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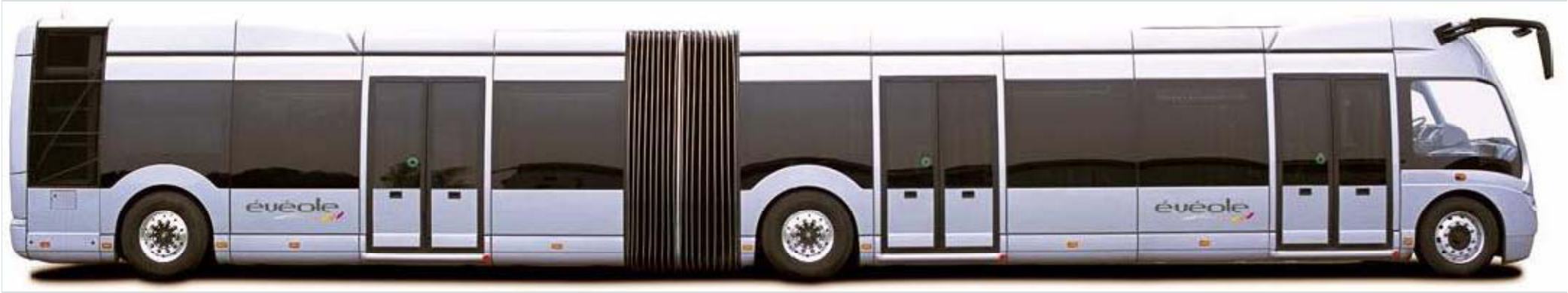

NRW Hydrogen Hyway –
Activities in North Rhine-Westphalia (NRW)

Dr. Heinz Baues
(Ministry of Economic Affairs and Energy NRW)

IPHE Implementation-Liaison Committee – Oslo, 10th March 2009

NRW – The Energy State

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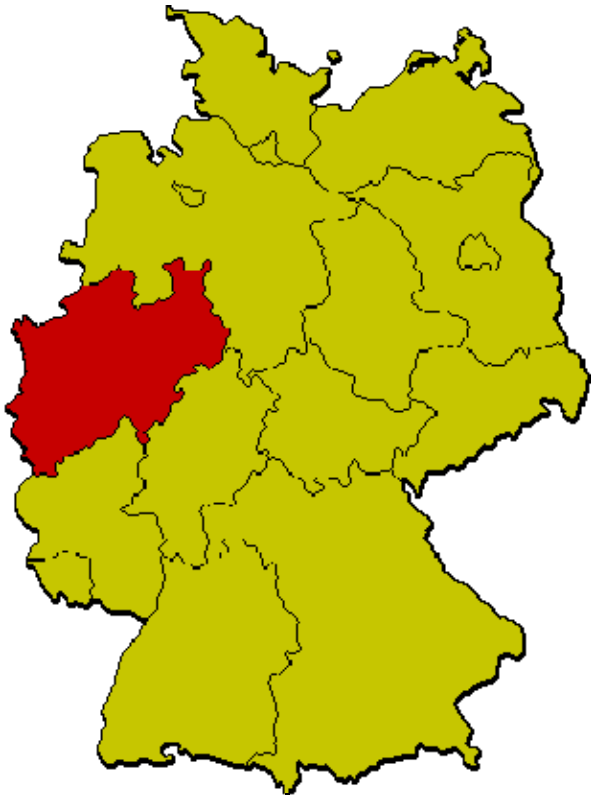

North-Rhine Westphalia …

- is home of 18 million inhabitants (20 % of Germany)

- provides 90 % of German hard coal
- provides 50 % of German lignite coal

- consumes 40 % of German power demand
- generates 33 % of German power production
- has installed 30,000 MW power generation capacity

- has more than 1,1 Mio employees in energy engineering, power generation, mining industry

That's why NRW is called „The Energy State of Germany" and energy technology is an important branch of economy

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Climate Strategy of NRW

Specific Targets by 2020:

- Mitigation of the CO_2 emission in NRW by 81 million tons compared with 2005
  - equivalent to 29 % of total CO_2 emissions
  - equivalent to 44% of the overall German target for reduction of CO_2 emissions until 2020

Measures and Action Items:

