German Hydrogen & Fuel Cell Technology Update

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IPHE Implementation & Liaison Committee
Seoul, 12 June 2007

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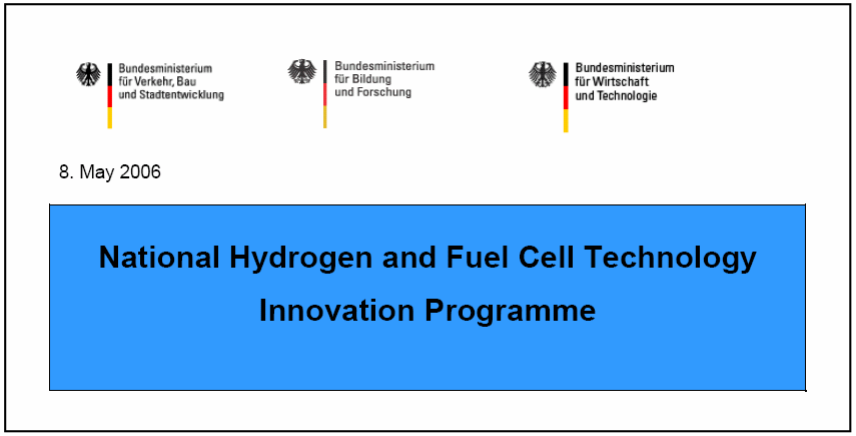
National Innovation Programme on H2/FC (NIP)

Goal: ⇨ Bridging the gap between R&D and market development
⇨ Preparing hydrogen and fuel cell applications for commercialisation
⇨ Maintenance and expansion of Germany's good starting position

- **Additional funding:** 500 million € over the next 10 years
- **Implementation**: through PPP with average public funding of 50 %
- **Focus**: demonstration and lighthouse projects, accompanied by R&D projects (basic and applied research)
- **Link**: close coordination with EU / further international activities



www.nkj-ptj.de and www.iphe.net/germany.htm

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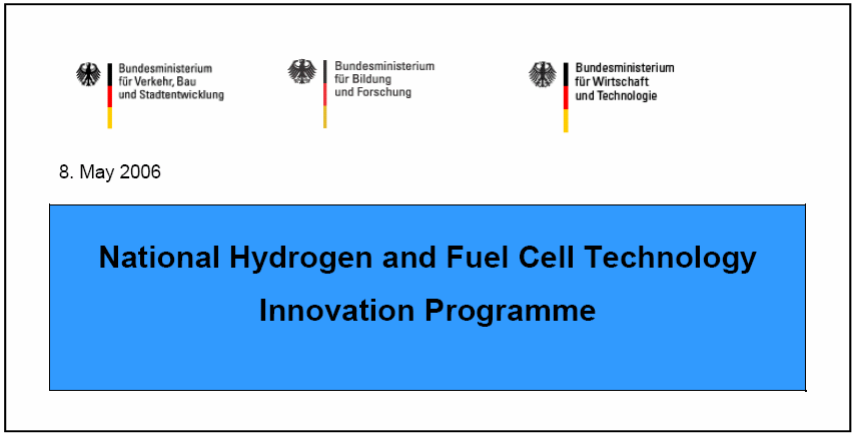
Current Status of the Implementation of NIP

- **Commitments of industry (Protocol declaration of 24 companies) for matching the public funding (October 2006)**
- **Agreements with the Federal States concerning their participation (since September 2006)**
- **Plenary meeting (March 2007)**
- **Work programme (= National Development Plan) finalised by Strategy Council H2/FC (April 2007)**
- **EU-Notification of the NIP (May 2007)**
- ***Forming of consortia for demonstration projects in the starter regions (ongoing)***
- ***Foundation of Programme Management Association (NOW) and begin of operational activities (expected July 2007)***



