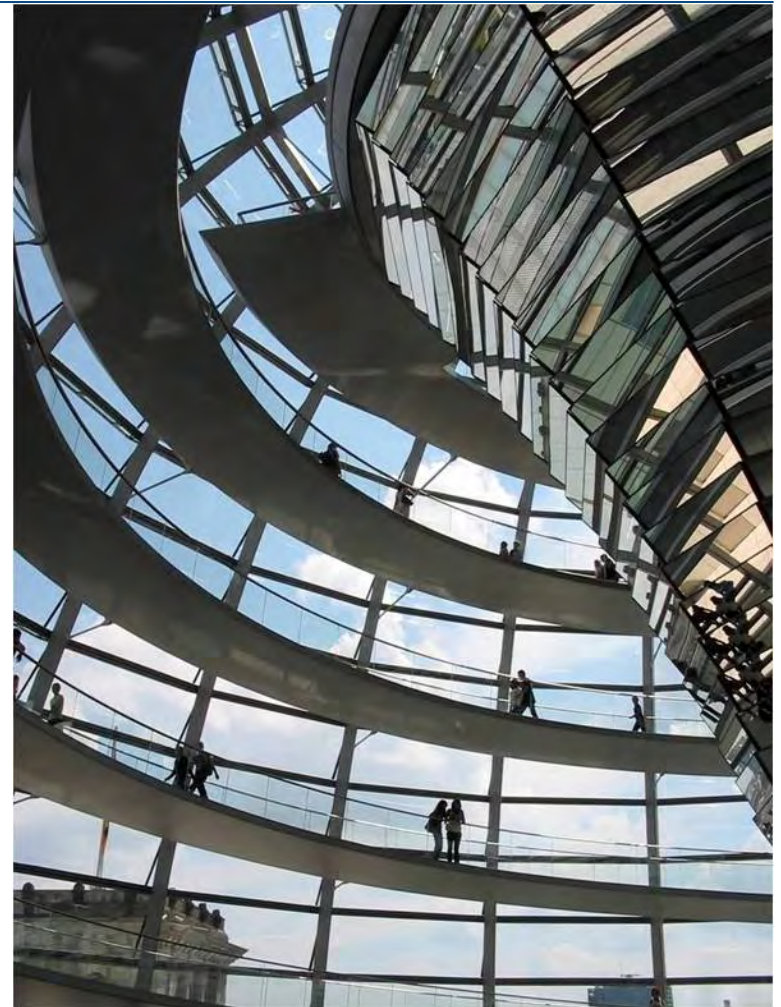
Public transport partners

- *Berliner Verkehrsbetriebe BVG*
> is operating 14 hydrogen busses with gaseous hydrogen in regular Berlin service
- *Hamburger Hochbahn HVV*
> operates 9 fuel cell busses in regular service in Hamburg
- *All within HyFLEET:CUTE*





Political influence challenging industry



Requirements of Future Energy Supply



Avoid/ reduce emissions



Increase efficiency



Secure fuel/ energy supply by
 diversification

*Global
 Competition*

Hydrogen and Fuel Cell Technologies offer huge potentials to support these goals!



Market Preparation Programmes



The German National Innovation Programme (NIP) has a similar structure like the European counterpart, the JTI



The NIP follows the concept of public-private-partnership meaning that industry, research and politics invest in and manage common activities

Clean Energy Partnership

CEP

CEP 2003 – 2007

Technologywise one of the most versatile projects in Europe



A lighthouse project within the National Hydrogen and Fuel Cell Technology Innovation Program





CEP 2003 – 2007

Technologywise one of the most versatile projects in Europe

- *More than 400.000 driven kilometres with hydrogen*
- *More than 3000 H2 fuellings*
- *Two new partners*
- *Sustainable increase of existing stations and cars*



Clean Energy Partnership

CEP

Technology update: Alteration of liquid hydrogen dispenser to Automotive Fuelling System



A lighthouse project within the National Hydrogen
and Fuel Cell Technology Innovation Program



Clean Energy Partnership

CEP

Technology update: Producing gaseous hydrogen through LPG steam reforming



A lighthouse project within the National Hydrogen
and Fuel Cell Technology Innovation Program





2008 – 2010

CEP becomes a European lighthouse project and creates one of Europe's largest hydrogen regions

- *New partners:
Shell Hydrogen and
Hamburger Hochbahn
AG*
- *Upgrade of cars and
fuelling infrastructure*
- *Five new stations
planned*
- *Validating technology*



