Programmes et Partenariats internationaux dans le domaine de l'hydrogène et des piles à combustibles

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CEA

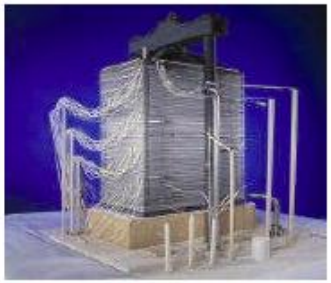
Sommaire

- Introduction: motivations et chiffres globaux
- Exemple des transports
- Exemple du stationnaire
- Organisations internationales
- Conclusion

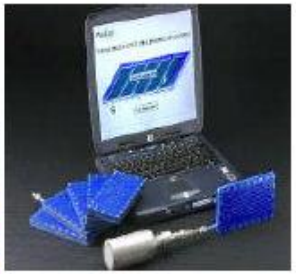
Many types of projects coming on stream….







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H2 Energy Applications reaching Market level

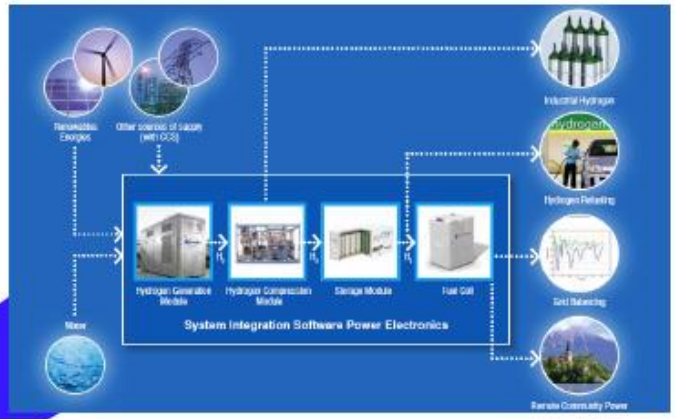
Early Markets

Mobility

Niche markets

CHP

Stationary



Motivations des programmes dans le monde

- Des hauts et des bas suivant les pays depuis 1995
  - Effet d'annonce, effet de mode etc…
  - Réalité des travaux et des progrès…
- Motivations
  - La dépendance au pétrole: USA et Europe
  - L'avance technologique: Canada…Allemagne…Japon
  - Le changement climatique et les pollutions locales: Europe, Japon, Chine
  - L'efficacité énergétique : Japon (Fukushima), Chine
  - L'exportation Chine…Allemagne, Japon

Programme de soutien public dans le monde: un effort constant, stabilisé et important

Pays	USA	Japon	Allemagne	Chine **	Corée	Canada	NOR	Commission ***	France
Budget public 2008/2009 M€/an	400 ↘	300 →	150 ↗	50 ↗	80 ↗	40	10	90	30-35* 6 ANR (50 M€ 2005/6)

* En rythme tendanciel: ANR 29M€ en 2005 à 11 M€ en 2009 et non en credit de paiement

**Chine: budget , démonstration déploiement (JO, Shangai 2010),"national Lab" DICP NTE H2 Pac
Inde: feuille de route nationale, commande de 20 000 piles pour les back up Telecoms

***** Programme JTI Joint technology Initiative On hydrogen and fuel cell**
Private public partnership
940 M€ on 7 years plus 100 M€

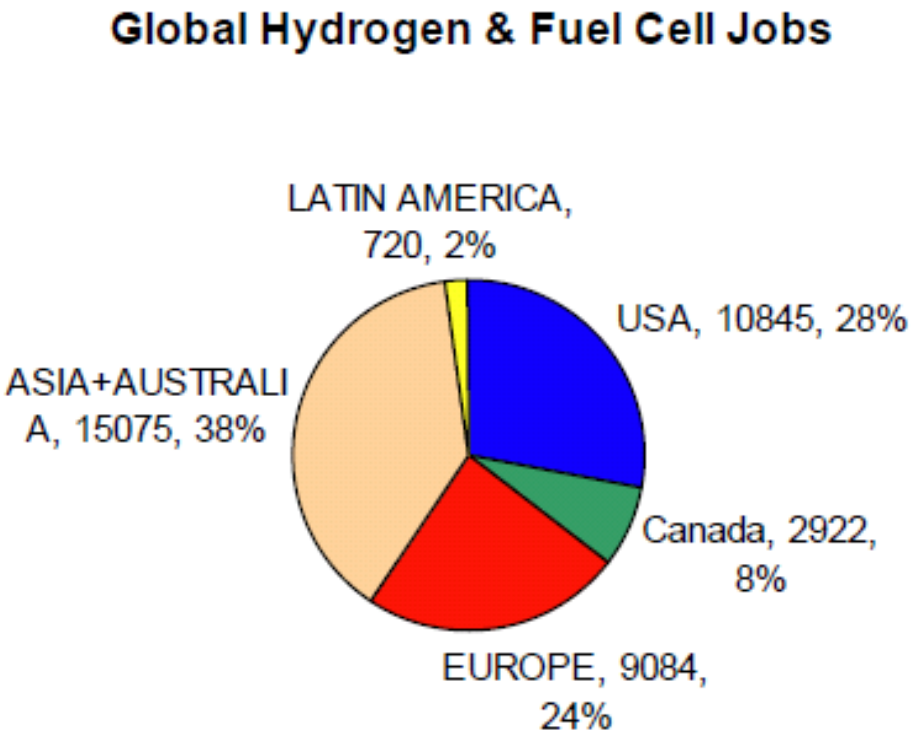
Estimation IPHE

Approximate 2010 Federal Funding

Country	Local Currency	Million U.S. Dollars[25]
Canada	41 million CAD	39.8
China	235 million RMB	34.7
European Commission	94.2 million EUR[26]	124.77
France	35 million EUR	46.4
Germany	89.1 million EUR	118.0
Iceland		0.83
India		3.0[27]
Italy	10.03 million EUR[28]	13.3
Japan	17.5 billion JPY[29]	199.3
Korea	70.2 billion KRW	60.8
New Zealand	1.5 million NZD[30]	1.1
Norway	57 million NOK	9.4
United Kingdom	15.8 million GBP	23.5
United States	380 million USD	380.0
Total		**$1054.9 Million**

Source www.iphe.org

Jobs, Dépenses et chiffre d'affaires



- Dépenses Totales dans le monde :près de 6 Milliards € en 2009
- 25 à 35 % de dépenses publiques
- En 2008 25 000 piles à combustibles comandées
- Chiffres d'affaires « commercial »
  - 500 à 1000 M€
- En 2009 plus de 50 % des brevets NTE l'étaient sur les piles et l'hydrogène

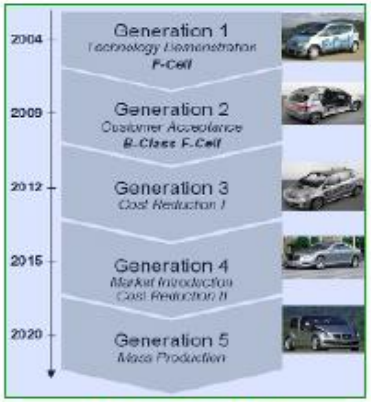
Volume deployments have started

- 200 HRS operational (WW)
- 50 buses & 300 demonstration FCV (WW)
- More than 20 000 stationary CHP systems (Japan)
- More than 2 300 Forklift (USA)

Marcoussis – Air Liquide

London – Bus à pile à combustible

France – Bouygues Telecom



Daimler Road Map

USA – Chariot élévateur

Allemagne

Preparing Hydrogen and Fuel Cell Markets: National Innovation Program (NIP)

Politics			Industry
BMVBS / BMWi / BMBF / BMU			
€ 500 million for demonstration	+	**€ 200 million** for R&D	+ **€ 700 million** Co-payment from industry

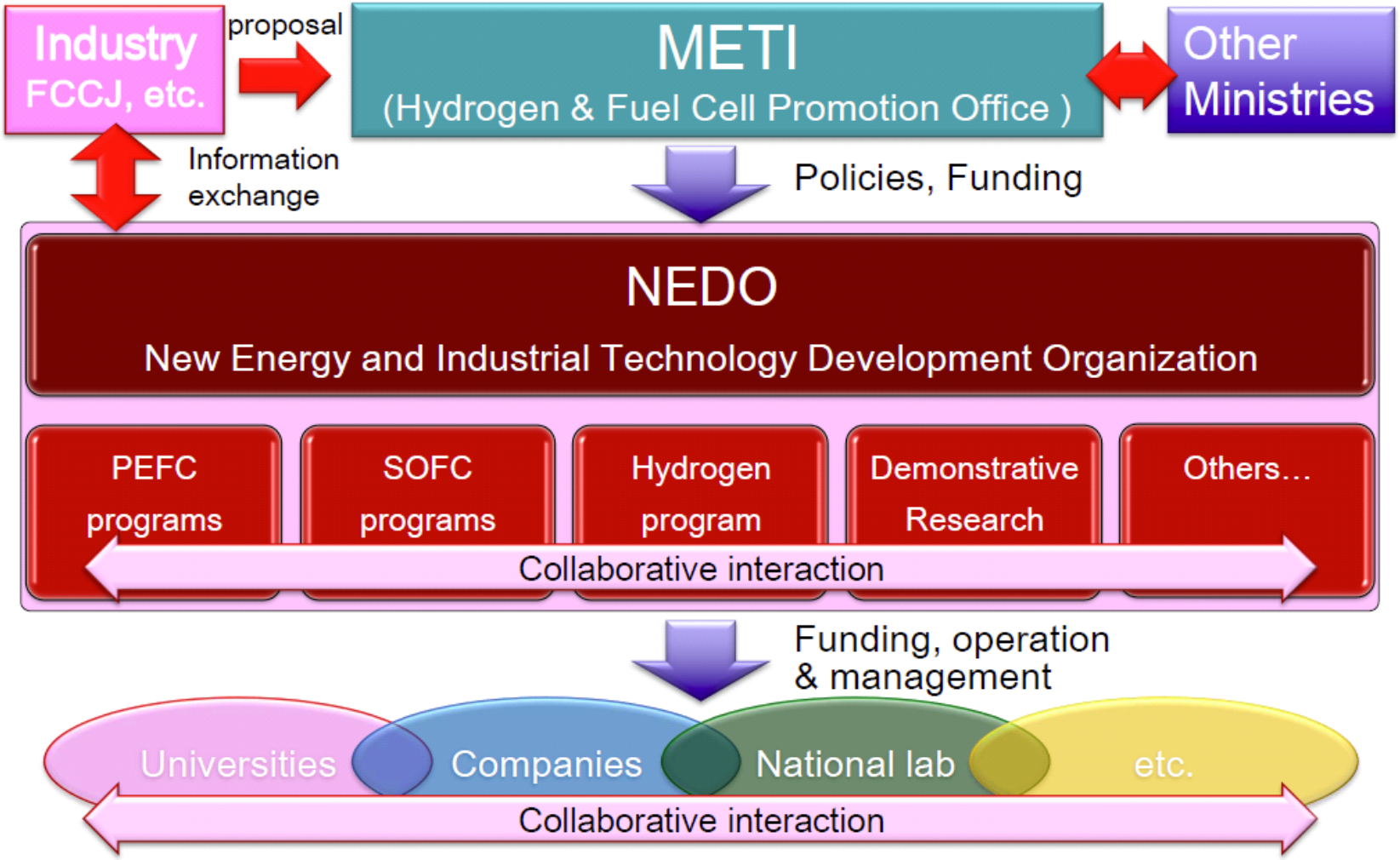
€ 1,4 billion
2007-2016

- Preparing hydrogen & fuel cell markets
- Focus on R&D combined with everyday demonstration
- Hydrogen & fuel cells driven by applications and markets: transport, stationary energy supply, special markets