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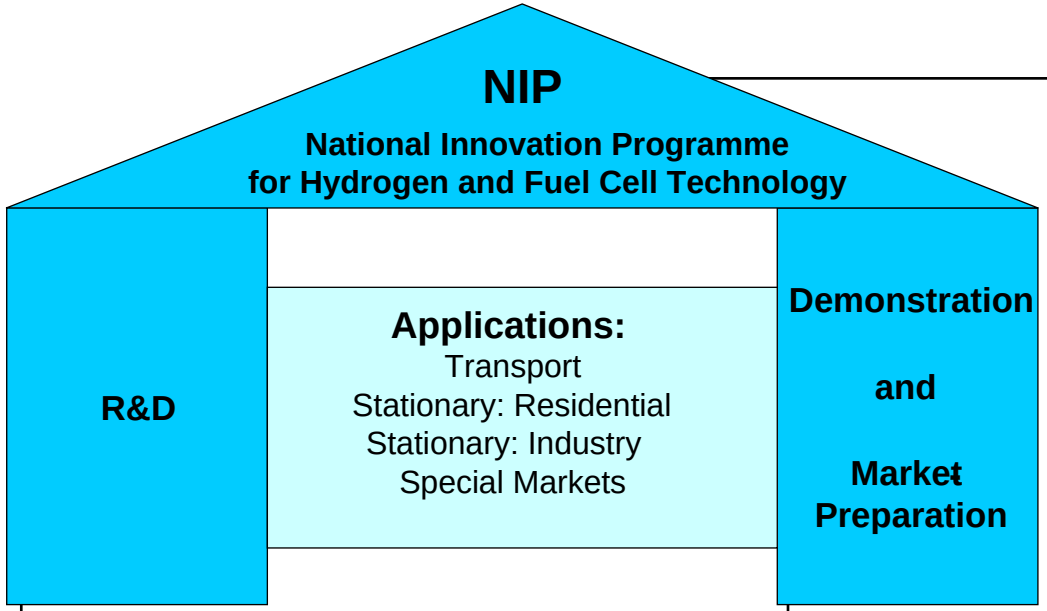
Structure for the Implementation of NIP



Coordination by the Programme Management Organisation (NOW)

Strategic governance by Advisory Board of NOW

Annual reporting of Advisory Board to Plenary Meeting of the Strategy Coucil H2/FC

Implementation by Project Management Organisation Jülich (PtJ)

Implementation by NOW (Administration of funding by a project management organisation)

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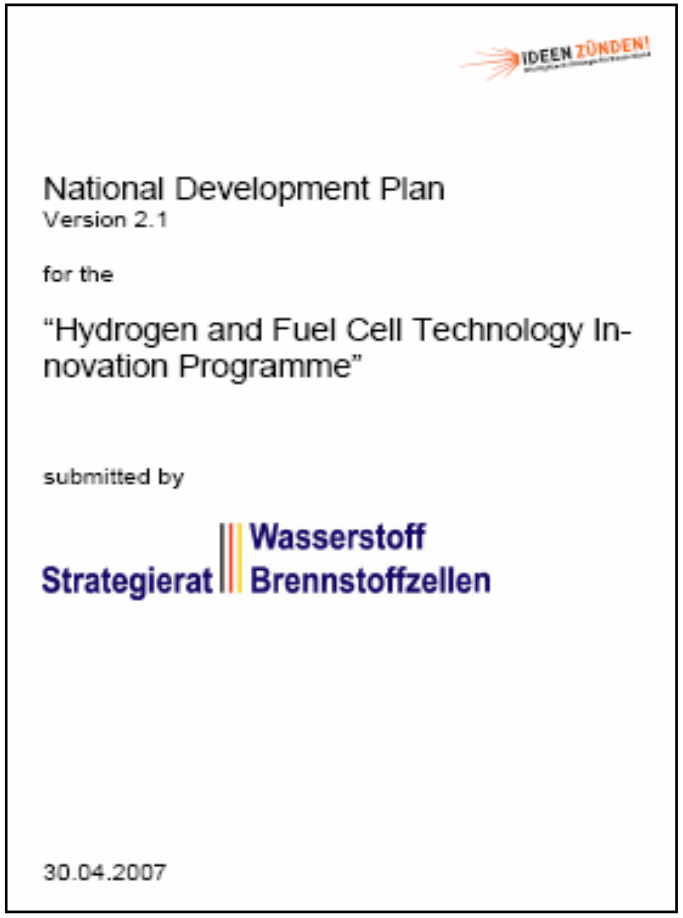
National Development Plan



The present work programme is divided into four development plans which are designated according to the different areas of operation:

- Transport including hydrogen infrastructure (production, distribution, storage and refuelling)
- Residential energy application
- Industrial applications
- Early markets for fuel cells