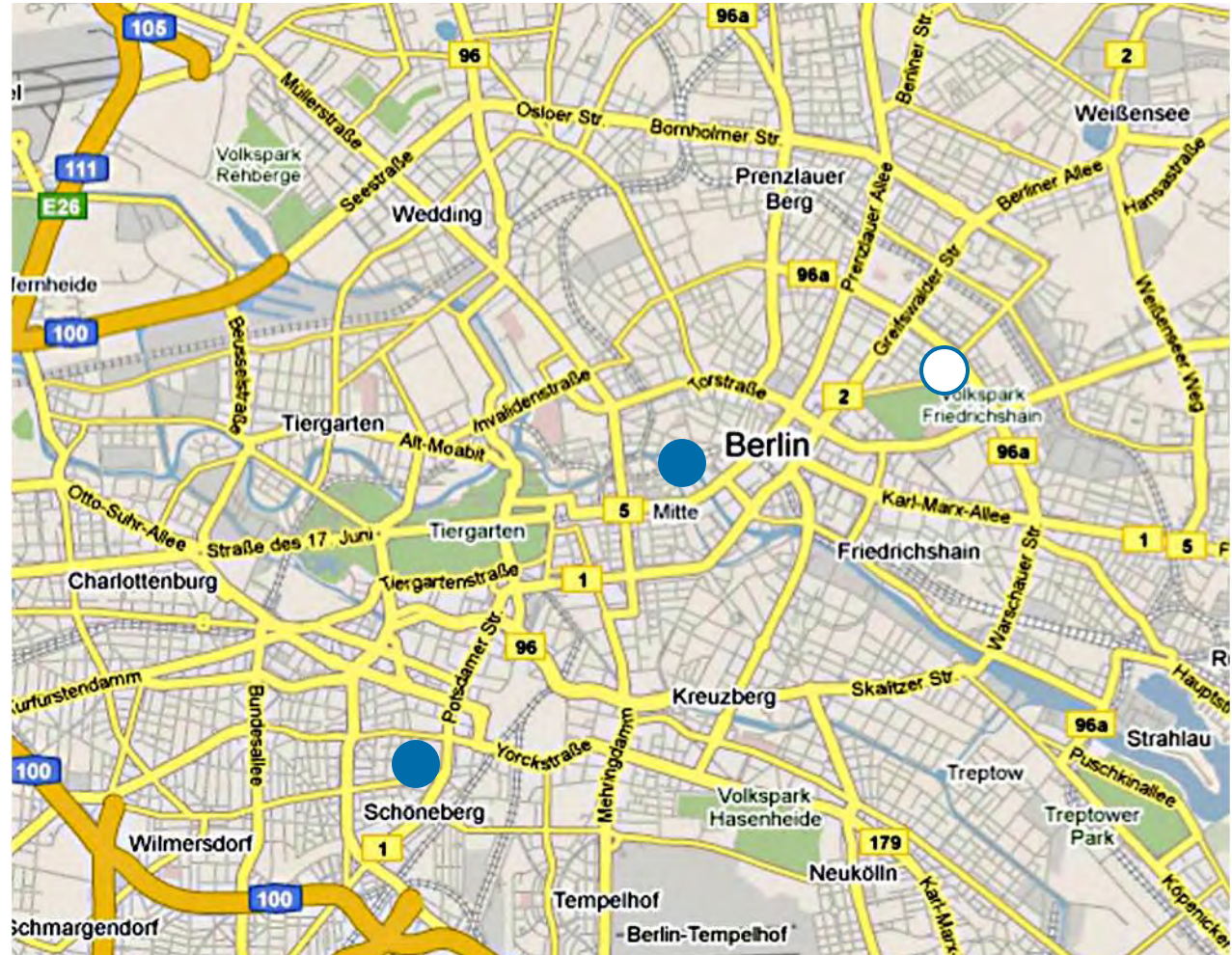


Technology update September 2008: First public station in Berlin with 700 bar fuelling system