Allemagne: Financement du programme national pour l'innovation H2 et Pac (NIP)

		Registrations 2007 for 2008-2016		Registrations 2010 for 2011-2016	Dispensation 2011 for 2011-2016	
		Budget in Mio. €	[%]	Budget in Mio. €	Budget in Mio. €	[%]
Transport Sector	R&D	658		250		
	Demonstration	478	54	356	144	36
	Cross Cutting Issues	8		4		
	Sum Transport Sector	**1144**		**610**		
H2 Production	R&D			60		
	Demonstration			106	34	9
	Sum H2 Production			**166**		
House Energy	R&D	361		125		
	Demonstration	141	24	151	97	24
	Sum House Energy	**502**		**275**		
Industry	R&D	80		100		
	Demonstration	170	12	72	49	12
	Sum Industry	**250**		**172**		
Special Markets	R&D	69		82		
	Demonstration	152	10	184	60	15
	Sum Special Markets	**221**		**266**		
Cross-Cutting Issues	R&D			18		
	Demonstration			15	16	4
	Sum Cross-Cutting Issues			**33**		
Total	R&D	1168		615		
	Demonstration	949	100	862	400 further 200 without assignment	100
	Total	**2117**		**1522**		

Framework for R&D of Hydrogen and Fuel Cells under METI in Japan



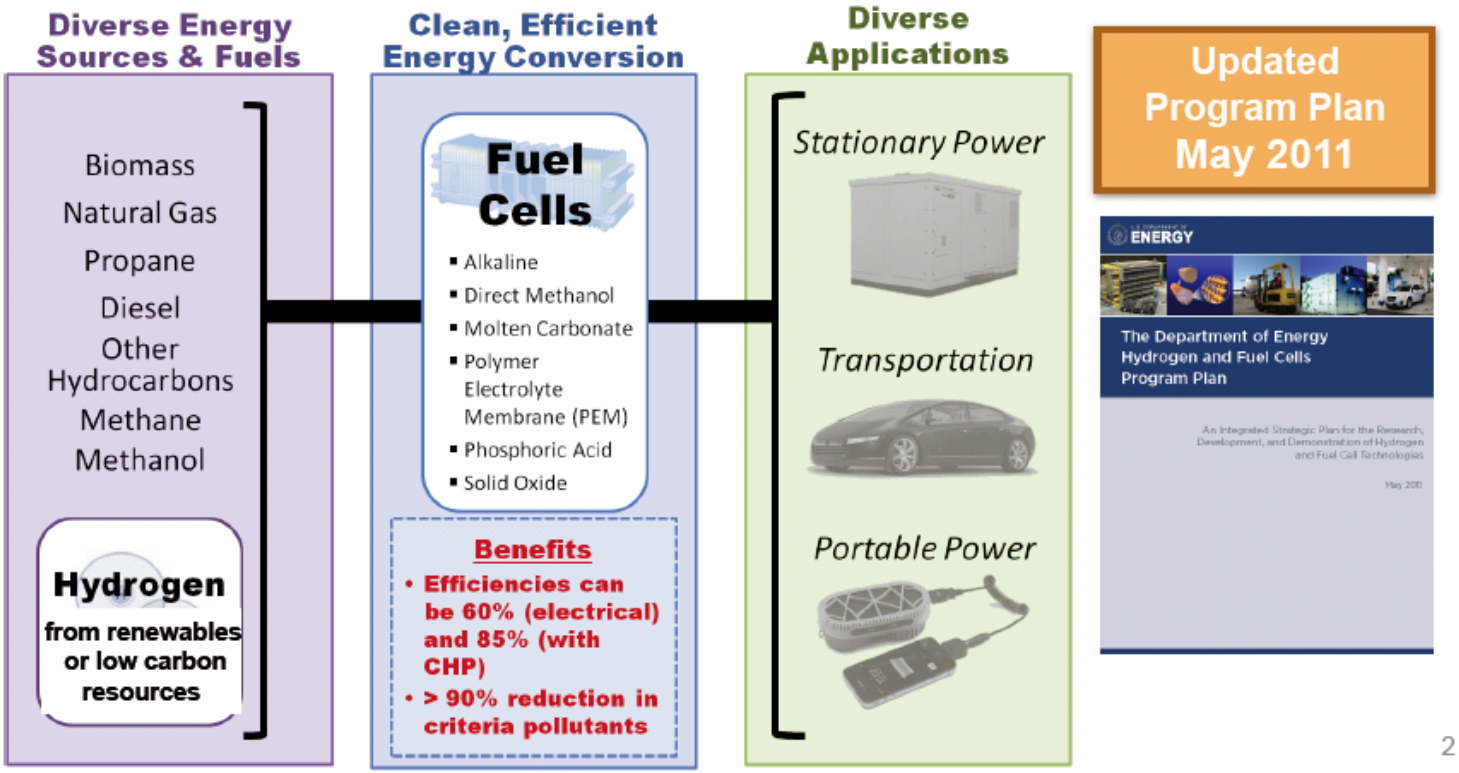
USA programme piloté par DOE

Hydrogen and Fuel Cells Key Goals

U.S. DEPARTMENT OF ENERGY

Enable widespread commercialization of hydrogen and fuel cell technologies:

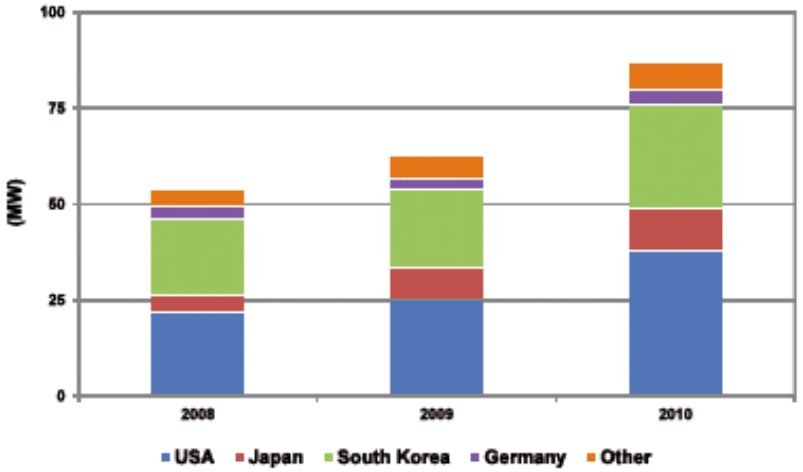
- **Early markets such as stationary power, lift trucks, and portable power**
- **Mid-term markets such as residential CHP systems, auxiliary power units, fleets and buses**
- **Long-term markets including mainstream transportation applications/light duty vehicles**



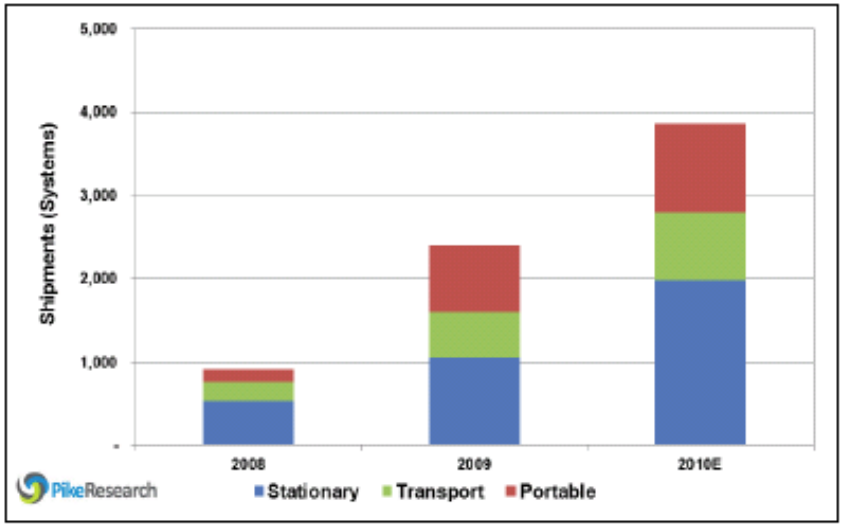
Fuel Cell Market Overview

U.S. DEPARTMENT OF ENERGY

Megawatts Shipped, Key Countries: 2008-2010



North American Shipments by Application



FuelCells2000, Pike Research, Fuel Cell Today, ANL

Fuel cell market continues to grow

- ~36% increase in global MWs shipped
- ~50% increase in US MWs shipped
- Published several reports
  - The Business Case for Fuel Cells
  - State of the States: Fuel Cells in America
  - 2010 Fuel Cell Market Report

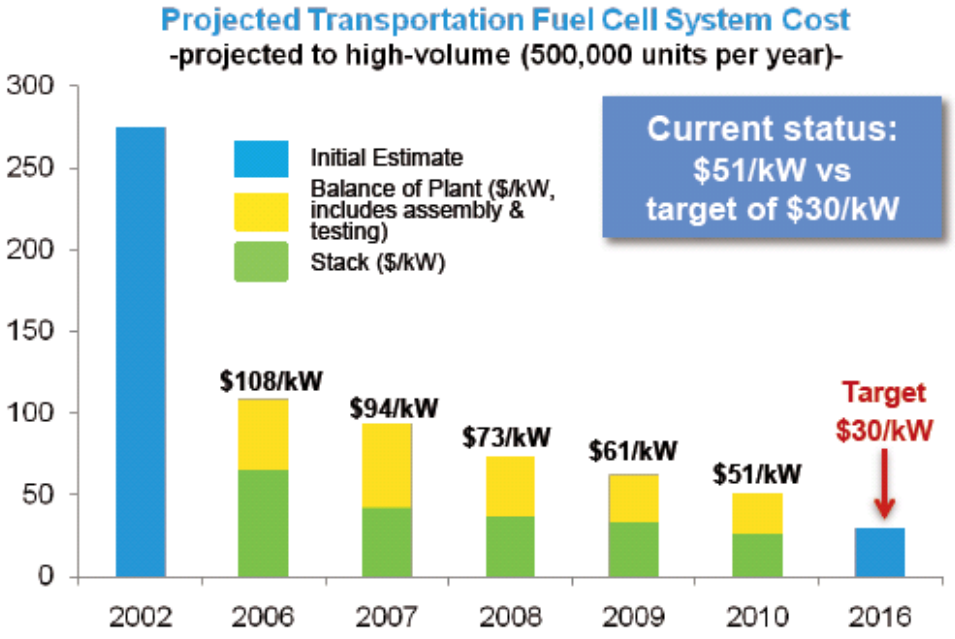
http://www.fuelcells.org/BusinessCaseforFuelCells.pdf
http://www.fuelcells.org/StateoftheStates.pdf

Progress – Fuel Cell R&D

U.S. DEPARTMENT OF ENERGY

Reduced the projected high-volume cost of fuel cells to $51/kW (2010)*

- *More than 30% reduction since 2008*
- *More than 80% reduction since 2002*



**Based on projection to high-volume manufacturing (500,000 units/year).*

***Panel found $60 – $80/kW to be a "valid estimate" for 2008 http://hydrogendoedev.nrel.gov/peer_reviews.html*

http://www.hydrogen.energy.gov/pdfs/10004_fuel_cell_cost.pdf

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Progress - Technology Validation

U.S. DEPARTMENT OF ENERGY

Demonstrations are essential for validating technologies in integrated systems

Real-world Validation

Vehicles & Infrastructure

- 155 fuel cell vehicles and 24 hydrogen fueling stations
- Over 3 million miles traveled
- Over 131 thousand total vehicle hours driven
- 2,500 hours (nearly 75K miles) durability
- Fuel cell efficiency 53-59%
- Vehicle Range: ~196 – 254 miles (430 miles on separate FCEV)