New Programme NIP

Application		Million € (2007 – 2015)	%	%
Transport	R&D	658	57	**54**
	Demonstration	478	42	
	Cross-section	8	1	
	Transport total	**1,144**	100	
Domestic energy	R&D	361	72	**24**
	Demonstration	141	28	
	Domestic energy total	**502**	100	
Industry	R&D	80	32	**12**
	Demonstration	170	68	
	Industry total	**250**	100	
Special markets	R&D	69	31	**10**
	Demonstration	152	69	
	Special markets total	**221**	100	
Total	R&D	1,168	55	**100**
	Demonstration	949	45	
	Grand total	**2,117**	100	

⇨The given numbers in the National Development Plan represent bottom-up calculated (target) figures not real budgets

⇨They provide orientation for the distribution of the funding and include public (EC, federal ministries, state ministries) and private funds

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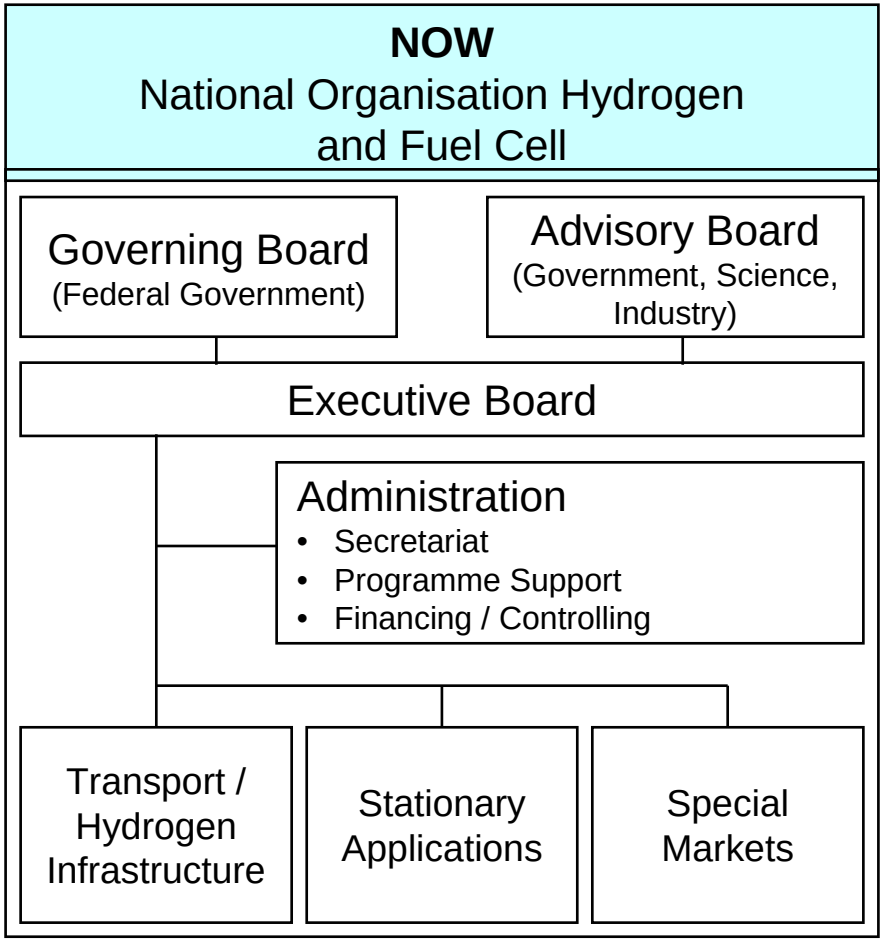
Structure of new Programme Association NOW



Tasks of NOW

- Coordination and supervision of the programme implementation on the basis of the development plan
- Identification and utilisation of synergies between the applications (e.g. materials sciences, production technologies)
- Acting as an interface with European and international initiatives
- Central point of contact for H2/FC community
- Conception and initiation of lighthouse projects
- Evaluation and monitoring of projects
- Interface between R&D and demonstration activities

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Structure of the Advisory Board of NOW

Politics:

- BMWi (Economics)
- BMVBS (Transport)
- BMBF (Research)
- BMU (Environment)
- States representative

Science:

- Research & Development Helmholtz Community
- Research & Development Institutes/Universities
- Training

Secretariat:

- Secretariat

Industry:

Applications:

- Mobility - cars
- Mobility - commercial veh.
- Domestic applications
- Industrial applications
- Special applications
- Fuel cell component manufacturers

