



The HyFLEET:CUTE Project 2006-2009

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and

HyFLEET: CUTE

Operation of 14 H₂ powered Internal Combustion Engine MAN buses in Berlin (Germany)

Continuous operation and optimization of existing H₂ filling stations and build-up of Berlin H₂ filling station





Project Objectives



Reduce energy and fuel consumption

of the whole transport system



Provide information and recommendation to EC on possible future energy and environmental policy impacts of H_2 transport energy systems



Education and training of new EU member states on the advantages of H_2 in either Fuel Cells or ICE



Inform key decision makers in Industry, Government and the Community on impacts of possible future H_2 transport energy systems





HyFLEET:CUTE Achievements of the Worlds Largest Hydrogen Powered Bus Fleet



HyFLEET:CUTE Achievements of the Worlds Largest Hydrogen Powered Bus Fleet

Quality & Safety and Environmental Impact

- Nil Accidents
- > 1 million liters diesel replaced
- 79% Share of renewable energy used for on-site H₂ generation

Dissemination & Communication

- Global outreach
- 67 thousand unique visitors to Website/
- 2000 viewings of Project video
- 800 Subscribers to News Service

from 95 different countries





Buses

- HyFLEET:CUTE demonstrated that funded projects are necessary to advance the technology towards commercialization.
 - FC lifetimes of the fuel cells of greater 5000 hrs were reached, need to improve to meet customer expectations. Similar holds true for some non-FC components.
 - ICE naturally aspirated engines performed well, turbocharged engines have some issues to be resolved.

Infrastructure

- Operation of fueling stations for up to 14 buses showed good reliability, but also improvement potential.
 - Acceleration in technology development necessary
 - Large scale refueling station projects to be defined in order to support large hydrogen bus fleets with higher hydrogen throughput.

Be CHIC and network!

HyFLEET: CUTE

- New project CHIC, 2010 2016
 (Clean Hydrogen In European Cities)
 - 5 project sites with public refueling facilities open for cars
 - 4 associated sites with ongoing activities ("Phase 0 regions")
 - Links to "Phase 2 regions" that have projects in the pipeline and want to learn
 - \rightarrow Continuity and information exchange
- Because it's far more than innovative technology.





Outlook



The Clean Energy Partnership (CEP)



Joint Innovation for an Emission-free Future





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

- Emerged from the "Transport Energy Strategy" (VES)
- Established in December 2002 as a joint political initiative lead-managed by the German Ministry of Transport and Industry
- Goal is the common approach across industries, research and action for an emissions-free future of cars and buses
- Demonstration of hydrogen as a fuel in everyday use and performance under real-life operating conditions







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

This includes

- the continuous operation of efficient hydrogen vehicles
- their fast and safe refuelling
- the clean and sustainable production of hydrogen
- hydrogen transport and storage in liquid and gaseous states
- The increasing integration of renewable energy sources







The CEP in numbers

- 13 Partners
- Over 50 cars from 6 different manufacturers by the end of 2010
- 10 fuel cell buses by the beginning of 2011
- 4 buses with hydrogen internal combustion engine
- Testing of the production process for hydrogen: electrolysis, steam reforming of natural gas, liquefaction
- 2 public filling stations in Berlin: Heerstr., Holzmarktstr.
- 1,900 cars refuelled in 2009
- 837,000 driven km with hydrogen approx. 21 times around the world...





NIP – National Innovation Programme for Hydrogen and Fuel Cell Technology

- 200 M€ public funding focus R&D, BMWi (Federal Ministry of Economics)
- 500 M€ public funding focus demo, BMVBS (Federal Ministry of Transport Building and Urban Affairs)
- 700 M€ Industry
- 1.400 M€ total budget
- Parts of the programme: Traffic/ Transport (incl. hydrogen production), stationary energy supply, special markets
- Project period 2008-2016



Nationales Innovationsprogramm Wasserstoff- und Brennstoffzellentechnologie





7 steps on the path to clean mobility









1. The CEP investigated in infrastructure.









Infrastructure

BERLIN

- Spandau (opened 2007)
- Holzmarktstrasse (opened 12.05.2010)

HAMBURG

• Start of building: HafenCity (opening planned for 2011)











2. The CEP developed new vehicles.







Ensuring clean mobility ...

- 60 Daimler B-Class F-Cell
- 13 BMW Hydrogen7
- 10 GM Opel HydroGen4
- 2 VWTiguan HyMotion,
 2 VW Caddy Maxi HyMotion,
 2 Audi Q5 HFC
- 3 Ford Focus Fuel Cell











3. The CEP growed.









International magnet effect – Japan came to Germany

Toyota joined in March 2010

- Model: FCHV-adv
- Quantity: at least 5 (from 2011)
- Drive: fuel cell
- Refuelling: gaseous hydrogen
- 700 bar
- Power: 90 kW
- Top speed: 155 km/h
- Range: ca. 830 km according to Japanese test cycle











4. The CEP is a trailblazer in technological development.







Faster refuelling

- 700 bar refuelling takes just 3 minutes
- State-of-the-art electrolysis technology
- *introduction of a fully automatic LH2automotive coupling*
- Hydrogen production
 using biomass









5. The CEP is increasingly relying on renewable energy.









Hydrogen – one element in integrating renewables!

- Increased the share of renewably produced hydrogen to 20%
- Wind turbines and photovoltaic arrays at the Holzmarktstrasse fuelling station
- Hydrogen from a hybrid power plant
- Hydrogen from biogenic waste









6. The CEP spread to other cities.









New hydrogen centres

- In May 2010, North Rhine-Westphalia became the first large state to join the CEP as an associated partner, represented by the EnergieAgentur.NRW
- In talks with Baden-Württemberg
- Strong state initiatives are being integrated; Integration of additional regions











7. As Europe's biggest demo project, the CEP actively pursued international alliances.









From Germany out into the world

Cooperation with California

• Partnership with the CaFCP for sharing insights about standardisation processes and research results

Networking with Scandinavia

• Planned expansion of the infrastructure to connect to Scandinavia in Phase III



DRIVING FOR THE FUTURE