Buses (with DOT)

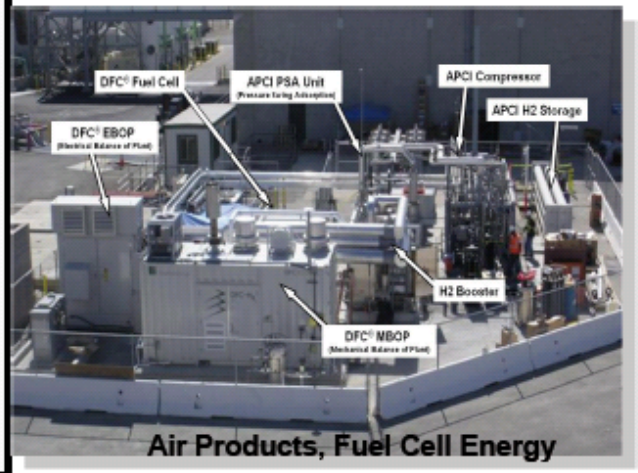
- H_2 fuel cell buses have a 42% to 139% better fuel economy when compared to diesel & CNG buses

Forklifts

- Over 44,000 refuelings at Defense Logistics Agency site

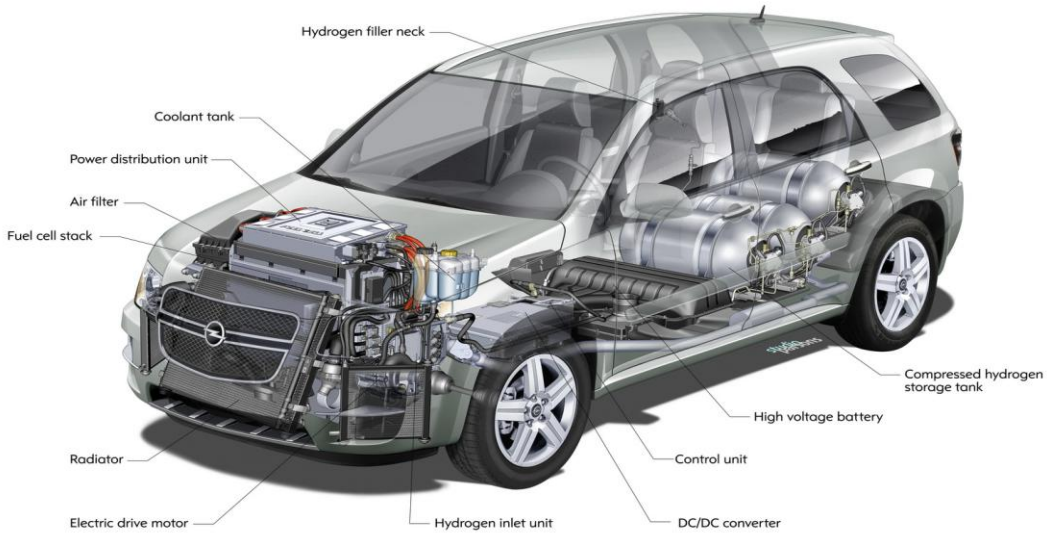
CHHP (Combined Heat, Hydrogen and Power)

- Achieved 54% (hydrogen + power) efficiency of fuel cell when operating in hydrogen co-production mode
- 100 kg/day capacity, renewable hydrogen supply



Air Products, Fuel Cell Energy

EXEMPLE DES TRANSPORTS



Technologies and Companies ready to move…

- **TOYOTA - Chris Hostetter, Sales Group vice-president of strategic resources - 10/05/2011.**
  "Fuel cell technology is viable and ready for the mass market," "Toyota plans to bring a fuel cell vehicle to market in 2015 or sooner, and we will not be alone in the marketplace.
  Source : http://pressroom.toyota.com

- **GM-OPEL - Mark Adams, Vice President of Design - 04/07/2011.**
  "Fuel cell propelled electric vehicles can be commercialized by a 2015/2016 timeframe,"
  Source : http://media.opel.com

- **DAIMLER - Dieter Zetsche, CEO - 02/06/2011.**
  "We intended to go for volume production in 2015, but because of the experience of the world tour we have pulled forward." He said volume production would begin in 2014. "The product is ready for the market technically,"
  Source : http://www.insideline.com

Infrastructure deployment now required !

- **HYUNDAI-KIA - Byung Ki Ahn, General manager of Fuel Cell Group - 04/06/2010.**
  "Pilot-scale production of 1000 fuel cell cars a year will begin for us in two years,". "Our first cars (…) will allow us to make the final stages of development progress before we begin commercial production of around 10,000 hydrogen cars a year in 2015."
  Source : http://www.autocar.co.uk

- **Steve S. Yang, Hyundai President and Chief Executive – 11/09/2010.**
  "Our ultimate goal is to build fuel-cell vehicles and make them available from 2015. Of course, we need EVs and we need hybrids but these are an intermediate step for FC vehicles.
  Source : http://www.newsmail.com.au

- **HONDA - Takanobu Ito, CEO – 21/01/2010.**
  "I think the ultimate eco car is a fuel cell car."
  Source : http://www.detnews.com
  Takanobu Ito fully expects his company to offer a vehicle powered by hydrogen fuel-cells by the year 2018 (01/03/2007)

- **FORD - Alan Mulally , CEO – 26/06/2009.**
  Alan Mulally sees 2015 as the date that fuel cell cars would go on sale.
  Source : Edison Electric Institute conference

High momentum of H2 Mobility-related initiatives in several countries

Overview of selected countries

- Announcement by **13 companies** (3 OEMs and 10 energy and infrastructure providers) and the Ministry of Transport to commercialize FCEV
  - Mass production of **FCEV by 2015**
  - **100 HRS operational** in 4 four metropolitan areas and connecting highways planned, **1,000 HRS** in 2020, and **5,000 HRS** in 2030

- South Korea laid out **"Green Car Roadmap"** including action for EV, PHEV, HEV, FCEV, and bio diesel
- Plans to have **168 HRS** and **100,000 FCEV** deployed **by 2020**
- Announced **government support** for **EV** of **up to EUR 20,000** in rebates, tax exemptions, and bonus/malus
- Incentives for **FCEV** will be defined later but are **expected to be comparable** to EV

- Hyundai-Kia signed **MOU** with four **Scandinavian countries** (Norway, Sweden, Denmark and Iceland) for the provisional distribution of FCEV
- FCEV will be used to complement the **Scandinavian Hydrogen Highway Partnership (SHHP) fleet** of 26 FCEV and to be increased to 46 in 2011
- SHHP also plans to **increase number of HRS** from 7 to 15 by 2015

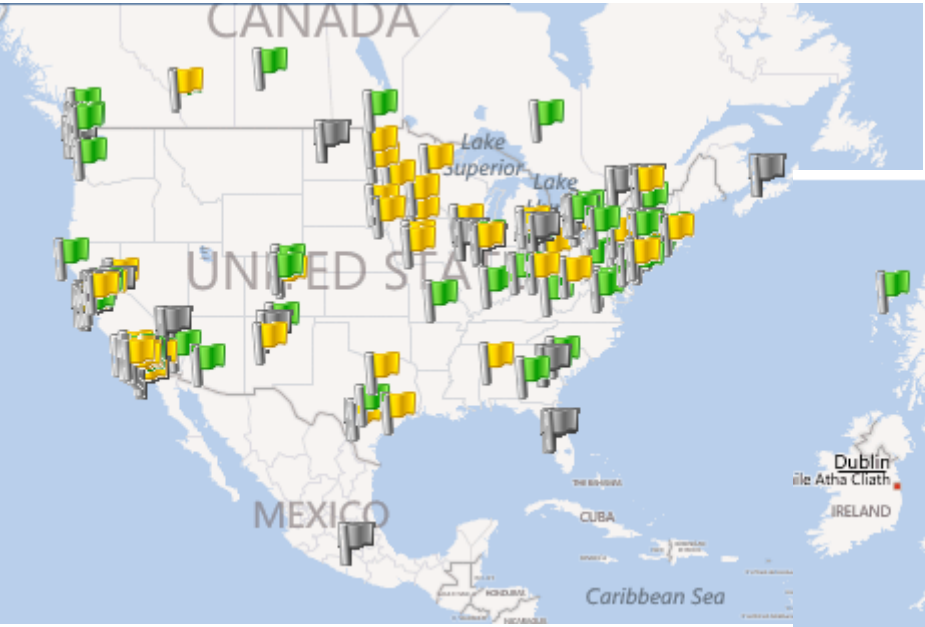
SOURCE: METI; Government of South Korea

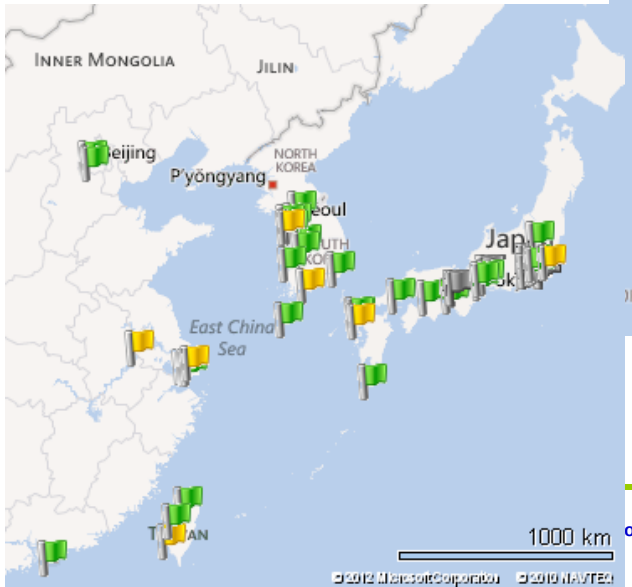
"H_2 Mobility" Initiative – Overcoming the Chicken and Egg Dilemma

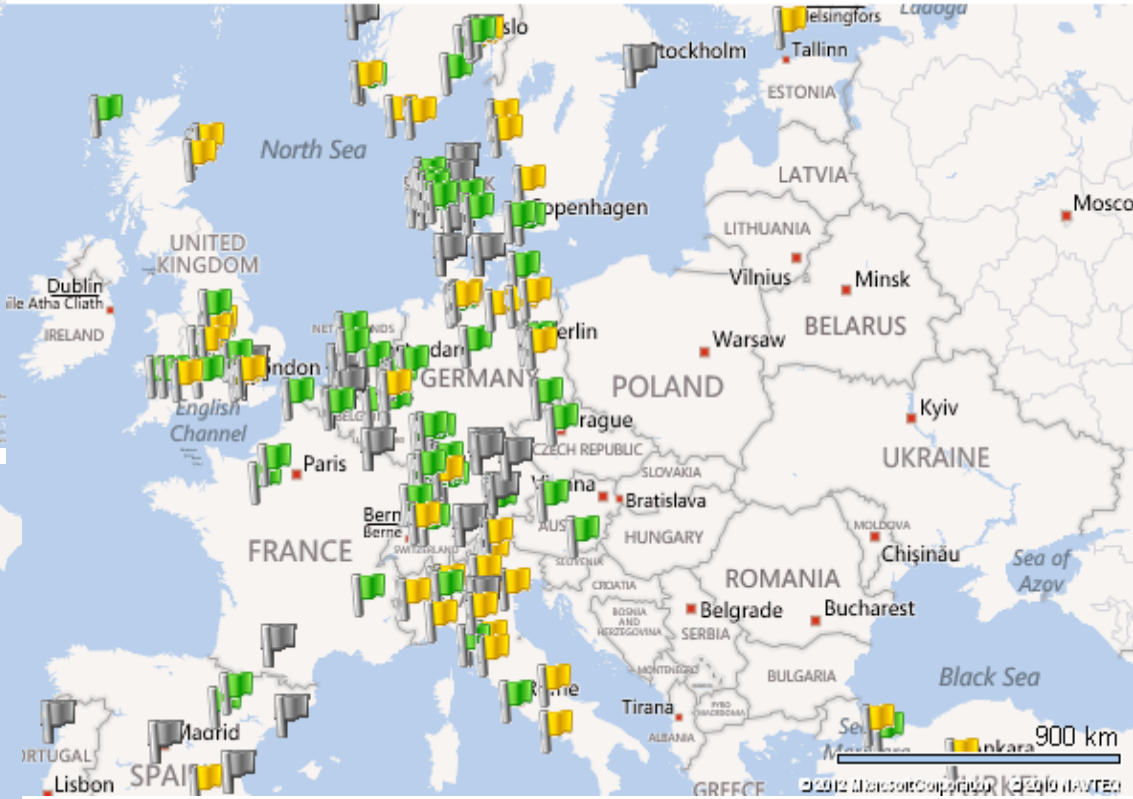
- Memorandum of Understanding for "H_2-Mobility" signed Sept. 10th 2009 in Berlin
- Ten key stakeholders from industries (OEM, oil, utility & industrial gas) and NOW as public-private-partnership
- Intention to build up hydrogen fueling infrastructure and establishing Germany as lead market