Energy & Infrastructure:

- Fuel indusry
- H2 production
- H2 provision
- Grid integration

Tasks of the Advisory Board

- Continuous monitoring and updating of the strategy
- Securing an exchange of information
- Creating of consensus and reconciliation of the interests involved
- Communication to regional, European and international bodies and to the public

Nordrhein-Westfalen represents the Federal States in the Advisory Board (together with deputy representative Hamburg)

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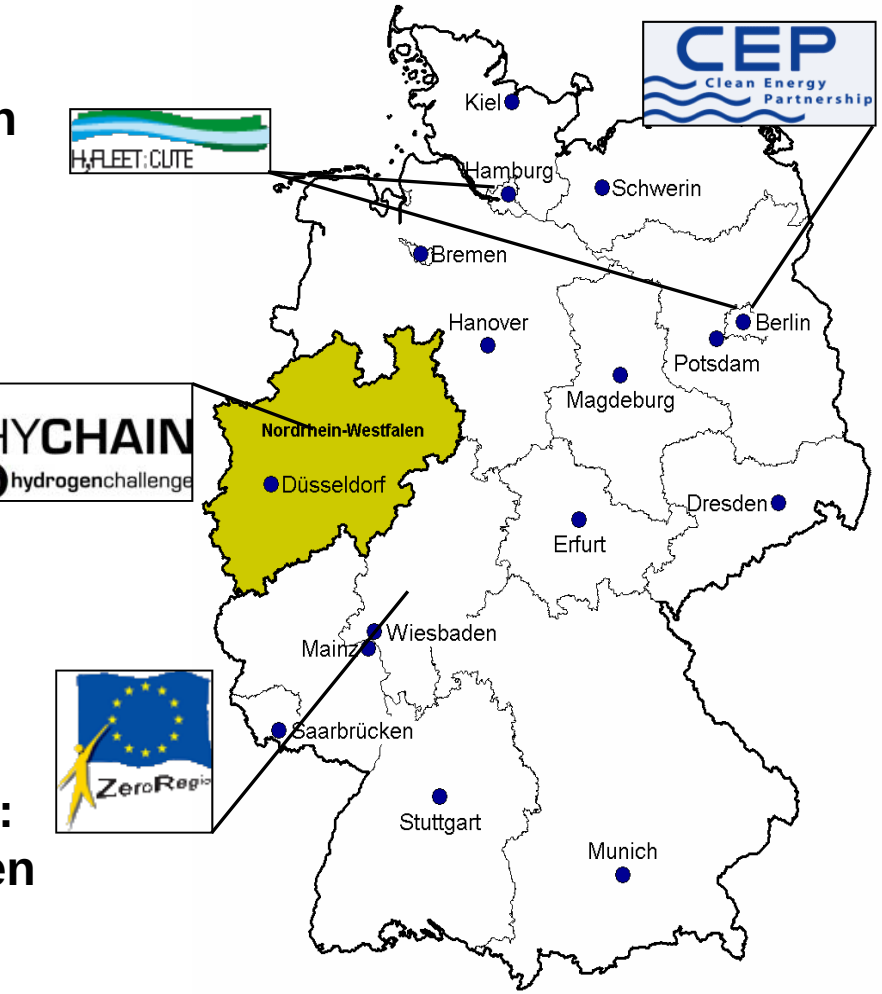
Lighthouse Projects in NIP

- Concentration on a few sites (clusters) in the beginning, broadening of activities and linking up with those in other European regions
- Advancement of existing R&D and demonstration projects

and

- Use of extensive experiences, capacity, financial commitments and existing infrastructure in individual regions

⇨ 3 “Starter Regions” have been identified: Berlin, Hamburg and Nordrhein-Westfalen



Example: Nordrhein-Westfalen

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Early Market Applications – Some Examples from NRW

