

CHIC₂

Phase 2 Cities/Regions Integration of H₂ Buses in Public Transport Fleets of other European Cities

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OUTLINE

- Phase 2 Cities - 15 cities interested so far
- Frankfurt via InfraserV Höchst
 - Large source of by-product Hydrogen available
 - Refuelling Infrastructure present
 - Hessen: a model region of e-mobility in Germany
- Feasibility study for Frankfurt - results
- Results expected in CHIC – Phase 1
- Strategy for Phase 2 cities

Phase 2 Cities / Regions

- Region of Abruzzo (Italy)
- Amsterdam
- Region of Amhem (Netherlands)
- Barcelona
- Birmingham
- Region of Flanders (Belgium)
- Helsinki
- Frankfurt (Region Hessen) – CHIC partner
- Region of Lazio/Rome
- Madrid
- Region of Midi Pyrenees (France)
- NRW / Cologne
- Region of Trentino (Italy)
- Turino
- Valencia

Frankfurt City

- Green city – many trees! 52% area is green
- Emission data – 40000t/a NO_x (60% Veh.); PM10-Fineparticles 2500 t/a (40% Veh.)
- City aims - EEV Standard for buses
 - 20% less CO₂ in next 10 years
- Bus fleet of 200 buses
- Diesel to Hydrogen - Feasibility study

Frankfurt Concept



Feasibility Study

200 Buses

Replace 40 Buses/year with Hydrogen
(as is done with conv. Diesel buses)

400 km/Bus/day

11 mil. Liter/yr. Diesel to be replaced
(26.4 mil. kg/yr. CO₂ emission reduced)

Capital Investment

- For fleet & Infrastructure for Hydrogen
- For fleet only for Diesel (250k€/bus)

Diesel price €1.4/liter (€0.14 /kWh) w. tax

H₂ price €0.28/Nm³ (€0.093/kWh) wo tax

H₂ bus consumes 50% of Diesel bus

Price/km for both is same

IF H₂ bus costs 350k€/bus (40% more)

Expected Results – Phase 1

- H₂ consumption <13 kg/100 km. (20-24 before)
 - Cost gap is reducing/closing with time
 - Maintenance costs reducing as well
 - Operation time is increasing
 - Fossil fuels will be scarce & more expensive
- ➔ Replacement with Hydrogen is feasible
CHIC will reduce ‚Time to market‘

Phase 2 Cities

- Present status of public transport
- Local (regional) strategy on climate, emissions
- Regional authorities and Stakeholders
- Regulatory barriers!
- Infrastructure possibilities
 - Present status
 - Hydrogen source/production
- Feasibility Study
- Commercialisation Plan

Concluding Remarks

- Experience so far and CHIC phase 1 will be providing results necessary for commercialisation
- CHIC phase 1 – stepping stone for transforming public bus fleets to Hydrogen
- Other potential services will be considered as well e.g. airport ground transportation.

Frankfurt Service Station



Contact Points - Hessen

- Ministry of Environment Hessen
 - Executive body-Hessen Agentur, Wiesbaden
- Department of Environment, City Frankfurt
 - City Administration (Mayor)
 - Dept. of Economic Development
- Public Transport Organisations
 - VGF, ESWE
 - TraffiQ

Refuelling Infrastructure