DAIMLER EnBW THE LINDE GROUP AIR LIQUIDE NOW OMV AIR PRODUCTS SHELL TOTAL eni VATTENFALL

Applications transports: infrastructure

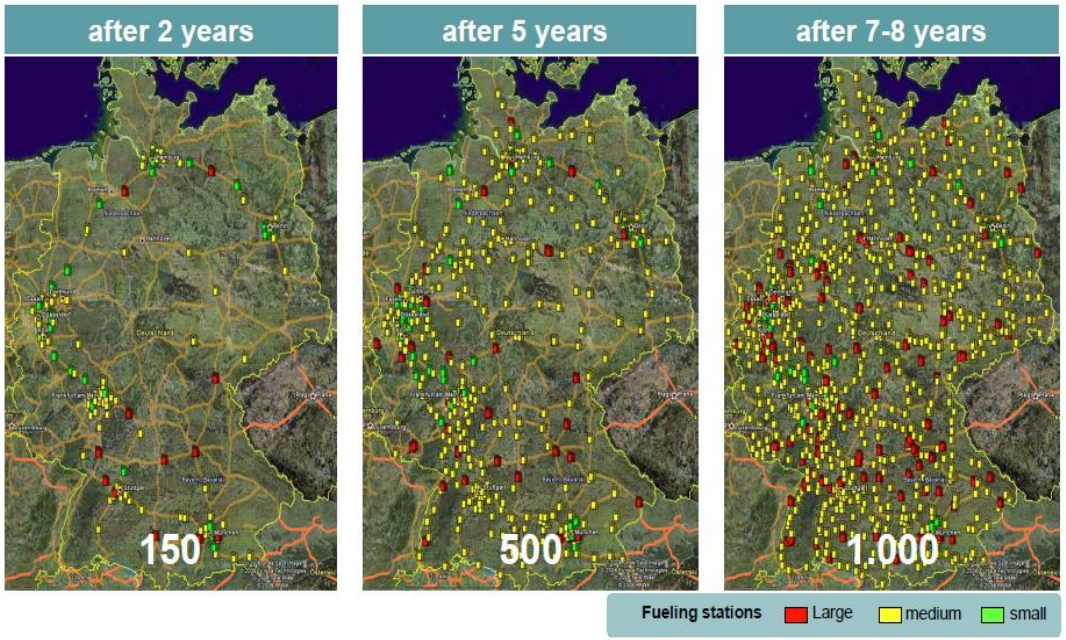




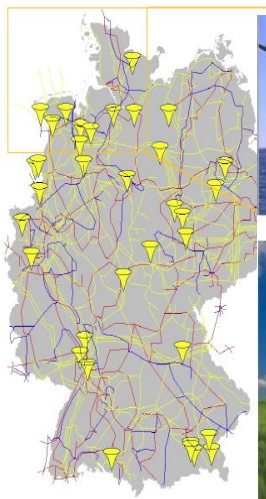


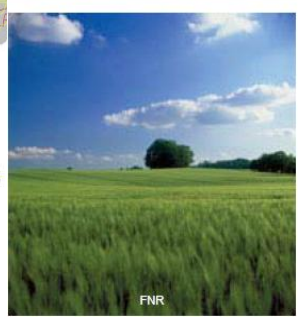
Source: H2stations.org

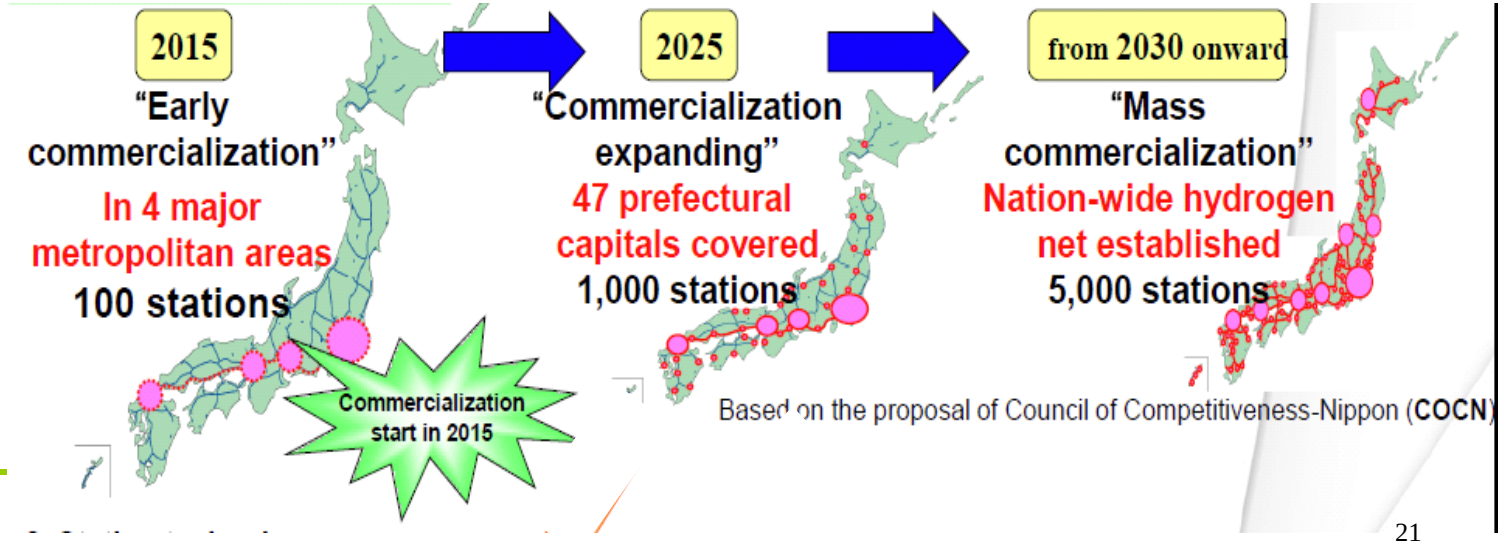
Des plans précis de déploiement des infrastructures en Allemagne et au Japon à partir de 2015



Utilisation du réseau gazier comme stockage

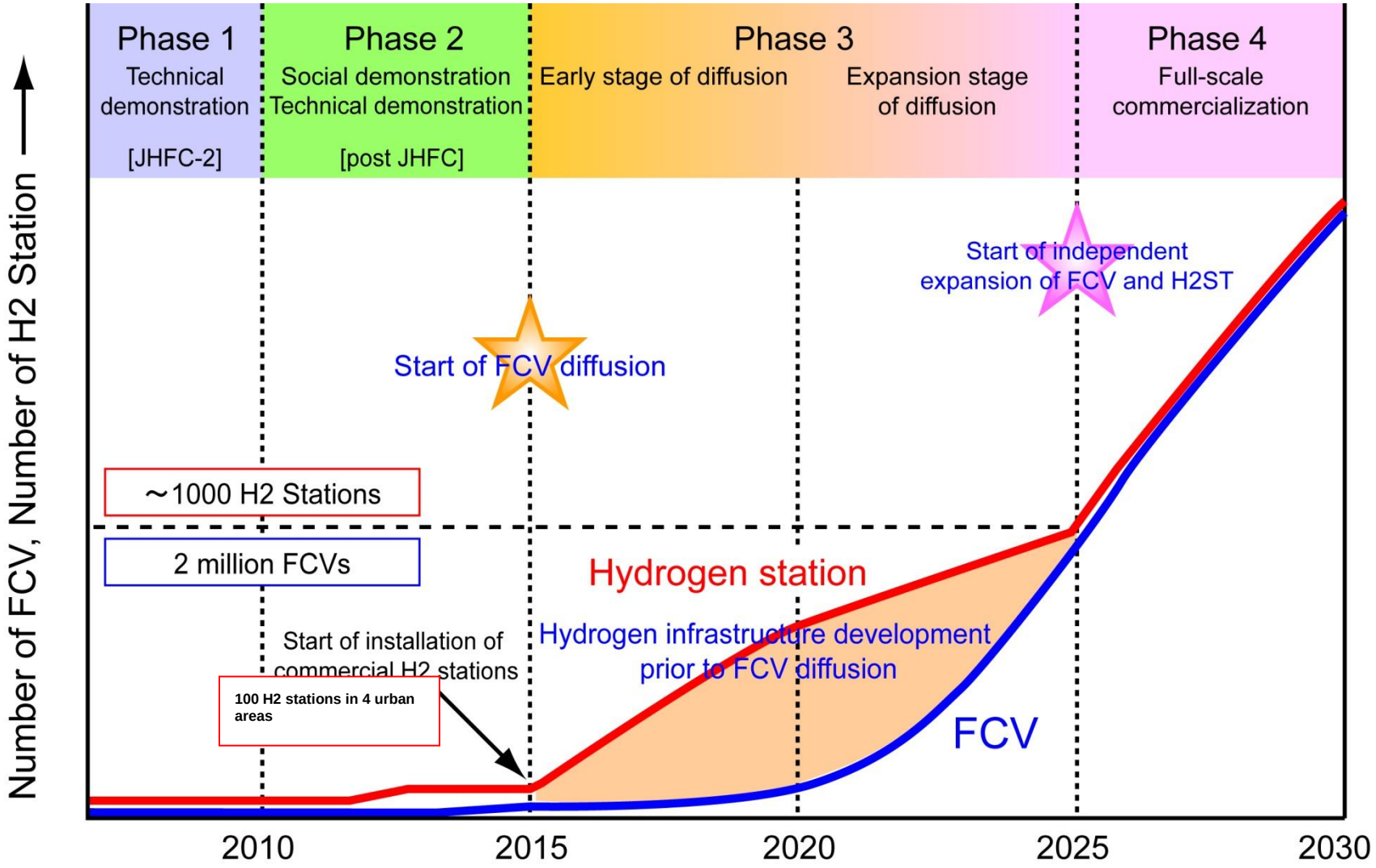






Based on the proposal of Council of Competitiveness-Nippon (**COCN**)

Japan:
Diffusion Scenario on FCV and Hydrogen Infrastructure



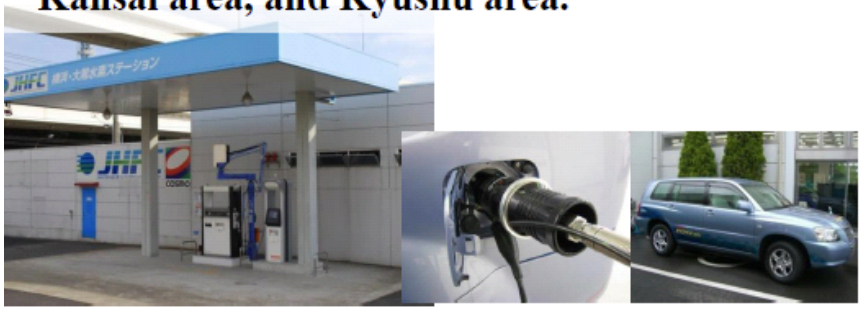
Steps toward a low carbon mobility
(implemented in relation to FCCJ scenario)

FCCJ: Fuel Cell Commercialization Conference of Japan

Japan Hydrogen & Fuel Cell Demonstration Project (JHFC Phase II)

- To clearly show energy-saving effect and environmental impact
- To collect data for codes & standards development and certification practices
- Project Year: 2006–2010

- Demonstration of FCV under actual circumstances
- Hydrogen stations: upgraded to 70 MPa
- Demonstrative operation of various means of H_2 production and supply and its verification
- Awareness & education: To raise public awareness regarding FCVs and H_2 Stations
- Currently operating 14 hydrogen fuelling stations and one hydrogen liquefaction facility in the Tokyo metropolitan area, Chubu area, Kansai area, and Kyushu area.