Masterflex
Brennstoffzellentechnik

HYDROGENICS
CORPORATION

HOPPECKE
POWER FROM INNOVATION

STILL

Focus: Fuel Cell / Hybrid up to 30 kW

ZBT

LIETEC
FUEL CELL TECHNOLOGIES

RITTAL

IdaTech

www.fuelcell-nrw.de

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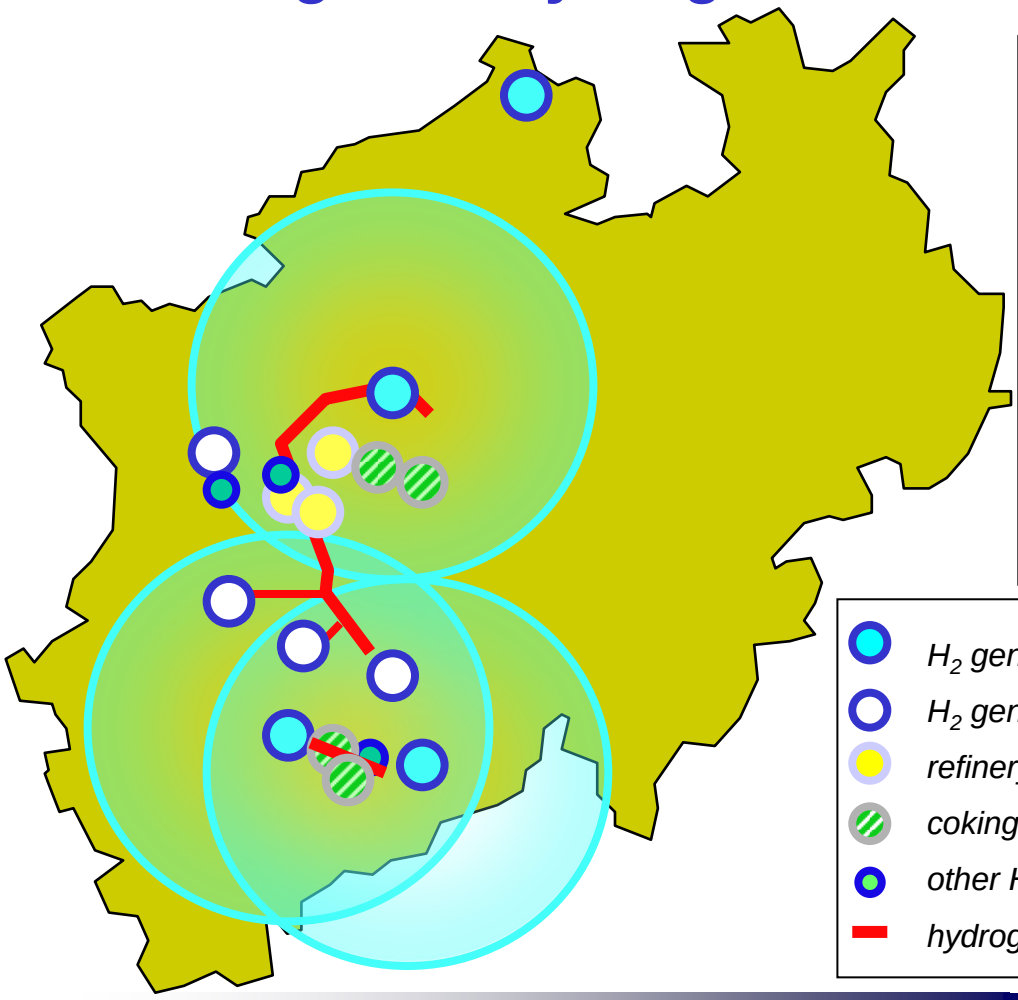
Advantageous Hydrogen Availability



NRW:

- **A unique cluster of by-product H_2 sources in Europe (> 35,000 tons/year, sufficient to operate approx. 150,000 cars*)**
- **Link of locations by hydrogen pipeline (230 km length)**

⇨ **Advantageous preconditions to reduce costs of early infrastructure set-up**

⇨ **NRW will be an infrastructure nucleus in Europe (result of HyWays project)**

*Assumptions:
15,000 km/a
1.5 kg H_2/100 km

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The Concept of Nordrhein-Westfalen

- Securing market entrance for early applications
- Organising large-scale deployment projects
- Implementing R&D activities for further applications
- Participating in national (and international) programs and partnerships
  - Partners in NRW have developed about 40 projects and already proposed more than 20 projects for the new National Programme NIP
  - Co-financing by industry and NRW agreed
  - Strategic partnership with other German regions under development
  - NRW intends to become a key location for NIP projects (focus: industrial hydrogen, fuel cells, UPS, light utility vehicles)

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The next long-term milestone …

18th World Hydrogen Energy Conference 2010
Essen, Germany, May 16 - 21, 2010

www.18whec2010.de info@18whec2010.de

A look in the future

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The next short-term milestone …

9th Implementation-Liaison Committee
Essen, Germany, February 18 - 20, 2008

4th German Hydrogen Congress
Essen, Germany, February 20 - 21, 2008

H2CONGRESS.de

www.H2CONGRESS.de

DWV Deutscher Wasserstoff- und Brennstoffzellen-Verband
Forschungszentrum Jülich in der Helmholtz-Gemeinschaft
E-world energy & water
EnergieAgentur.NRW
Europäische Union Europäischer Fonds für Regionale Entwicklung

www.h2congress.de contact@h2congress.de

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Thank you for your kind attention!

