AGENZIA NAZIONALE
PER LE NUOVE TECNOLOGIE, L'ENERGIA
E LO SVILUPPO ECONOMICO SOSTENIBILE

Energia pulita per i trasporti: il ruolo dell'idrogeno nella strategia europea e le opportunità per l'Italia

Le iniziative internazionali

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Piazzale R. Morandi, 2
incontro dibattito
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Contenuto

- **Veicoli ad idrogeno e celle a combustibile: Il contesto mondiale**
  - Europa
  - Germania
  - Francia
  - UK
  - USA
  - Giappone
  - Corea
  - Brasile, India, Austria, Norvegia, Islanda, ….
  - E l'Italia?

H2 e EFCV nei Progetti europei (FCH-JU 2008-2011)

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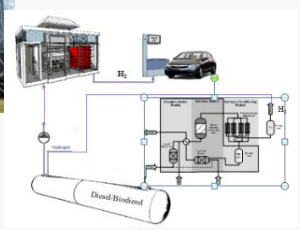
TRASPORTO & IFRASTRUTTURE DI RIFORNIMENTO	**10 progetti** 6 demo 2 ricerca 2 studi	        
HYDROGEN PRODUCTION & DISTRIBUTION	**14 progetti** 6 demo 8 Ricerca	   

Germania : Trasporto - L'uovo e la gallina

L'uovo e la gallina
Non ci sono Veicoli FC senza infrastrutture idrogeno e viceversa

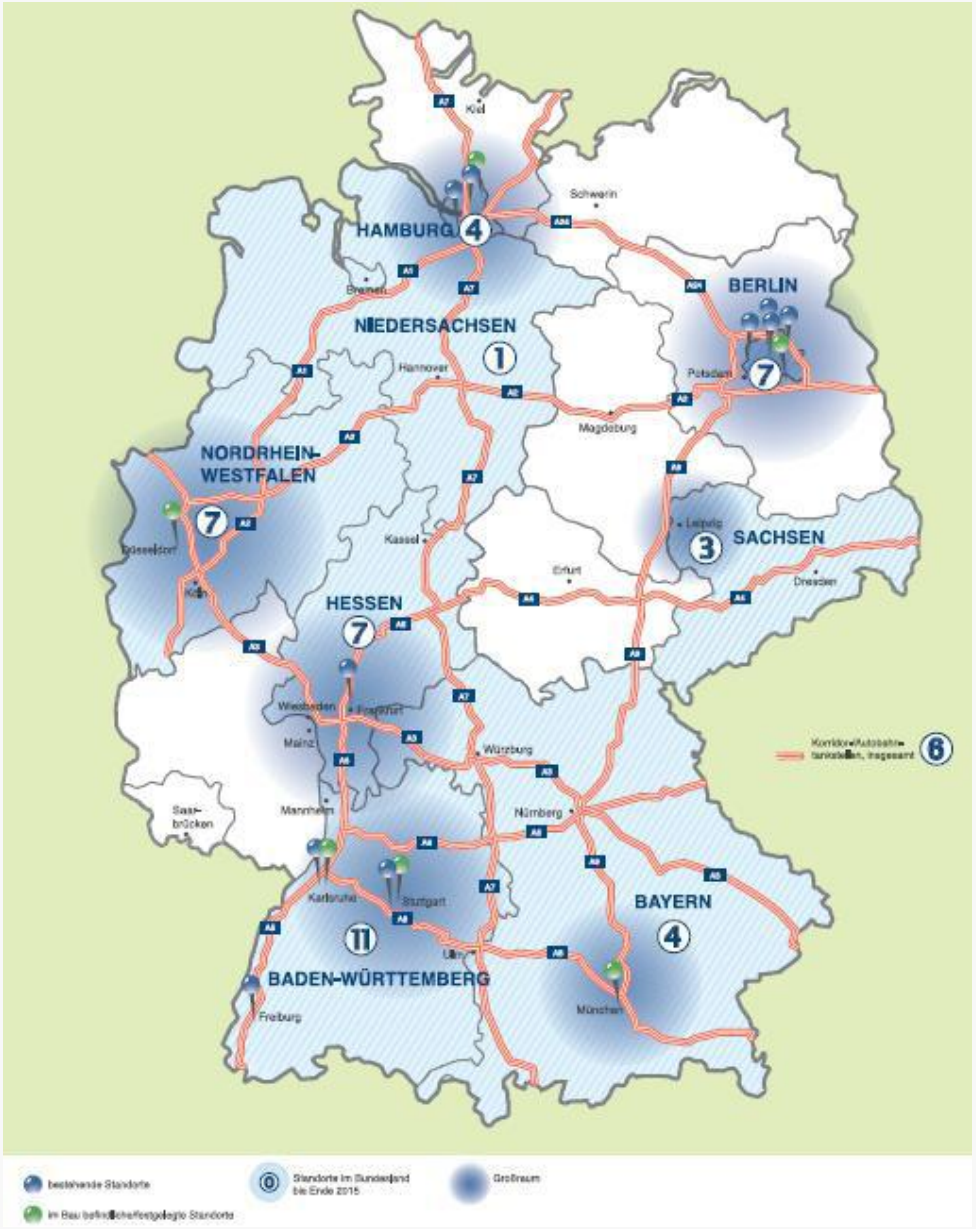
I — **Clean Energy Partnership (2002-2016)**
H_2 and FC Demonstration project in following federal states: Berlin, Hamburg, Hessen, Nordrhein-Westfalen and Baden-Württemberg

