Nationale Organisation Wasserstoff- und Brennstoffzellentechnologie

Linking the H2 Mobility Plan to EU Deployment Strategy

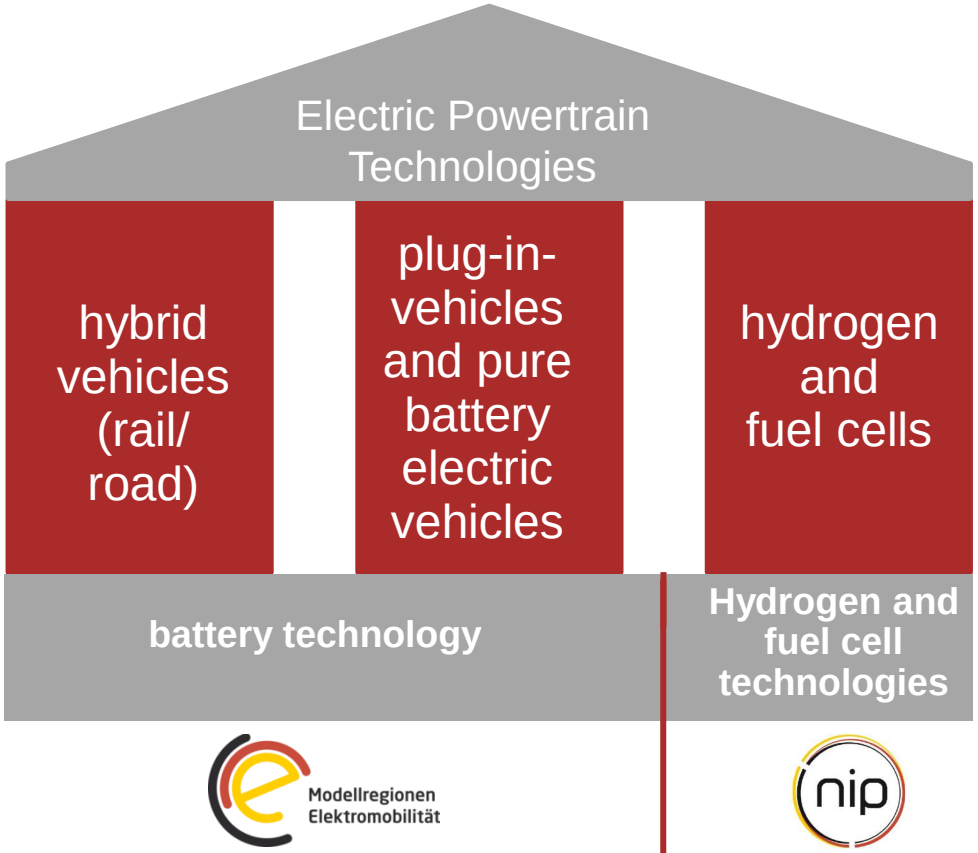
Fuel Cells and Hydrogen Joint Undertaking (FCH JU)
5th Stakeholders‘ General Assembly

Paris, October 12, 2012

Dr. Klaus Bonhoff | Managing Director (Chair)
NOW GmbH National Organization Hydrogen and Fuel Cell Technology

Market Preparation for Eletro-Mobility

Three pillars of electrifying the powertrain



500 mio. € budget (2009-2014);
- Incl. 150 mio. € BMVBS (2009-2011)
- ~ 100 mio. € (2011-2014)

1,4 bn. € budget (2007-2016)
- incl. 700 mio. € federal funding: BMVBS (500 mio. €) and BMWi (200 mio. €)

batteries

and

hydrogen / fuel cells

are

key technologies for a sustainable mobility

Gefördert durch:
Bundesministerium für Verkehr, Bau und Stadtentwicklung
aufgrund eines Beschlusses des Deutschen Bundestages
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Clean Energy Partnership – FCV Fleet

Clean Energy Partnership CEP
Ein Projekt im Nationalen Innovationsprogramm Wasserstoff- und Brennstoffzellentechnologie (nip)

Planned fleet of Fuel Cell Vehicles in CEP by the end of 2012

- 80 Daimler B-series F-CELL
- 20 Opel Hydrogen4
- 8 Volkswagen Touran, Caddy, Tiguan HyMotion, Audi Q5-HFC
- 5 Toyota FCHV
- 2 Honda FCX Clarity
- Hyundai has recently joined the CEP
- 7 Fuel Cell Busses (Evobus) in Hamburg

Clean Energy Partnership – Hydrogen Refueling Stations (HRS)

publicly accessible, 700 bar

Ein Projekt im Nationalen Innovationsprogramm Wasserstoff- und Brennstoffzellentechnologie

