

# North Rhine-Westphalia's Way to Hydrogen Based Mobility

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**Fuel Cell and Hydrogen Network NRW**





- **Non-profit organization**, working on behalf of the NRW State Government, founded in 2000, under roof of EnergyAgency.NRW

- **Political targets:**

- Climate protection
- Support the establishment of a demand oriented and sustainable hydrogen energy economy → create new working places



- More than **420 members** worldwide

- ~ 120 FC and H<sub>2</sub> projects with **120 million € funding (NRW + ERDF)** and 190 million € expenditures initiated

## Comprehensive Strategy “NRW Hydrogen HyWay“

### Topics:

- Hydrogen production
- Hydrogen Infrastructure
  - Pipeline
  - Filling Stations
- Vehicle development and deployment
- Stationary applications
- R&D and special market applications



# Hydrogen Based Mobility-

## Topics to be addressed...

- Availability of vehicles
- Sources of hydrogen
- Refueling infrastructure
- Cooperation with initiatives

# Hydrogen Based Mobility - Vehicles - Development and Demonstration



1<sup>st</sup> FC Hybrid Bus 2006



## EU Project "HyChain" with Special Vehicles 2006-2011 (I, F, E, NRW)

2 Buses until Oct 2014 (85.000 km)

2 Mini trucks (City Herten)

4 Cargo Bikes (Telekom)



NRW-NL Coop. Project 2009-2011  
2 VDL in operation since 2011 in Cologne  
Area (+ 2 Van Hool since May 2014):  
125,000 km, 17.5 t H<sub>2</sub>



## Passenger Cars since 2012

4 Daimler F-CELL (ongoing)

1 Ford Focus FCV (ongoing)

5 GM/Opel Hydrogen 4 (terminated)

5 Hyundai IX 35 (to come in 2015)

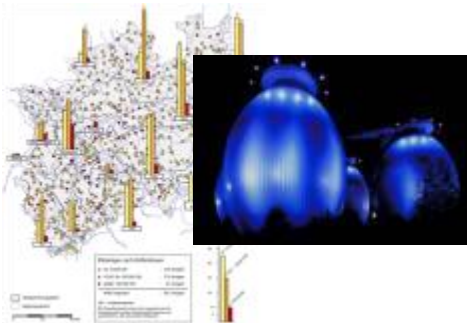
100,000 km, 1.8 t H<sub>2</sub>



# Hydrogen Based Mobility - Sources of Hydrogen



- 1) Chemical industry (existing):  
400,000 t/a (2 mio. t/a in Germany),  
mainly by natural gas reforming
- 2) By-product (existing):  
Use of significant sources of industrial by-product hydrogen mainly from large-scale electrolysis in NRW (capacity 35,000 t/a),  
sufficient for 300,000 cars or 6,000 buses
- 3) “Power-to-Gas” (future):  
Hydrogen as storage for excess wind energy by using electrolyzers, potential:  
some TWh of energy
- 4) Digester gas (future):  
Hydrogen production at water treatment plants (e.g. by reforming digester gas,  
theoret. capacity 45,000 t/a)



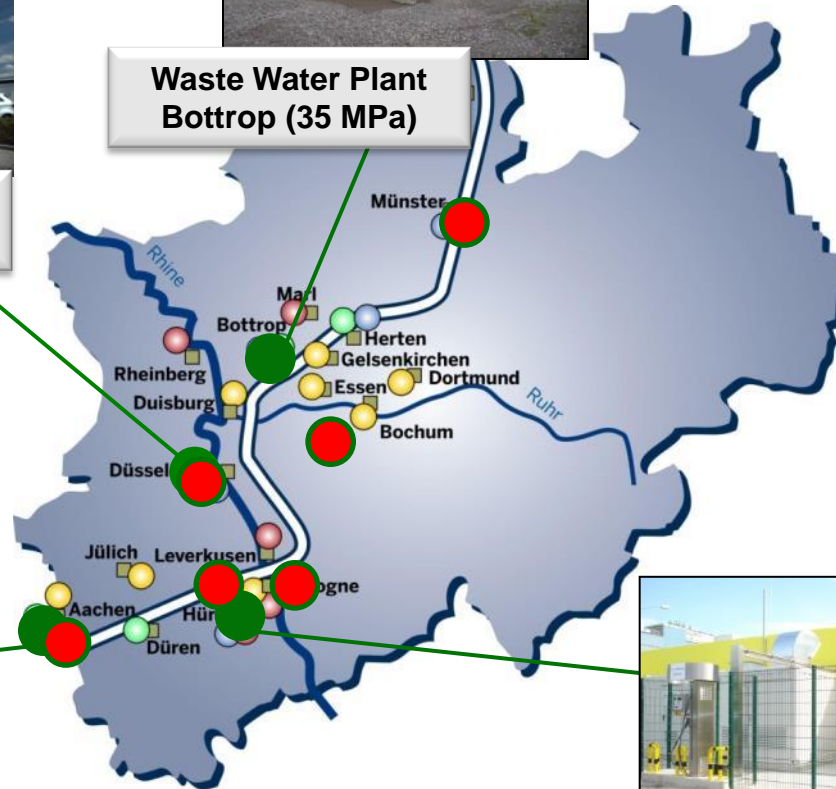
# Hydrogen Based Mobility - HRS - Infrastructure



**Automeile Düsseldorf  
(70 MPa)**



**Waste Water Plant  
Bottrop (35 MPa)**



**Ford Research Aachen  
(35 MPa)**

## **Planned 700 bar stations in 2015:**

- Münster
- Aachen
- Wuppertal
- Cologne Airport
- Cologne A4/A1
- South Düsseldorf

(with 35 MPa option)



**Chemical Park Hürth  
(35 MPa)**



## NRW – Associated Clean Energy Partnership Member (since May 2010)



## HyER – Hydrogen Fuel Cells & Electromobility in European Regions

### Topics:

- Harmonisation of regional activities across Europe;
- Initiation of inter-regional projects;
- Data collection and monitoring (Observatory)





# Things we have learned and to do now

- **Keep away from “bricolage-type” of vehicles! Risk of disappointment and loss of acceptance**
- **Public Transport has important role for FCV market introduction (high visibility) and hydrogen refilling infrastructure set-up (high H<sub>2</sub> demand) → NRW continues its participation in EU Bus Studies and Procurement Projects**
- **Infrastructure should anticipate demand from vehicles**
  - Combination of “corridor” and “cluster” distribution of sites
  - Filling stations have lots of “technical problems”: compressors, valves, control devices, communication with user terminal, gas measurement
- **Sources of hydrogen must be diversified, switch from “brown to green” hydrogen**
  - Opportunity for H<sub>2</sub> as storage of excess renewable power: “Power-to-H<sub>2</sub>-fuel”
  - Business model for small utilities as supplier of fuel
- **Co-operation with others and EU-wide harmonization of regulations and strategies is a must: Permissioning procedures, H<sub>2</sub> Gas Quality, Authorization, Payment (Roaming, H<sub>2</sub> Credit Card), 35/70 MPa-Stations, HRS Corridors**
- **Don’t discuss with the battery vehicle people! The future will show...**

**Thank you for your  
kind attention!**



 **Fuel Cell  
and Hydrogen  
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