- Most important - Renewal of coal power plants
- Among further measures - **The "NRW Hydrogen HyWay" Concept**

NRW Hydrogen HyWay

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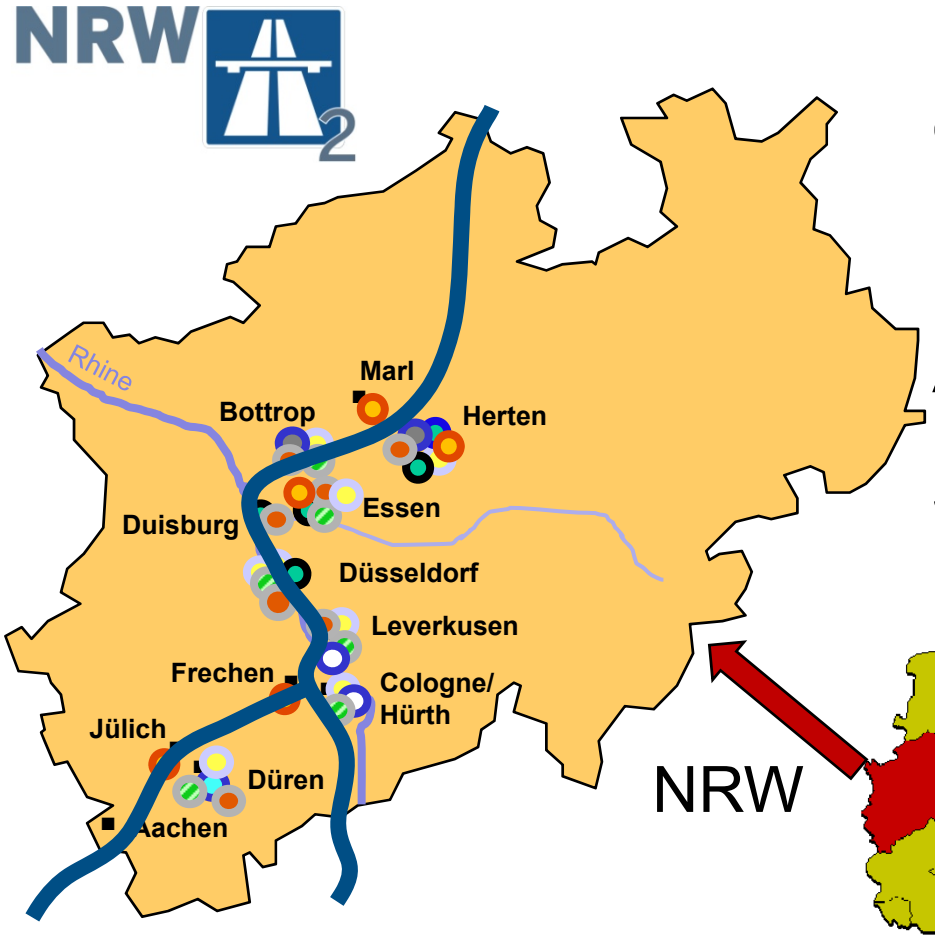