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Backup slides

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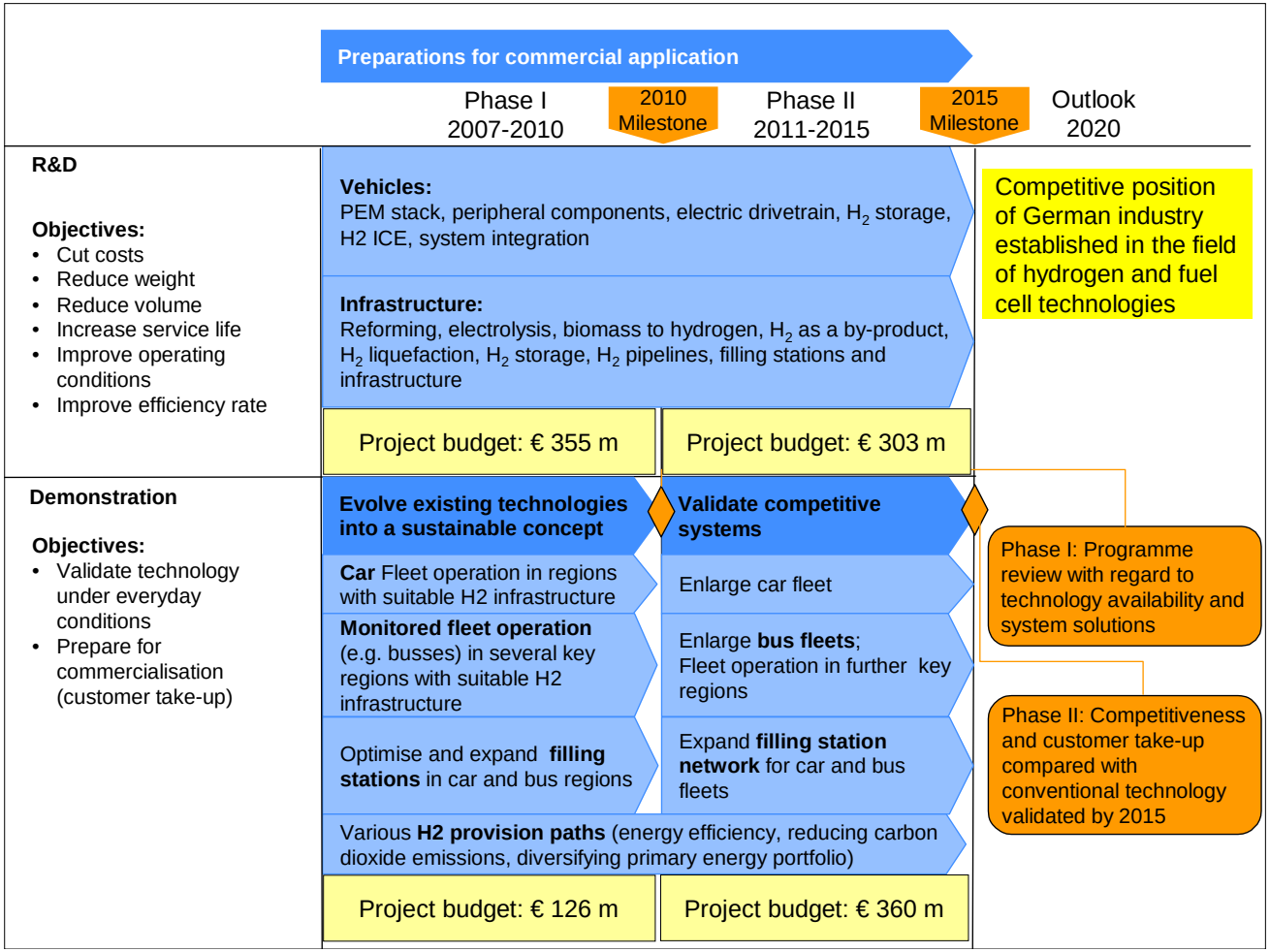
Development Plan "Transport"