Report on the Long Distance Demonstration Drive of 1,100km (approx. 684 miles) by Three Fuel Cell Vehicles

- The top-ranked vehicle in the project has recorded an efficiency of 61.3 percent and a mileage of 159 km/kg of hydrogen (Japan's 10-15 mode).

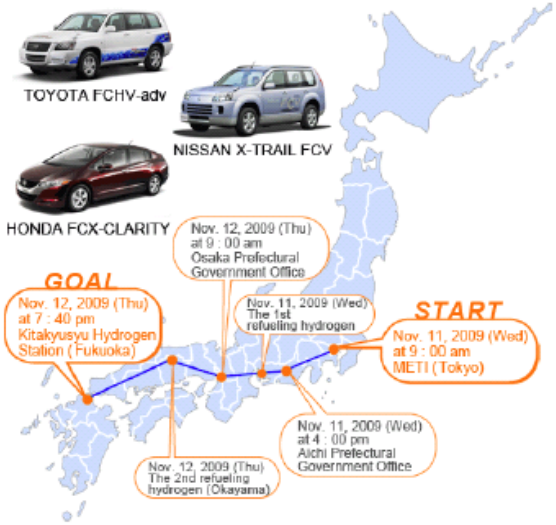
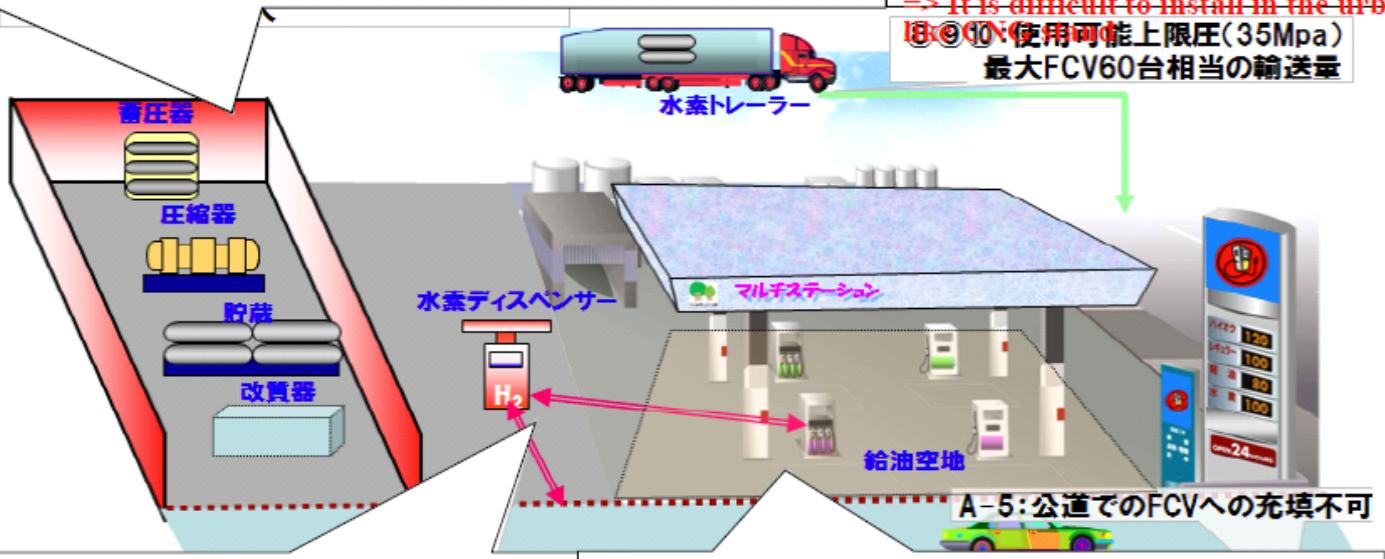


Image of the cost down of the H_2 fueling station by reviewing regulation: Before the review, Construction Cost > 600 million yen

5 Simplify the application of Technical Standards Adaptation for specific facilities and pluming of low design coefficient
6 Enhance of usable steal stock mentioned in Exemplified Basis
10 Simplify the application of Technical Standards Adaptation of compound vessel usage for hydrogen stand accumulator
16 Change maximum refueling pressure for Full-refueling and revise Exemplified Basis (container related) Change maximum refueling pressure for Full-refueling and revise Exemplified Basis (general related) => **Building Cost Up**
3 Formulate Safety Inspection Regulation to simplify process of safety inspection and assign at the Safety Inspection Announcement
11 Rationalize regulations of fueling stations related to the setting of the hydrogen stations
13 Allow hydrogen refueling to those who are not permitted of high pressure gas manufacturing, set forth to realizing self-refueling hydrogen stands => **Running Cost Up**

1 Maintain Technical Basis and Exemplified Basis compliant to 70MPa hydrogen stand
2 Alleviate the distance regulation that facilitate of building CNG stands
4 Increase of hydrogen holdings in the urban area
semi-industrial area 3,500 Nm3
commercial area 700 Nm3 (FCV 20 units)
semi-residential area 350 Nm3 (FCV 10 units)
*more than 200 units at CNG stands
=> **It is difficult to install in the urban area as before**

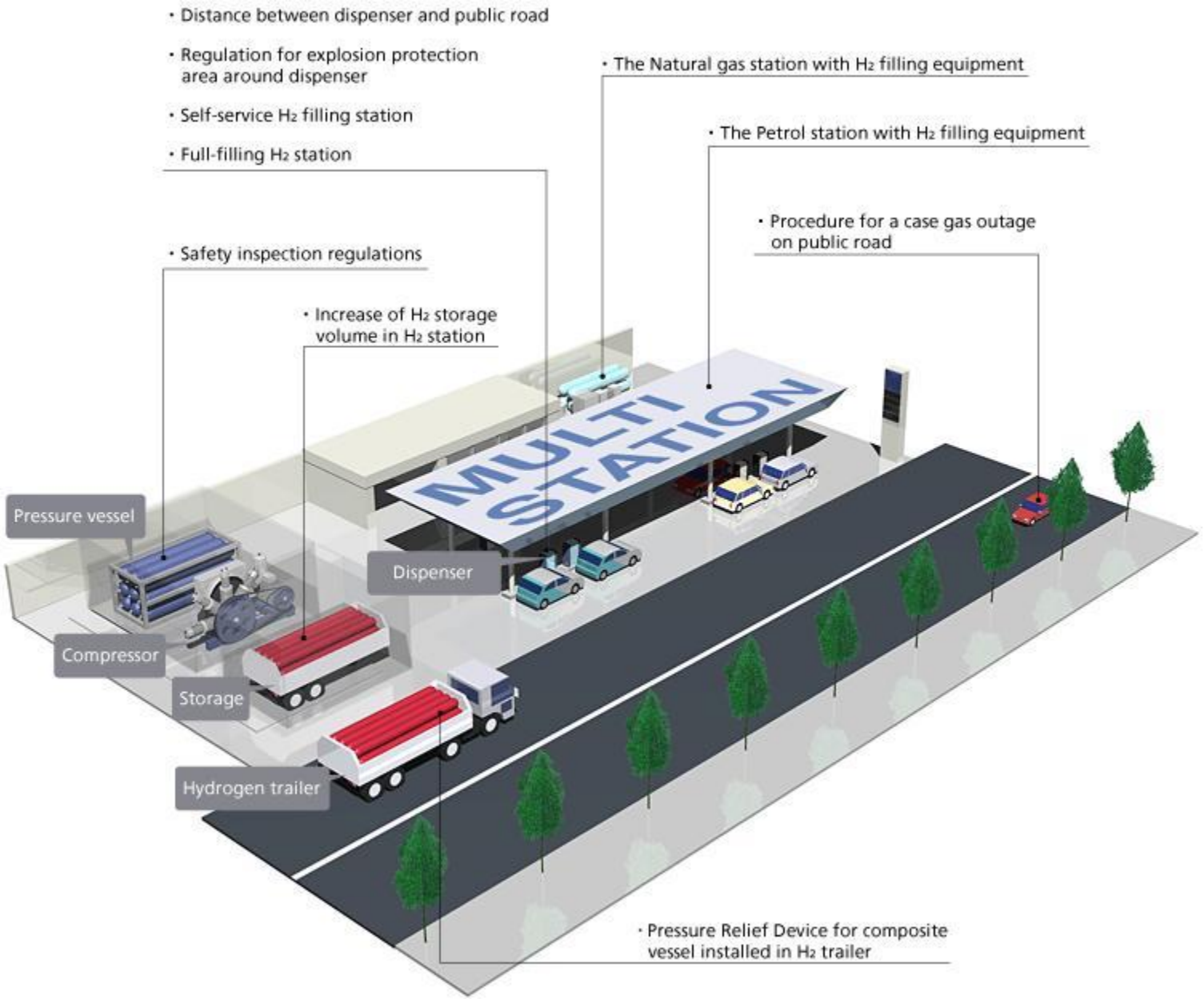


14 Clearly articulate the explosion protection zone basis related to hydrogen dispensers
Distance from fire road: >6m(35MPa), >8m(70MPa)
*4m (like gasoline stations)
Difficult to find location