Hamburg, Bramfelder Chaussee Shell

Hamburg, HafenCity Vattenfall/ Shell

Hamburg, Cuxhavener Str. Total

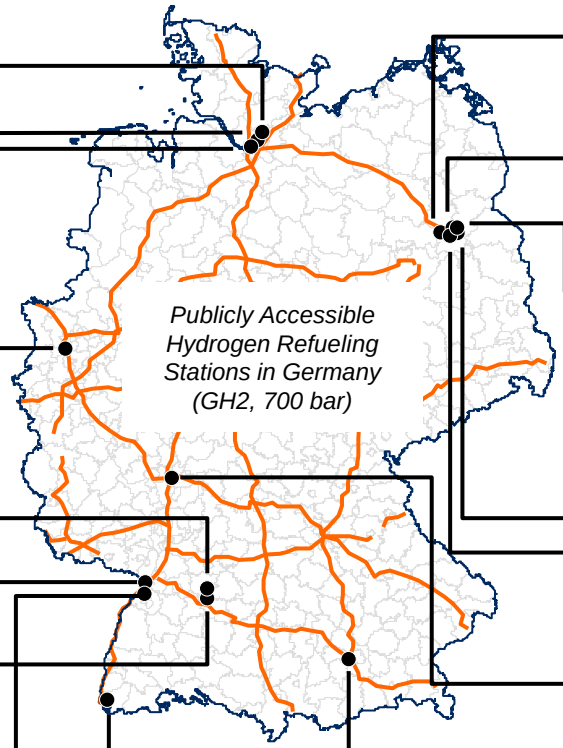
In operation — **Düsseldorf**, Air Liquide

Under construction — **Stuttgart**, EnBW

Stuttgart, Airport OMV

Karlsruhe, ENBW

Under construction — **Karlsruhe**, KIT



Freiburg, FhG ISE

Berlin, Heidestraße Linde/Total

Berlin, Heerstraße Total

In planning stage — **Berlin**, BBI Total

Berlin, Holzmarktstraße Linde/Total/ Statoil

Berlin, Sachsendamm Shell

Frankfurt (Höchst), AGIP

Munich, Detmoldstraße Total *(only LH2)*

Key achievements

- Safety of stations proven
- Refueling standards agreed
- Storage and compressor technology tested
- H_2 supply chain tested
- Bugs of station technology eliminated

Several additional stations are currently planned

The German Government has announced 50 stations until 2015

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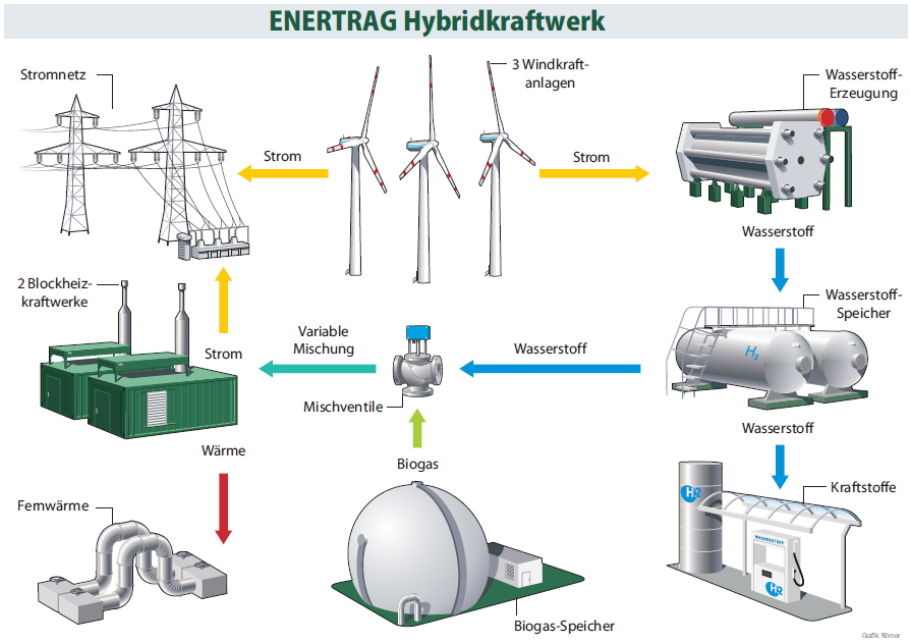
Demonstrating Wind-Hydrogen for Mobility

hydrogen as part of an integrated energy system ⟹ **renewable hydrogen as fuel**



Enertrag: Hybrid Power Plant

Total: Refueling Station at Heidestr., Berlin
First delievery of wind-hydrogen on April 18th, 2012