II — **H_2 Mobility (since 2009)**
Initiative for build-up of nationwide H_2-Infrastructure. Development of a business plan and joint venture negotiations were the first steps

III — **Daimler/Linde Cooperation (2011-2014)**
20 new H_2 fuelling stations are planned in Germany in a cooperation with The Linde Group and Daimler AG. The first station will be built in 2012

IV — **H_2 Mobility Joint Venture (from 2012/13)**
Transformation of H_2 Mobility to a Joint Venture

Germania: programma nazionale idrogeno e celle a combustibile (NIP) (1,4 Miliardi di € - 2007-2016)

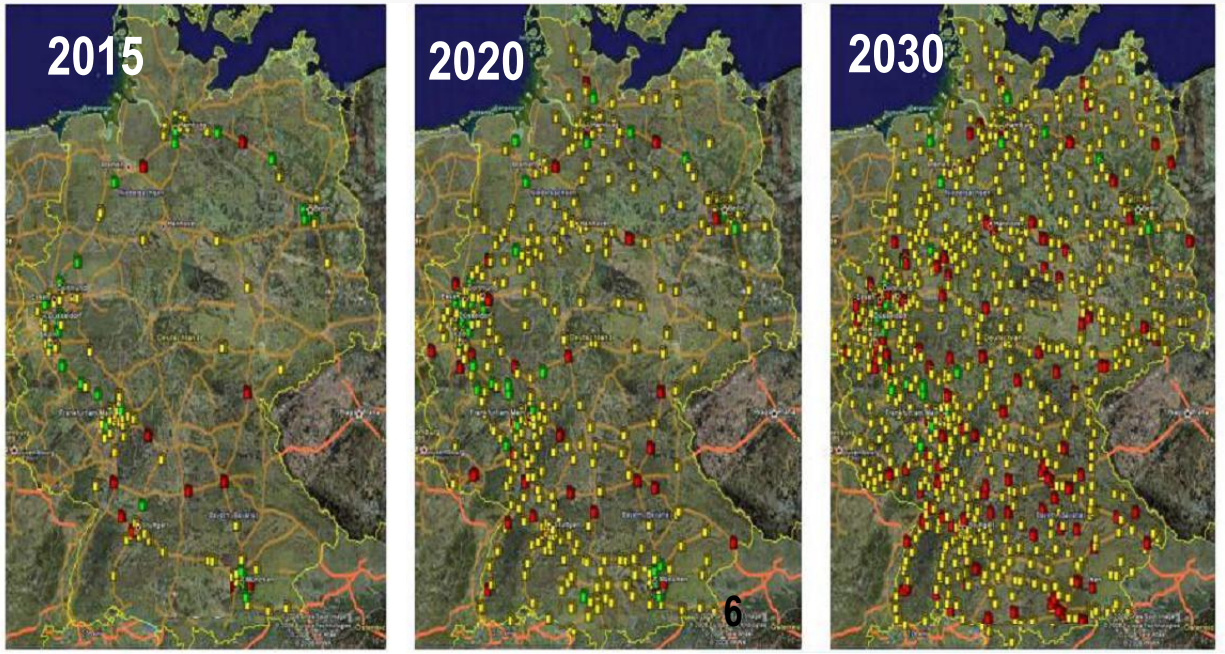


Clean Energy Partnership (CEP)

Portare il numero delle stazioni di rifornimento dalle attuali 15 a 50 al 2015 (40M€)

H2 mobility in Germania

- Iniziativa pubblico privato
- Da 200 a 500 HRS nel 2020
- Da 150.000 a 500.000 FCEV su strada nel 2030