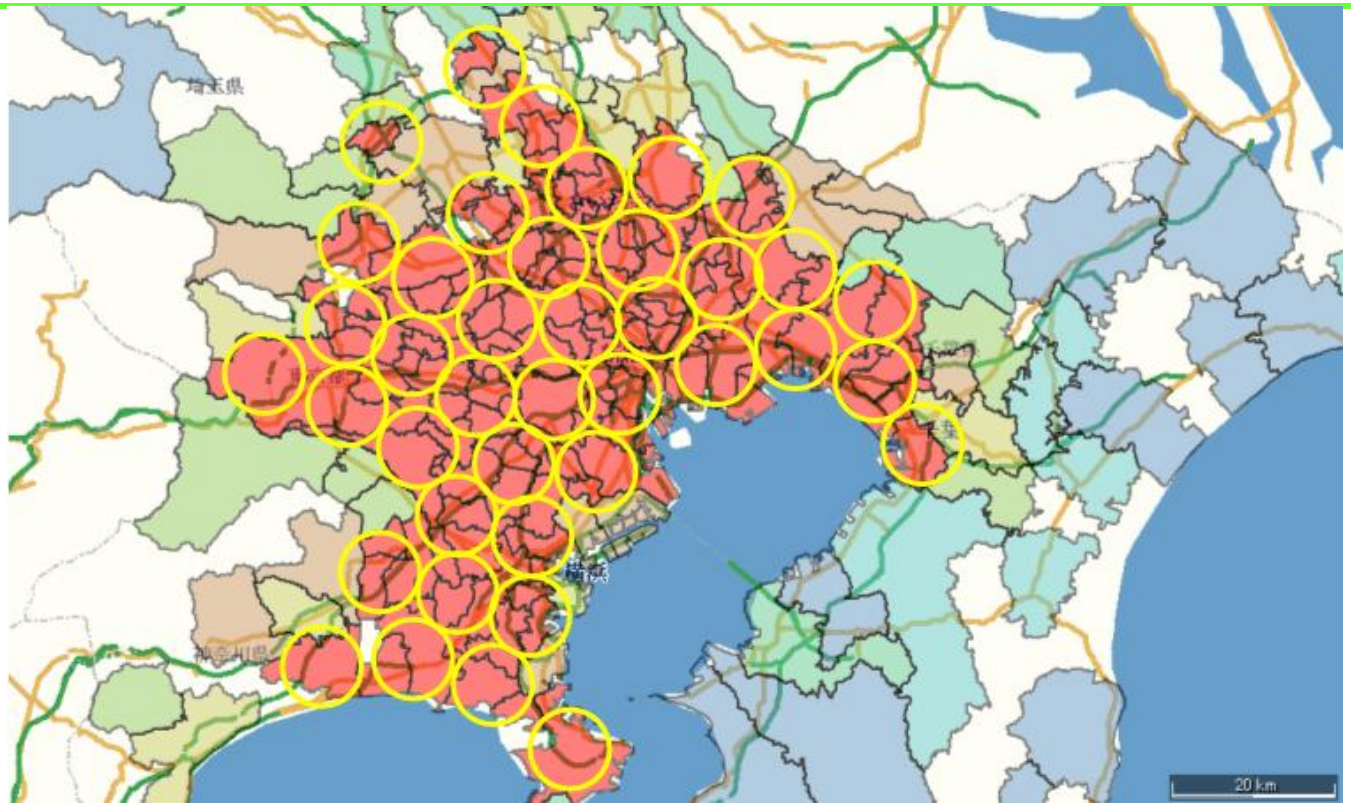
11 Rationalize regulations of fueling stations related to the setting of the hydrogen stations
14 **Distance from fire source**: >6m(35MPa), >8m(70MPa)
*4m (like gasoline stations),
Difficult to find location

Reference: PAJ

Regulation Reviews for Construction and Operation of Hydrogen Station (FY2011-2012)



Estimation of number of stations to be in place by 2015

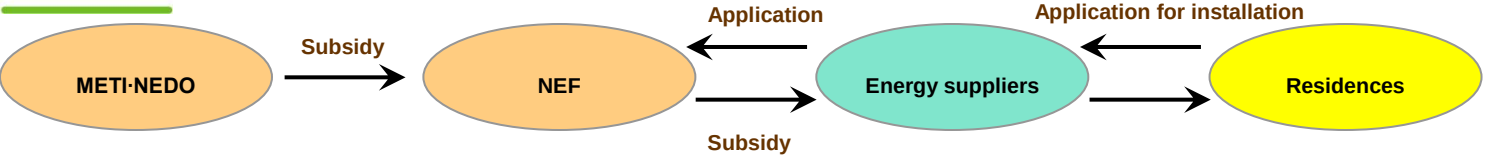


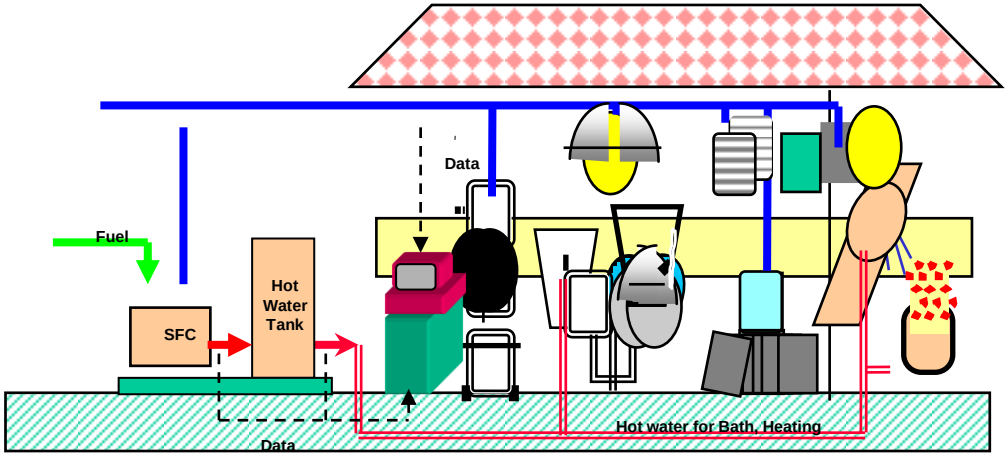
- Average vehicle speed in the densely populated area near Tokyo is 20km/h.
- Cover area (business territory) of a station is assumed to be within 15 min drive (5 km) from the station.
- Pick up the station business territories having more than 100,000 registered cars.

The red areas are the potential areas for initial market entry and can be covered by 40 stations that have 5 km circular business territories. After the initial market entry phase, service area expansion and demand density increase are to be targeted.

EXEMPLE DU STATIONNAIRE

Fuel cells for Residential applications Market is starting NOW

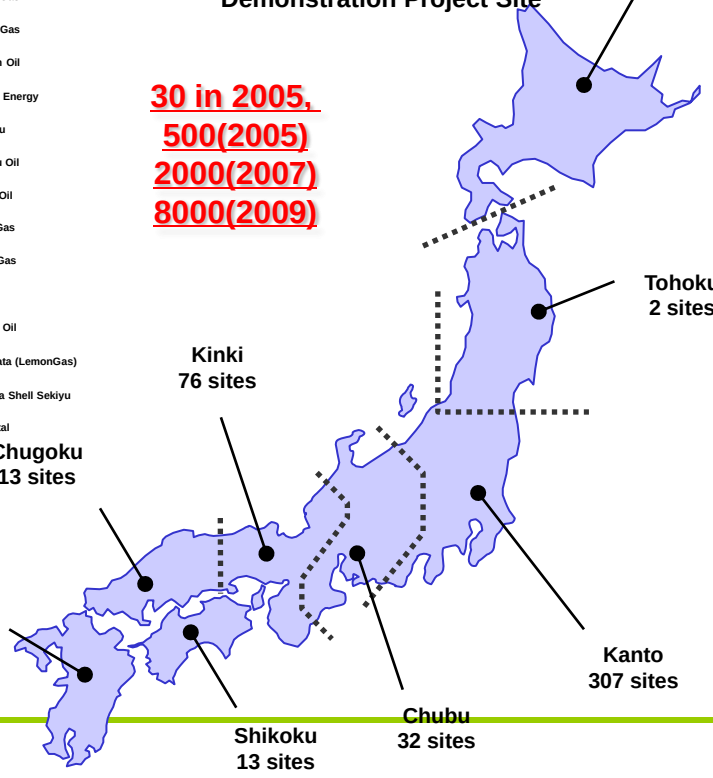




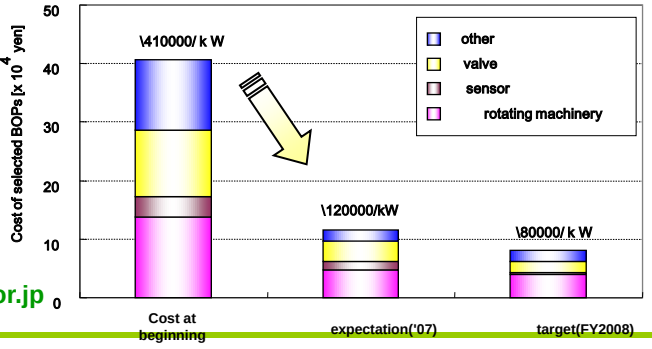
Tokyo Gas
Osaka Gas
Nippon Oil
Japan Energy
Idemitsu
Kyushu Oil
Taiyo Oil
Toho Gas
Saibu Gas
Iwatani
Cosmo Oil
Kamata (LemonGas)
Showa Shell Sekiyu
Total

Demonstration Project Site

30 in 2005,
500(2005)
2000(2007)
8000(2009)



15,3 % benefit on primary energy
846 Kg/site/year CO2, -28%



Web site: http://happyfc.nef.or.jp

Commercialization of Residential Fuel Cells

Residential fuel cell systems commercialized in 2009.
- 0.7–1.0 kW PEFC + heat recovery (CHP)
- Three manufactures
- Subsidization program initiated

1/2 of users' costs (system + installation): up to 1.3M JPY in 2010

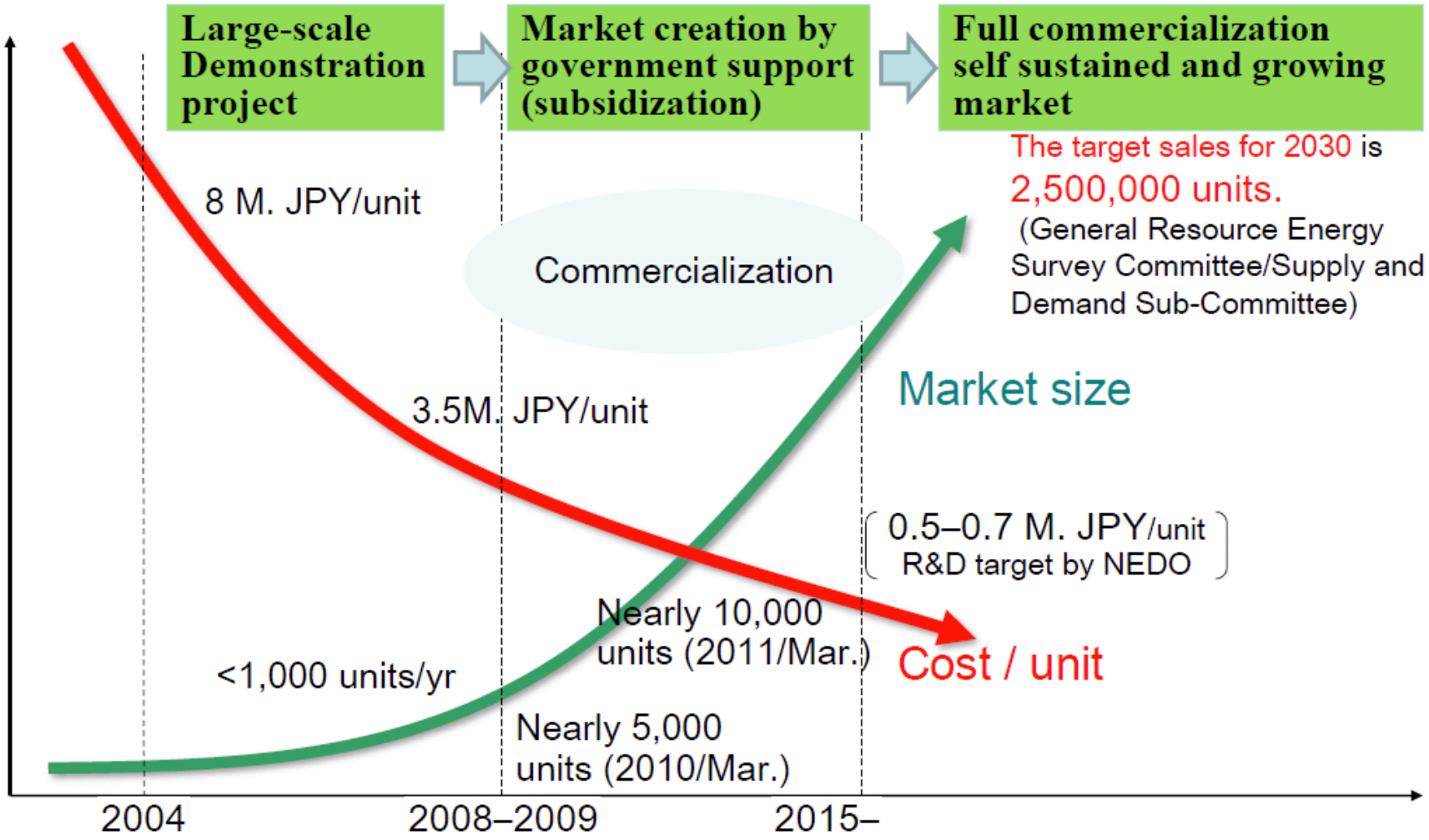
Nearly 10,000 units were offered (as of Mar. 2011)

(3,307 by demonstration project in 2004-2008)

ENE·FARM

"ENE-FARM" - The unified logo for Residential Fuel Cells

Scenario of Market Creation for Residential Fuel Cell



Les accords internationaux

Pourquoi des coopérations internationales sur l'hydrogène ?