Germany to expand nationwide network of hydrogen filling stations from 15 to 50 by 2015

June 20, 2012

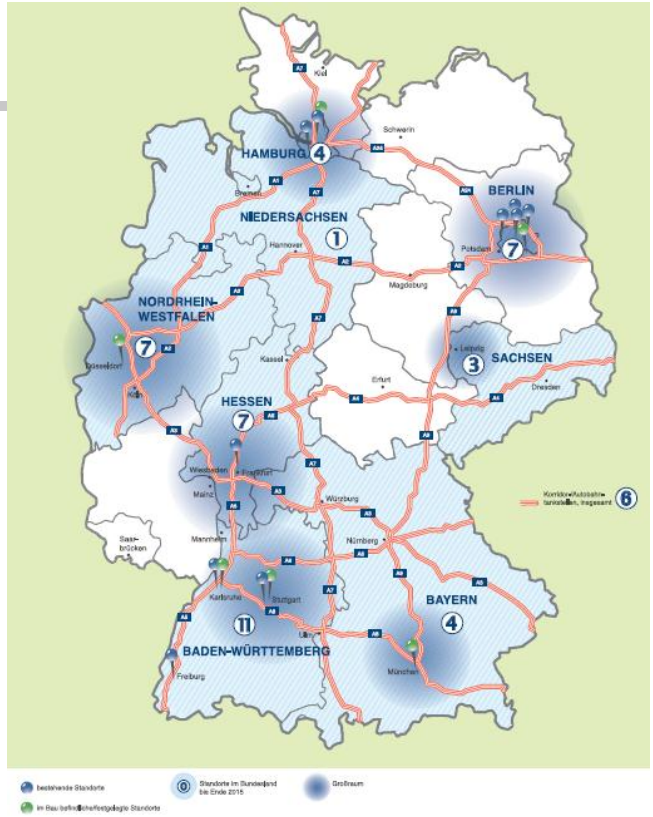
- **joint Letter of Intent to expand the network of hydrogen filling stations in Germany**
  - signed by the German Ministry of Transport, Building and Urban Development (BMVBS) and several industrial companies
  - part of the National Innovation Programme for Hydrogen and Fuel Cell Technology (NIP)
  - overall investment more than €40 million (US$51 million)

- **market-relevant testing of filling-station technology**
- **ensure a needs-driven supply for fuel cell vehicles**
- **coordination by NOW GmbH in the frame of the Clean Energy Partnership (CEP)**

Federal Ministry of Transport, Building and Urban Development

Clean Energy Partnership CEP

Ein Projekt im Nationalen Innovationsprogramm Wasserstoff- und Brennstoffzellentechnologie (nip)



„To facilitate market introduction [of fuel cell vehicles] we need a hydrogen station network covering and connecting the metropolitan regions.“

Dr. Peter Ramsauer, Federal Minister for Transport, Building and Urban Development

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Clean Energy Partnership
continued R&D for hydrogen refuelling stations

Clean Energy Partnership CEP
Ein Projekt im Nationalen Innovationsprogramm Wasserstoff- und Brennstoffzellentechnologie (nip)

	H_2 filling	H_2 quality	Leakproofness test filling system	H_2 flow measurement
Goal	*Inspect filling stations with regard to refuelling (pressure and temperature)*	*Take samples of hydrogen at filling stations and subject them to analysis/testing*	*Leakproofness of nozzle, hose and tear-away coupling*	*Calibratable hydrogen flow measurement*
Work group Participants ***[Management]***	TOTAL, GM, BMW Group, DAIMLER, VATTENFALL, EnBW	AIR LIQUIDE, Shell, BMW Group, Linde, DAIMLER, HONDA	VATTENFALL, GM, BMW Group, AIR LIQUIDE, Linde	Linde, Shell, DAIMLER, TOTAL, Ford, VOLKSWAGEN
Modelled on	• SAE 2601 / CSA 4.3	• SAE 2719 / ASTM	• SAE 2600	