Boundary Conditions

Objectives

Locations

Activities

Scope of the Project

NRW Hydrogen HyWay

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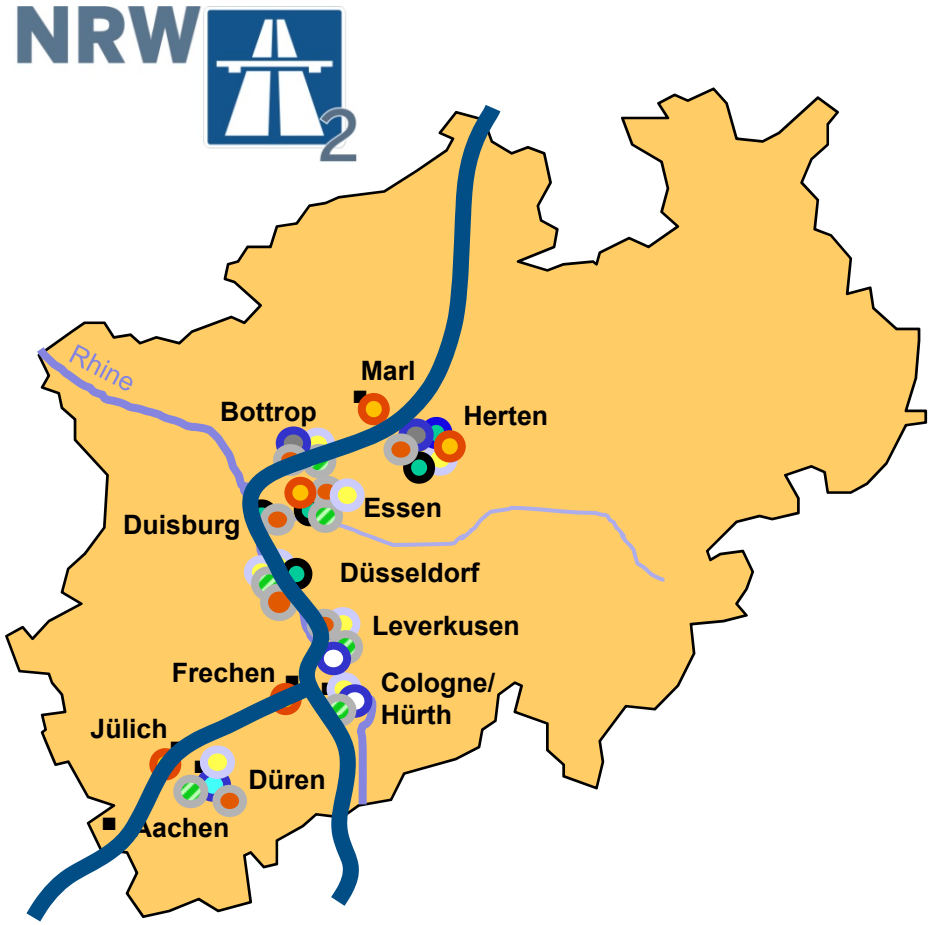

Boundary Conditions

- **Industrial by-product Hydrogen**
  - ~ 370 million Nm^3 per year
    sufficient to operate
    ~ 330,000 cars or 6,000 buses
  - More than 80% of by-product hydrogen from industrial electrolysis (high purity)
  - Costs expected to be at natural gas level plus compression and purification (if needed)
  - As production sites (chemical plants) are almost close to the pipeline (230 km), several scenarios for use of hydrogen are possible

NRW Hydrogen HyWay

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Boundary Conditions
Main Objectives

- Strengthen and enlarge ongoing activities towards mass market applications and market introduction
- Intensification and linking-up of already existing local activities in NRW
- Preparation of WHEC 2010 in Essen
- Building bridges to National and European large-scale demonstration activities
- **Contribution to International Highway activities (IPHE)**