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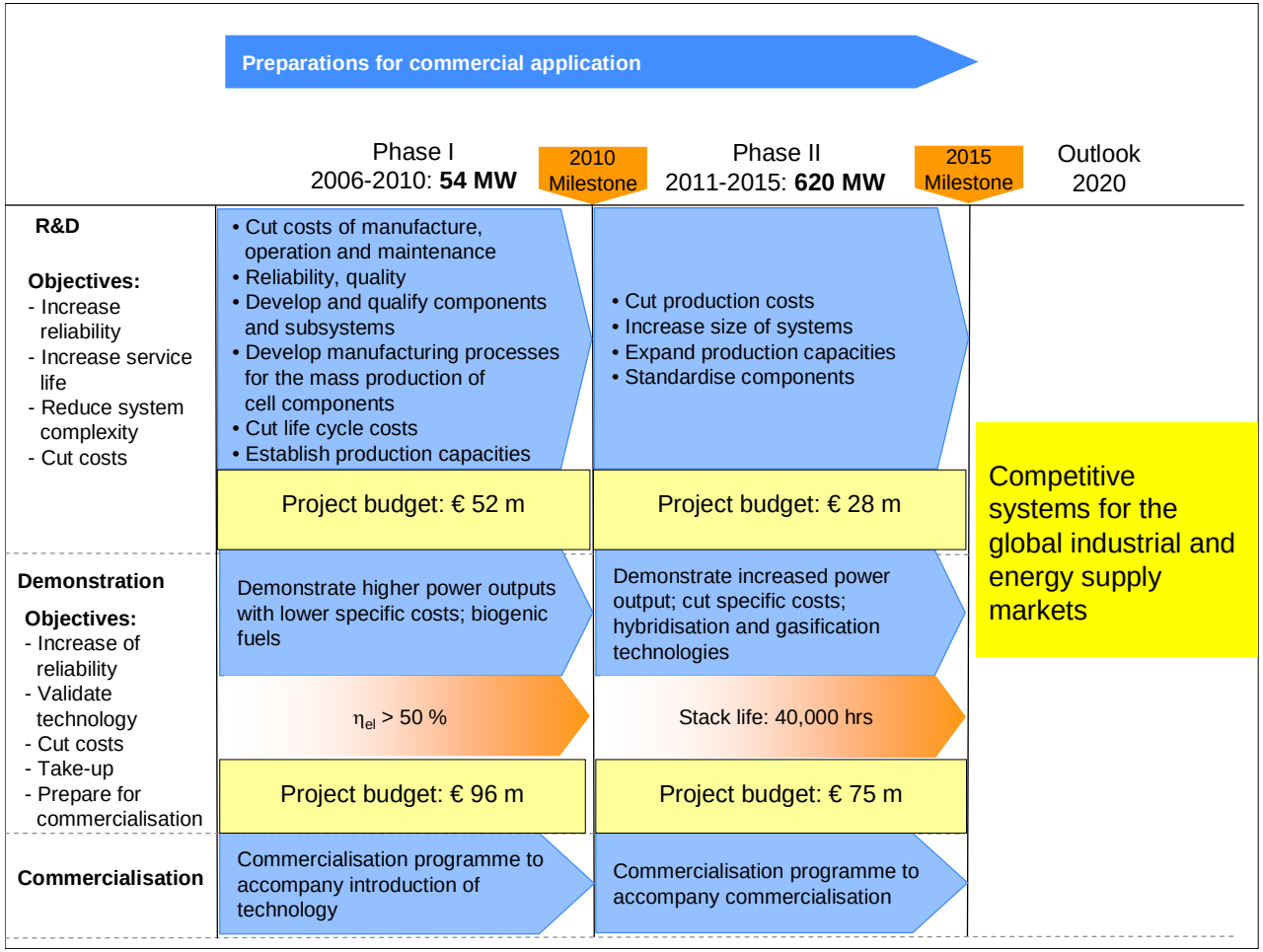
Development Plan “Industrial Application”