➔ **Need for international harmonization**

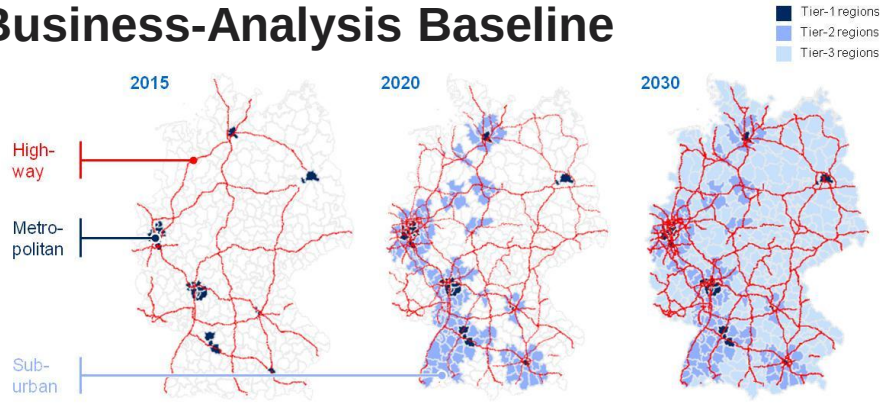
Preparing for a Hydrogen Infrastructure in Germany

H_2 Mobility

H_2 Mobility analysis participants in 2011

DAIMLER, TOYOTA, NISSAN, TOTAL, VATTENFALL, EnBW, GM, BMW GROUP, Intelligent Energy, Linde, SIEMENS, AIR LIQUIDE, OMV, HYUNDAI, KIA MOTORS, AIR PRODUCTS, NOW – Nationale Organisation Wasserstoff- und Brennstoffzellentechnologie

Business-Analysis Baseline



	2015	2020	2030
No. of FCEVs Thousands	~ 5	~ 150	~ 1,800
No. of HRS	~ 100	~ 400	~ 1,000
Total population covered by HRS Percent	~ 20	~ 60	~ 100

Hydrogen Production Pathways:

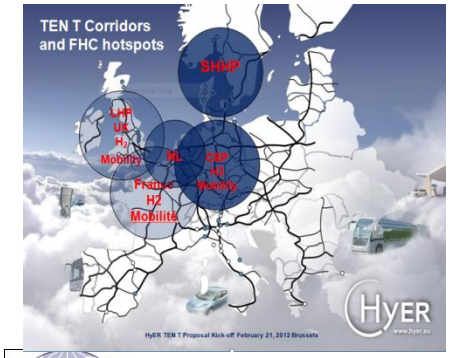
- Increasing the share of pathways based on renewable energy sources
- Reducing the specific CO_2 footprint per unit of hydrogen

European Infrastructure Activities

UK H_2 Mobility
- Assesment phase

H2-Mobility France
- In preparation

TEN-T



IPHE EU members:

Iceland; Italy; Norway; UK; Germany

Scandinavian Hydrogen Highway Partnership
- 45 HRS / 2015
- 500 cars / 2015

H_2 Mobility

CEP

- starting point: 50 HRS (within the CEP) / 2015

H2 SWISS MOBILITY
- 10-15 HRS

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Thank you very much!

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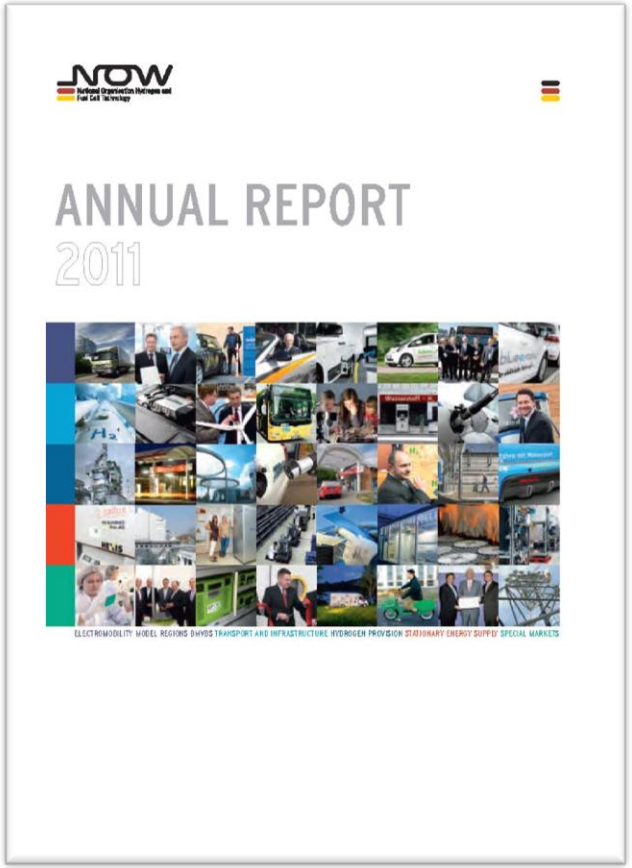

download: www.now-gmbh.de