NRW Hydrogen HyWay

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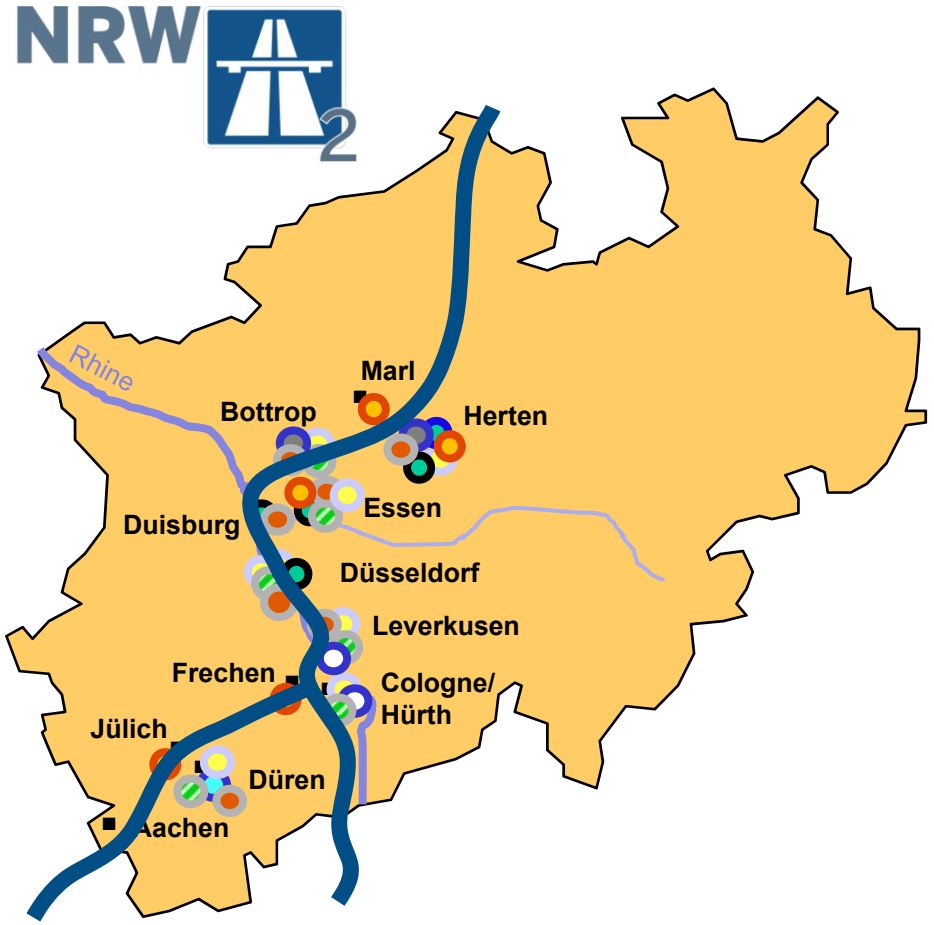

Boundary Conditions
Main Objectives
Locations

- Aachen (Euregio, NL, B)
- Cologne
- Düsseldorf
- Essen
- Northern Ruhr Area
- … and more to come

NRW Hydrogen HyWay

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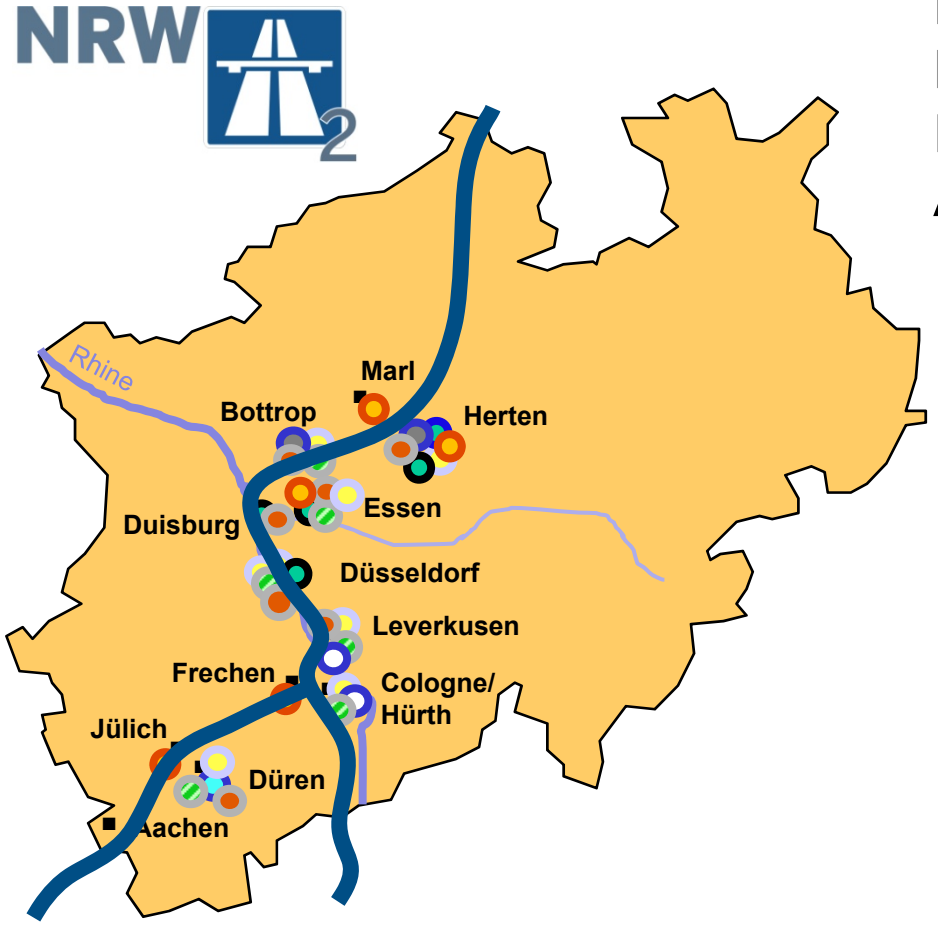