- H2 et Pac est un sujet difficile et à long terme
  - Coûts, rendements, sécurité
  - Critiques sur ces technologies et ce système
- Pour l'automobile l'hydrogène est une rupture technologique majeure
- Les investissements sont très lourds
- La R&D est complexe
- La communication sur l'hydrogène est particulièrement délicate
  - Medias
  - Gouvernements
  - Grand public
- L'approche Business as usual ne suffira pas
  - Intervention de la sphère publique et politique
  - Partenariats public/privé

Objectifs (théoriques) de la coopération internationale institutionnelle?

- Echanger les informations programme, scientifiques et techniques et bonnes pratiques
  - Coûts, rendements, sécurité
  - Critiques sur ces technologies et ce système
- Favoriser/Faciliter les coopérations notamment sur:
  - Normes
  - Sécurité
  - Scientifiques et industriels sur les sujets non compétitifs
- Améliorer la communication sur l'hydrogène en dehors du monde de l'hydrogène
- Force de propositions et d'expertise vis-à-vis des gouvernements
- Coordonner les programmes ?

Exemples de coopération institutionnelles internationales

- IPHE
- IEA
- ONU/UNIDO ICHET
- OTAN
- Les associations Hydrogène

- **Established in November 2003 for 10 years**
- **Chaired by United States, then Canada, now Germany f or 4 years period including Secretariat function**
- **18 partners now South Africa with growing interest *(e.g. Israel, Mexico)***

IPHE
International Partnership for the Hydrogen Economy

www.iphe.net

Russian Federation | USA | Canada | Iceland

IPHE Partners' Economy:

- Over $35 Trillion in GDP, 85% of world GDP
- Nearly 3.5 billion people
- Over 75% of electricity used worldwide;
- > 2/3 of CO_2 emissions and energy consumption

Japan
Republic of Korea
China
India

United Kingdom
France
Germany
Italy

Australia | Brazil | Norway | European Commission | New Zealand

Workshop sponsorized by EC and Spanish companies

Workshop "*Hydrogen – A competitive Energy Storage Medium to enable the large scale integration of renewable energies*"

Seville, 15-16 November 2012

Agence Internationale de l'Energie

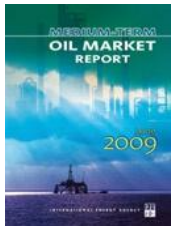
International Energy Agency

About IEA

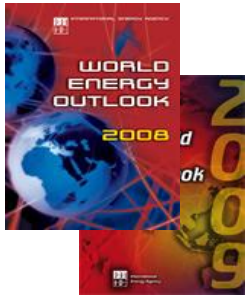
- Agence de l'OECD: 28 pays: structure politique, structure expertise (Siège Paris)
- 40 Implementing Agreement

- Advanced Fuel Cells
- Advanced Materials for Transportation
- Advanced Motor Fuels
- Bioenergy
- Buildings and Community Systems (ECBCS)
- Clean Coal Centre Clean Coal Sciences
- Climate Technology Initiative (CTI)
- Co-operation on Tokamak Programmes
- Demand-Side Management
- District Heating and Cooling, CHP
- Efficient Electrical End-Use Equipment
- Electricity Networks Analysis, Research & Development (ENARD)
- Emissions Reduction in Combustion Energy
- Storage
- Energy Technology Data Exchange (ETDE)
- Energy Technology Systems Analysis Programme (ETSAP)
- Enhanced Oil Recovery Environmental,
- Safety and Economic Aspects of Fusion Power
- Fluidized Bed Conversion
- Fusion Materials
- Geothermal Greenhouse Gas
- Heat Pumping Technologies
- High-Temperature Superconductivity (HTS)
  - on the Electric Power Sector
- Hybrid and Electric Vehicles
- Hydrogen
- Hydropower
- Industrial Energy-Related Technologies and Systems
- Multiphase Flow Sciences
- Nuclear Technology of Fusion Reactors
- Ocean Energy Systems
- Photovoltaic Power Systems
- Plasma Wall Interaction in TEXTOR
- Renewable Energy Technology Deployment
- Reversed Field Pinches
- Smart Grids (ISGAN)
- Solar Heating and Cooling
- SolarPACES
- Spherical Tori Stellarator-Heliotron Concept
- Wind Energy Systems

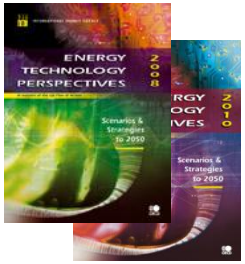
Presentation des travaux IEA



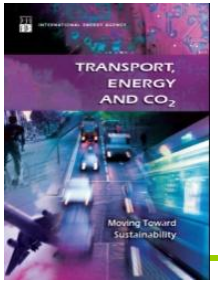
- **Medium term Oil Market Report**
  Horizon 2015, focus on oil
  Scenarios currently based on two different GDP growth assumptions, includes biofuels projection



- **World Energy Outlook (WEO)**
  Horizon 2030, all energy sources
  Scenarios depicting different developments on the basis of policy actions
  One underlying assumption for GDP and population growth
  Includes a thorough analysis on the oil supply availability



- **Energy Technology Perspectives (ETP)**
  Horizon 2050, all energy sources
  Scenarios that pay particular attention to the role of technology, especially on the demand side
  One underlying assumption for GDP and population growth



- **Transport, energy and CO_2** *Just Out!*
  Moving towards sustainability
  "Transport book"
  Horizon 2050, all energy sources
  Builds and expands the work done on ETP

Hydrogen Implementing Agreement (HIA)

A collaborative research and development (R&D) program
Created in 1977 on a task-shared, "bottom-up" basis

Strategic Framework

Vision

A hydrogen future based on a clean sustainable energy supply of global proportions that plays a key role in all sectors of the economy

Mission

To accelerate hydrogen implementation and widespread utilization to optimize environmental protection, improve energy security, and promote economic development internationally while establishing the HIA as a premier global resource for expertise in hydrogen.

Strategy

To facilitate, coordinate and maintain innovative research, development and demonstration (RD&D) activities through international cooperation and information exchange

IEA HIA Members

June 2009

Canada
Mr Nick Beck

European Commission
Dr Marc Steen

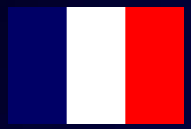
Japan
Dr Yoshiteru Sato

Italy
Mr Agostino Iacobazzi

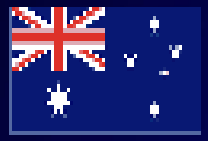
Iceland
Dr Agusta Loftsdottir

Lithuania
Dr Rolandas Urbonas

The Netherlands
Mr Frank Denys



France
Mr Paul Lucchese



Australia
Dr John Wright

Germany
Mr J.-F. Hake

Greece
Dr Elli Varkaraki

Turkey
Dr Alper Sarioglan

Korea Mr Kijune Kim

New Zealand Dr Steven Pearce Co Vice-Chair

Norway
Dr. Stian Nygaard

Spain
Mr Antonio Garcia-Conde
Chair

Sweden
Dr Lars Vallander

Switzerland
Dr Stefan Oberholzer

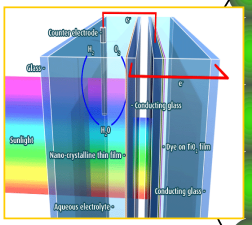
United Kingdom
Mr Ray Eaton

United States
Dr Carole Read

Denmark
Mr Jan Jensen
Co Vice-Chair

Finland
Dr Heikki Kotila

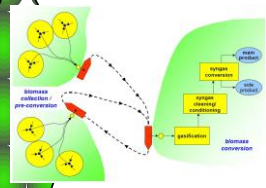
Task 26: Advanced Materials for Waterphotolysis of H2



May 2008 – May 2011

OA: Dr Eric Miller of DOE

Task 27: Near-Market Routes to H2 by Co-Utilization of Biomass as a Renewable Energy Source with Fossil Fuel



2008 – 2011

OAs: Dr Jan-Erik Hanssen and Ms. Elif Caglayan

Task 25: High Temperature Processes for H2 Production

May 2007 – May 2011

OA: Dr. Francois Le Naour. S

PORTFOLIO H_2 PRODUCTION

Task 21: BioInspired H2

May 1999-May 2013 (recently extended)

OA: Dr. Michael Seibert

Task 24: Wind Energy and H2 Integration

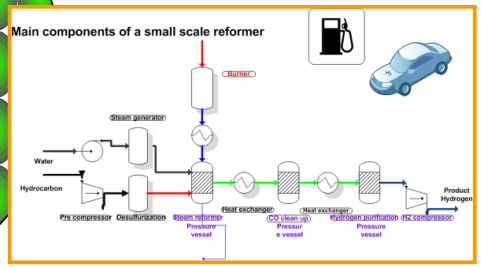
December 2006-December 2011

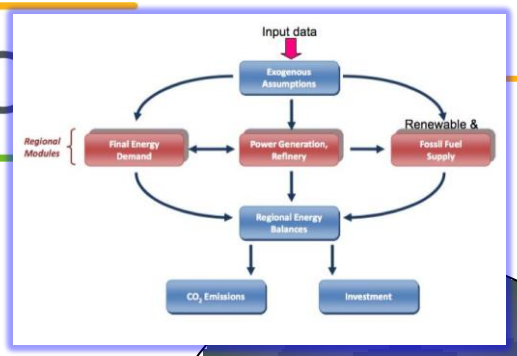
OAs: Dr. Luis Correas – Ismael Aso (Hidrógeno Aragón)

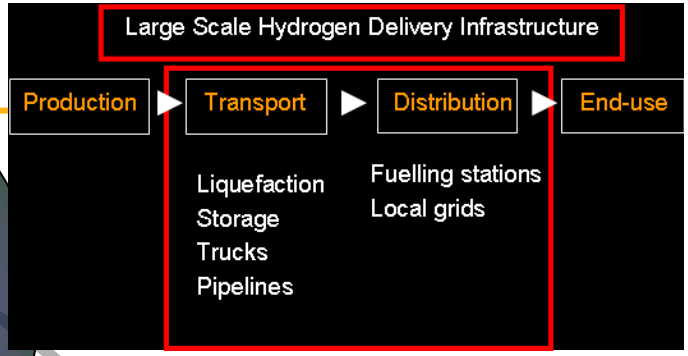
Task 23: Small-Scale Reformers for On-Site H2 Supply