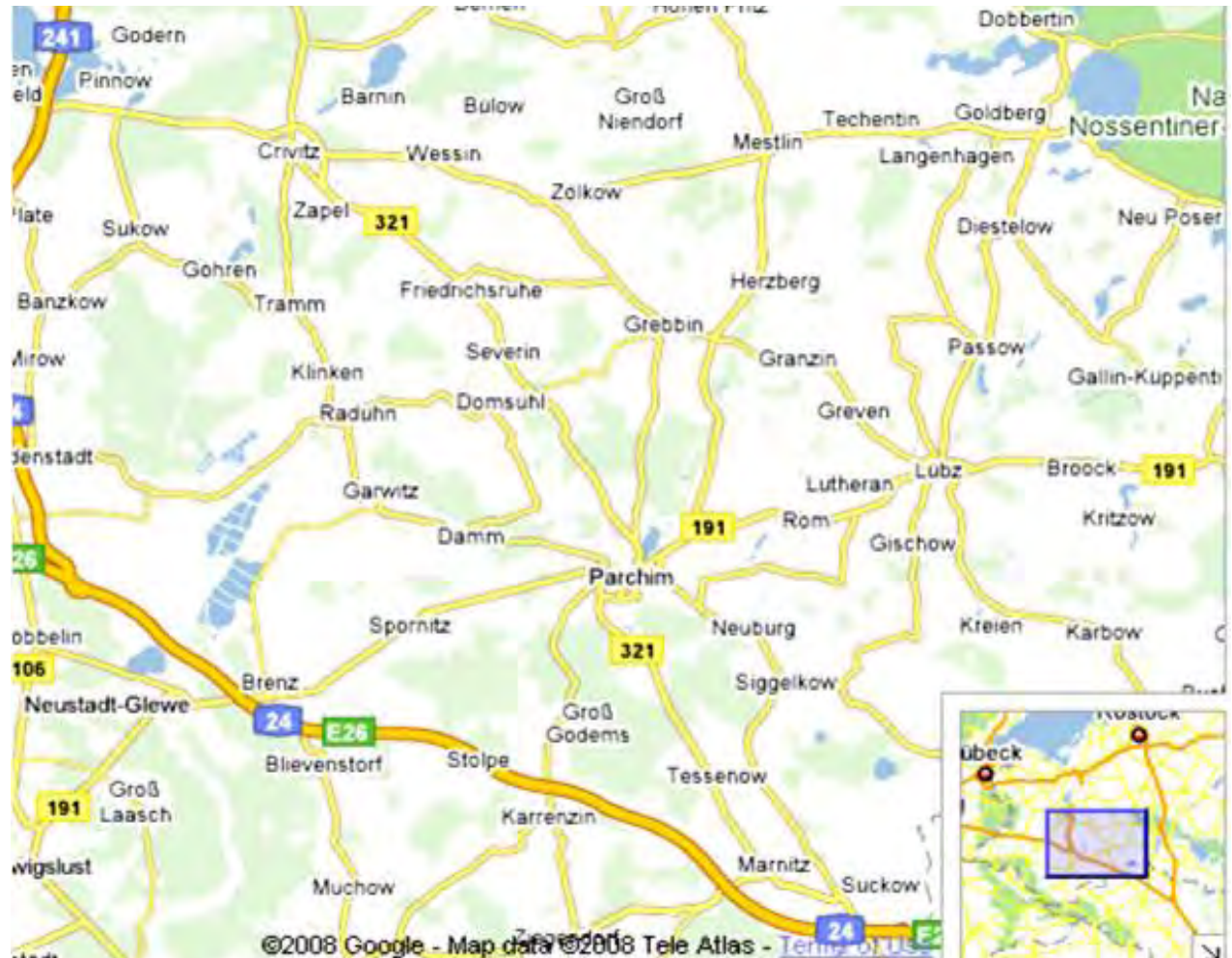
Planned infrastructure of CEP in Berlin

- *Friedrichshain (temporary)*
- *Berlin-Mitte*
- *Berlin Süd*



Planned infrastructure of CEP from Berlin to Hamburg

- *Stolpe (Mecklenburg-Vorpommern)*
- *Hydrogen from wind power*
- *TOTAL motorway station*





New cars and more cars

- *Planned cars for phase II:*
- *GM Opel HydroGen4*
- *BMW Hydrogen7*
- *Ford Focus Fuel Cell*
- *Daimler B-Class F-Cell*
- *VW Tiguan HyMotion3*





Fuel Cell & Battery-Powered Electronic Vehicles

- *Two technologies which are not mutually exclusive*
- *The partner of CEP researching simultaneously in fuel cells as well as in battery-powered vehicles*
- *Both technologies can be perfectly combined (ex. a hybrid series together with a fuel cell as a range extender)*
- *The research and development of the fuel cell offer a variety of synergism as battery technology and electric motors are essential parts for them*





Fuel Cell & Battery-Powered Electronic Vehicles

Advantage of hydrogen:

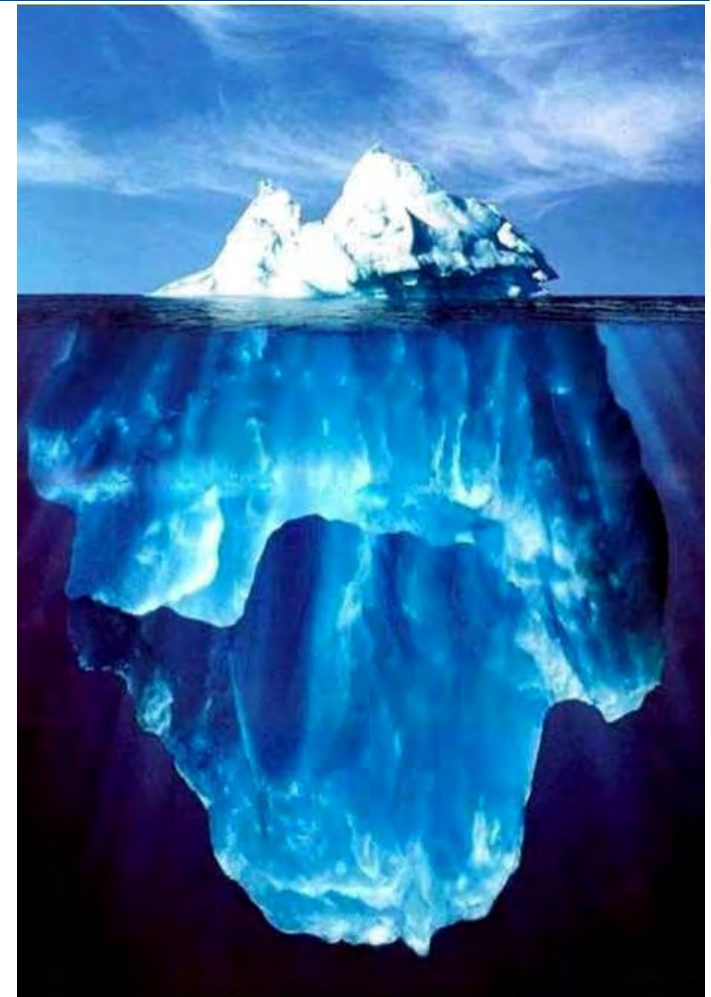
- *Fast refuelling*
- *Range*
- *Suitable for an energy accumulator as energy can be stored for an unlimited period of time*

Disadvantage of hydrogen:

- *An extensive and expensive building up of infrastructure*
- *Higher costs of system components (ex. facilities, equipment etc.)*

Technology challenges

- *Efficient hydrogen production technologies*
- *Infrastructure build-up*
- *Available cars at reasonable prices*
- *Efficient, cheap and light storage of hydrogen*
- *Measurement of hydrogen sufficient for sales and taxation*



Challenges in international politics

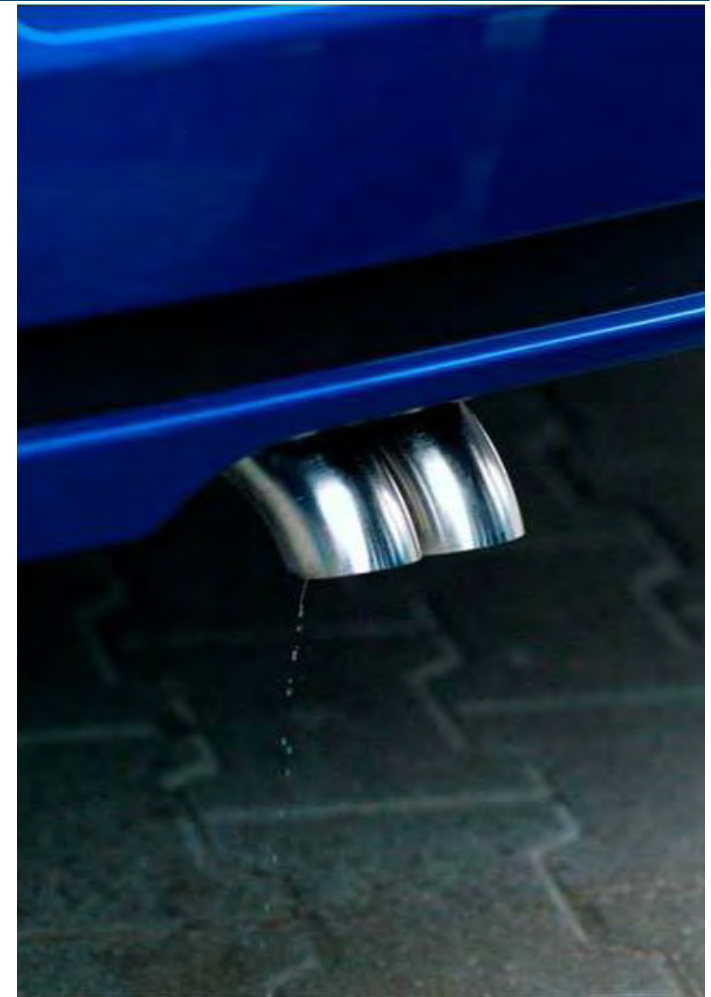
- *Consensus on EU- and global level regarding frame conditions, rules, regulations and authorizations*
- *Legislation for hydrogen distribution and the operation of hydrogen fuelling stations and vehicles*





The A-quartet

- *Accessible energy at*
- *Affordable prices with*
- *Acceptable impacts and*
- *Adequate return for investors*





DAIMLER



StatoilHydro



VOLKSWAGEN
AKTIENGESELLSCHAFT