Boundary Conditions
Main Objectives
Locations
Activities

- **Hydrogen for Transport**
  Filling infrastructure, buses, cars, light-transport
  (e.g. up to 20 busses by 2010)
- **Stationary Applications**
  Residential CHP
  (up to 50 systems by 2015)
- **Special Applications**
  Material handling, UPS, remote power, ships, special vehicles, etc.

NRW Hydrogen HyWay

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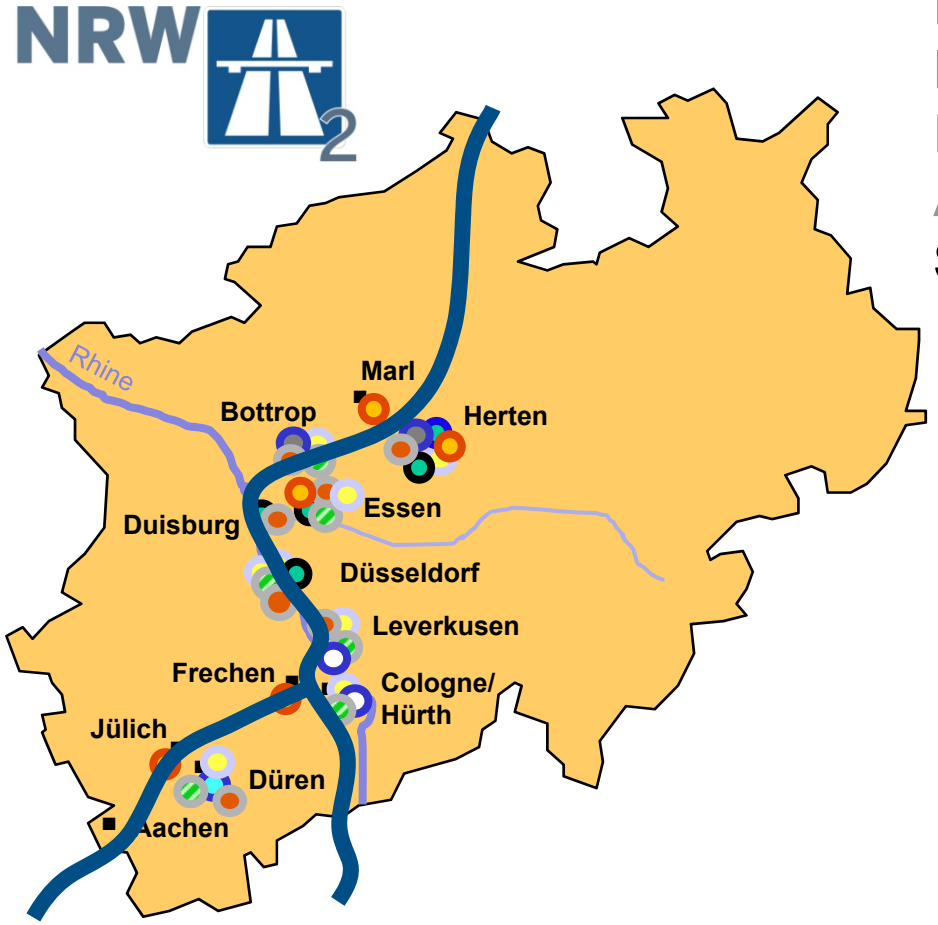

Boundary Conditions
Main Objectives
Locations
Activities
Scope of the Project

- Duration 2008 - 2011
- About 200 Mio. € total project expenditures
- About 40 single projects
- Funding:
  - Ministry of Economics NRW:
    > 50 million € (committed)
  - Ministry of Transportation NRW:
    ~ 10 million € (committed)
  - EC + Federal: ~ 30 million € (planned)