December 2006 - December 2011

OA: Dr. Ingrid Schjølberg of Sintef







Task 28: Large Scale H2 Delivery Infrastructure

May 2010 – April 2013

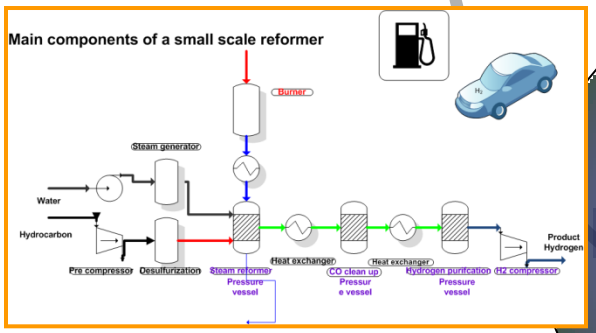
OA: Dr. Marcel Weeda

Task 30: Global Analysis of Hydrogen Systems

May 2010 - June 2013

OAs: Mr. Jochen Linssen and Dr. Susan Schoenung

H2 as part of an energy system



Task 23: Small-Scale Reformers for On-Site H2 Supply

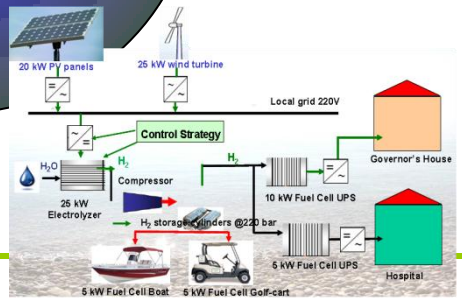
December 2006 - December 2011

OA: Dr. Ingrid Schjølberg of Sintef

Task 29: Distributed and Community Hydrogen

December 2010 - December 2013

OA: Dr. Federico Villatico



IEA/Advanced Fuel cells

For further information please contact:

M. Thierry Priem
French representative
IEA Advanced Fuel Cells
Executive Committee
thierry.priem@cea.fr

Or see web site at
www.ieafuelcell.com

IEA/
Hydrogen Implementing agreement

For further information please contact:

M. Paul Lucchese
French representative
IEA Hydrogen Implementing
Executive Committee
Paul.lucchese@cea.fr

Or see web site at
www.ieahia.org

L'OTAN finance des projets
Science for Peace programme

Nato funded project 2007-2011
« SfP:Science for peace programme »
Morocco and Mauritania
Saharawind leader

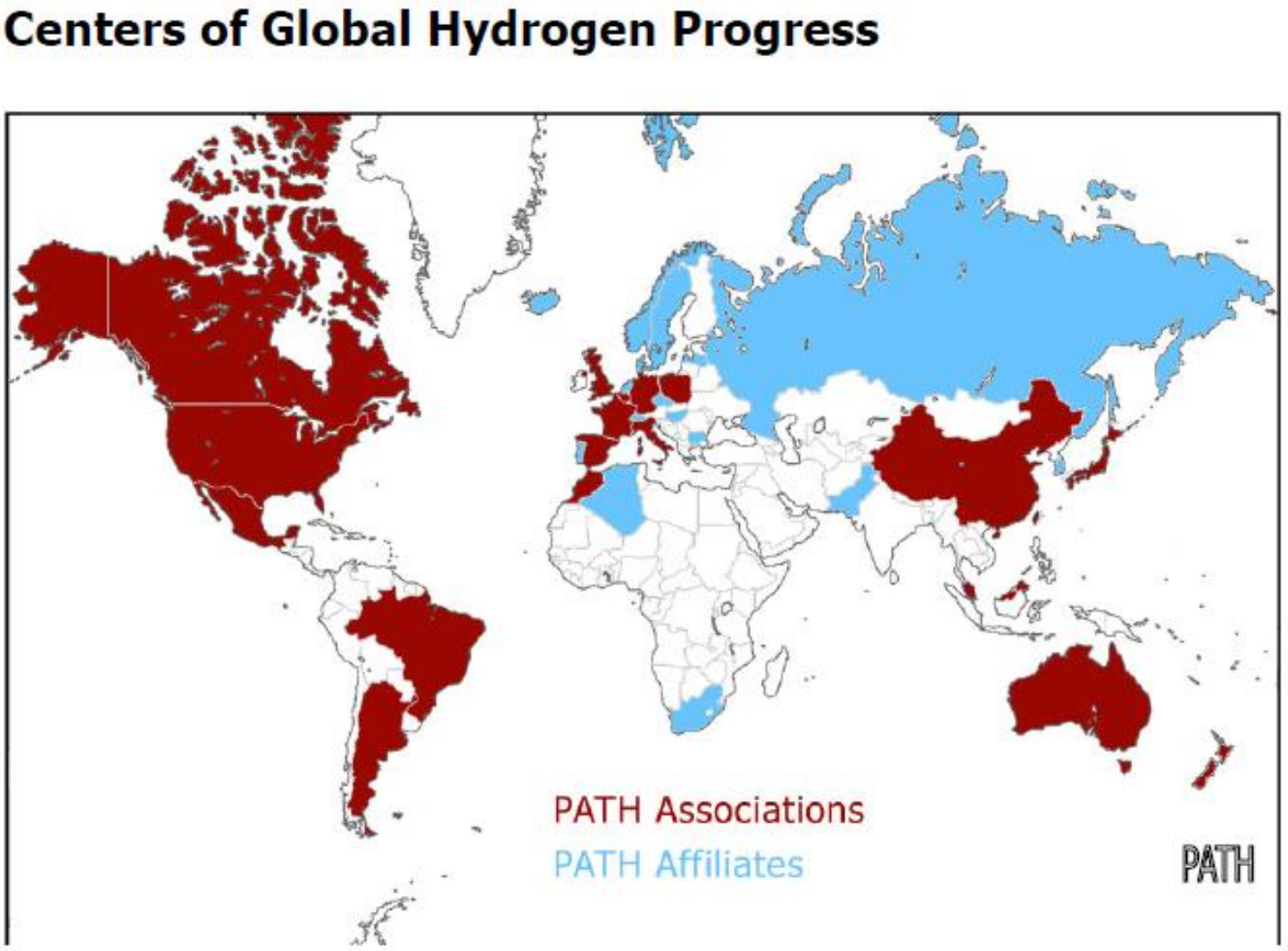
Nato project to study feasability of producing H2/O2 or H2/Cl2 by wind in excess and to use in industrial use :
- water industry
- fertilizer industry, ammonia production,
- iron processing
- chemical…

Sahara wind

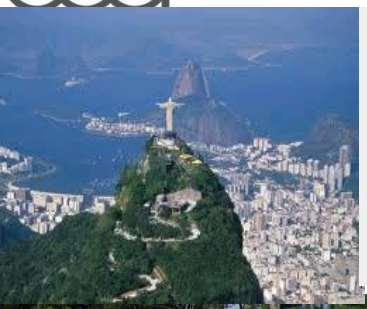
UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

INTERNATIONAL CENTRE FOR HYDROGEN ENERGY TECHNOLOGIES

Pays avec une Association Hydrogène



Evenements mondiaux : une occasion de communiquer



Rio2016

Brasil 2014

LONDON 2012

Cab Hybride
30kW PEMFC, 14kWh Li-P
400km autonomie

Eletropaulo · BALLARD · EPRI · HYDROGENICS · Marcopolo
NUCELLSYS · PETROBRAS · trasporti · FINEP · GEF
EMTU · SECRETARIA DOS TRANSPORTES METROPOLITANOS · GOVERNO DE SÃO PAULO · Ministério de Minas e Energia · BRASIL

INTELLIGENT ENERGY
Clean fuel and power

Beijing 2008

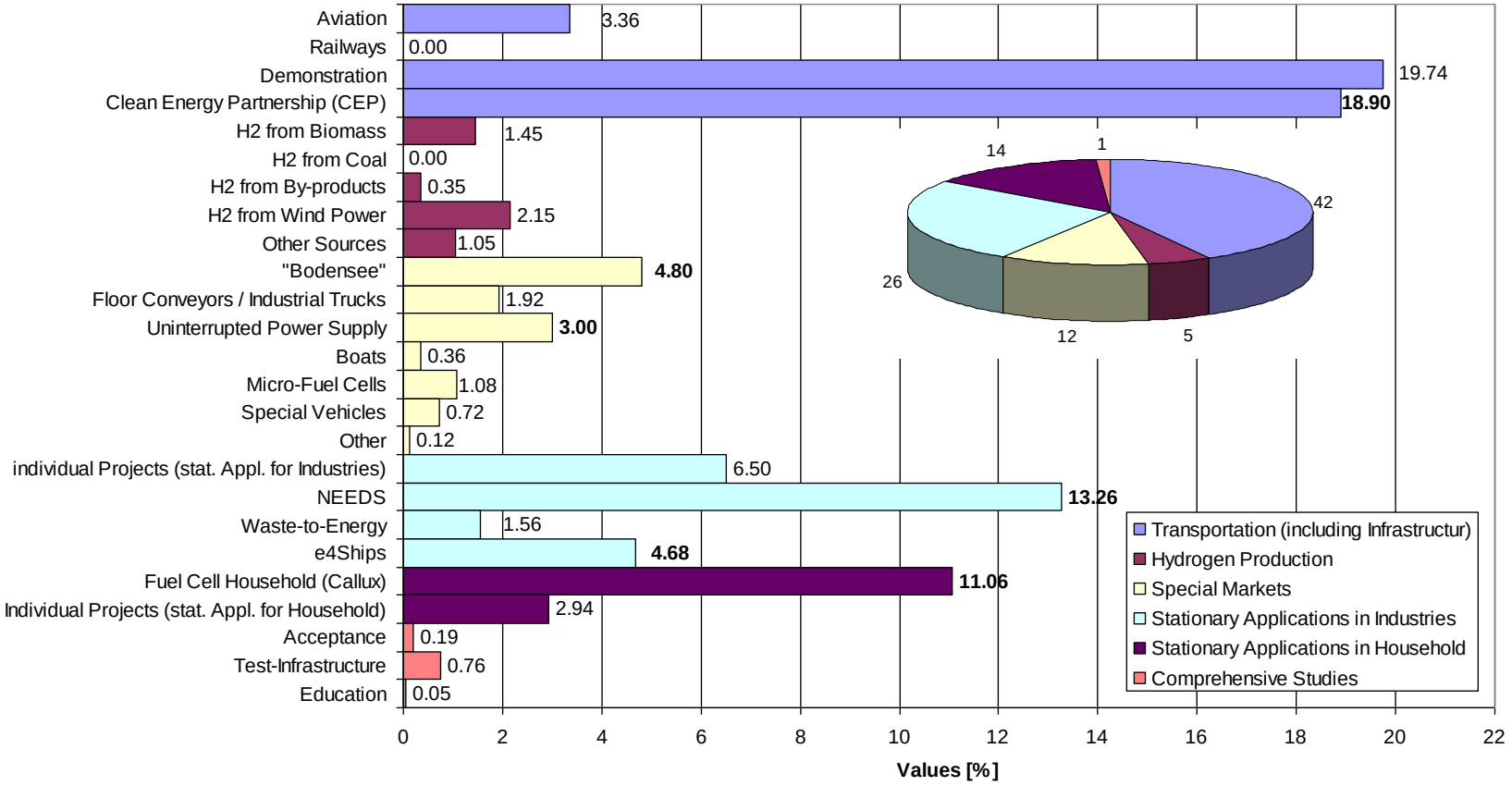
EXPO 2010 SHANGHAI CHINA

MERCI POUR VOTRE ATTENTION

Détails du programme NIP

GOAL: Prepare the market for hydrogen as an energy carrier!

Source: Fed. Ministry of Transportation, Building and Urban Development 2008: „Status and Actual Situation NOW and NIP-Realization“



95 projects within 196 requests are financed with 188 Mio. € until the end of 2010!