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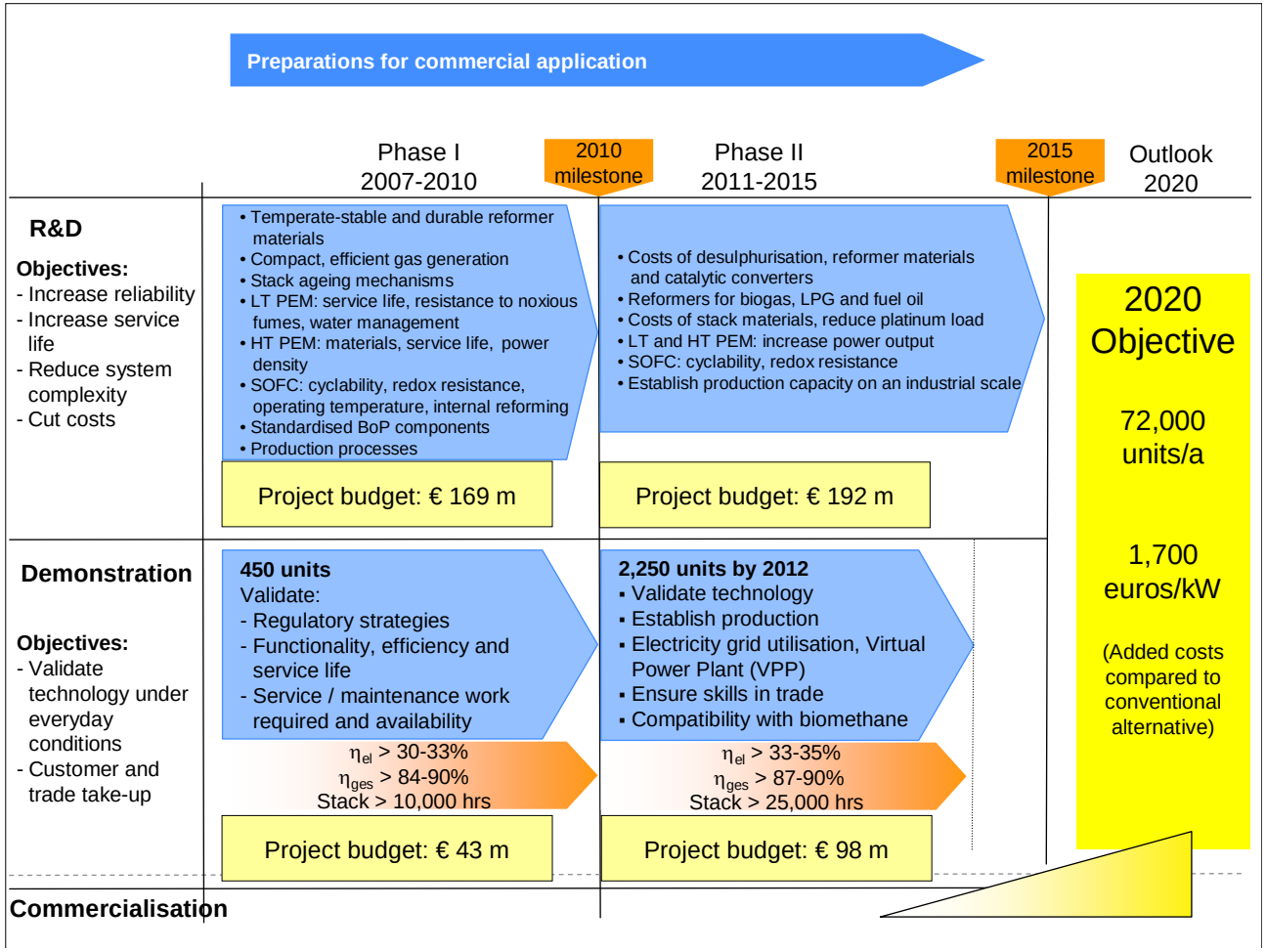
Development Plan "Residential Application"



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Development Plan “Special Markets”

The common feature of fuel cell applications in the “special markets” is a more advanced marketability in comparison to other applications, with prototypes being ready for use in many cases. These are in particular:

- **Emergency power supplies / UPS**
- **Material handling vehicles (fork-lift trucks, airport tractors etc.)**
- **Light electric vehicles and boats**
- **Onboard power supplies for the leisure market (boats, mobile homes)**
- **Miniature applications (4-C applications) based on micro fuel cells**