NRW Hydrogen HyWay

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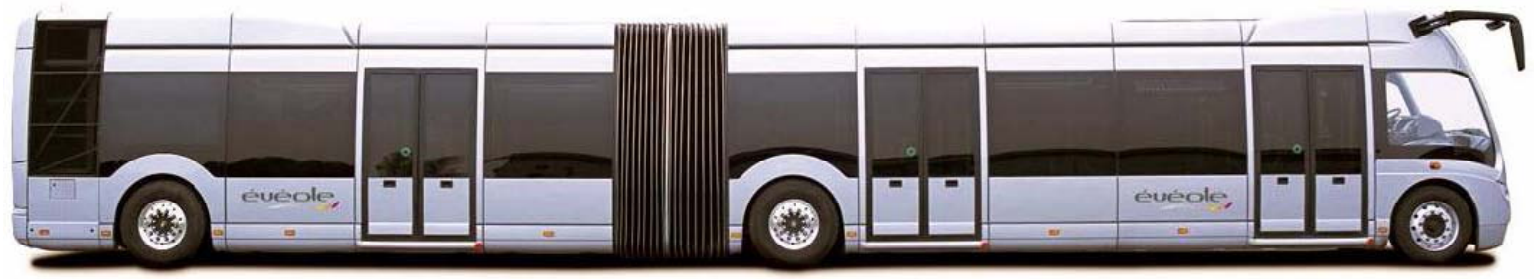
Dutch – NRW Collaboration on Clean Mobility

- First project in place (Joint FC bus project)
  - Sites: Amsterdam, Cologne
  - Exchange of experience with different technical concepts
- Consideration of joint EC activities within the JTI
- Discussions on Dutch-NRW Hydrogen Highway corridor



NRW 2

WHEC 2010

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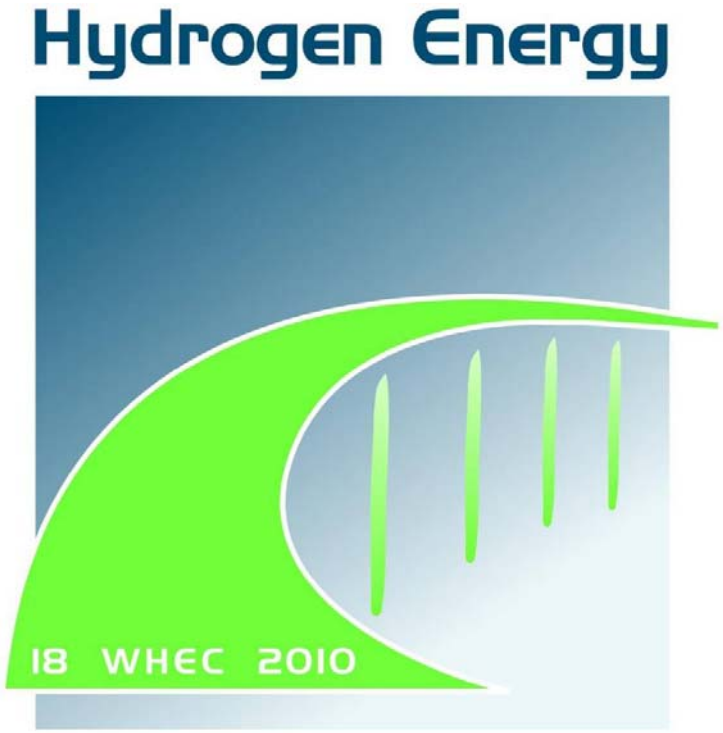

Essen, Germany,
May 16 - 21, 2010

Objective

- WHEC 2010 should become an international showcase for the capability and advances of H2 and FC technology (NRW, Germany, worldwide)

Actions

- Establishing of the H2 infrastructure and deployment of FC technology in as many applications as possible (NRW Hydrogen Hyway, NIP, JTI, IPHE)
- Invitation of German as well as European and international projects and partners to Essen
- Showcase of concrete projects and products not only to experts but also to the general public

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Hydrogen Energy

18 WHEC 2010

THANK YOU

and please mark your calendar ...

18th World Hydrogen Energy Conference 2010

NRW

Essen, Germany,
May 16 - 21, 2010