Francia : Mobilità idrogeno

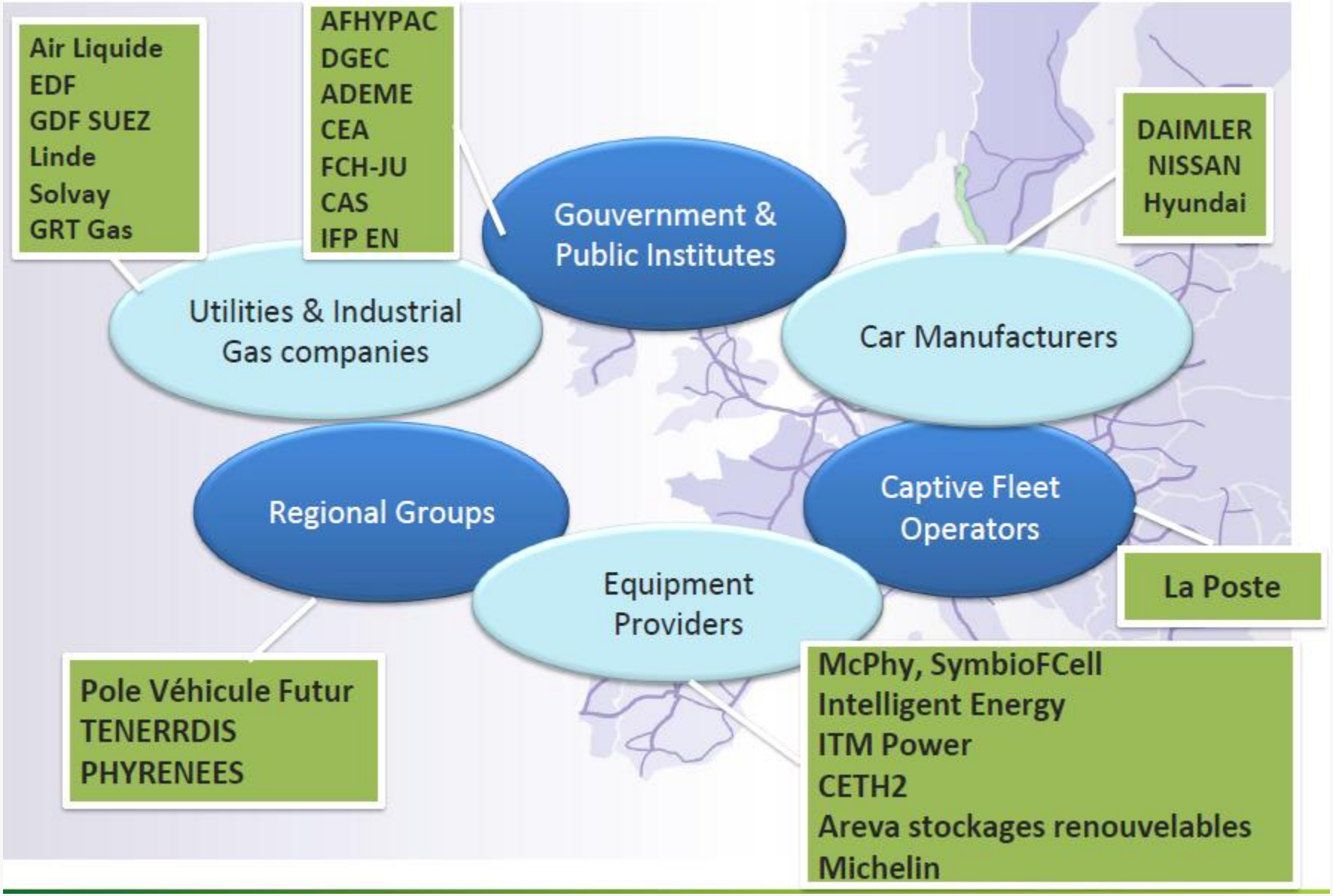
Hydrogen Infrastructure for Transport

MOBILITÉ HYDROGÈNE FRANCE

- La Francia lancia il piano per la “mobilità idrogeno” per fare la sua parte a supporto del piano di sviluppo Europeo per la realizzazione delle infrastrutture idrogeno

- Partner di un progetto coordinato dall’Olanda (DK, FR, NL, Svezia)

Francia: i maggiori attori



Francia: la dichiarazione del ministro dell'ecologia, dello sviluppo sostenibile e dell'energia

Dichiarazione 17 Maggio:

- **Forte supporto alla permanenza francese nell'FCH-JU e IPHE**
- **Supporto al progetto FC nell'aviazione civile (APU)**
- **Forte supporto alla R&S tecnologico in supporto all'industria**
- **H2 mobilty Francia dovrà contribuire alla H2 mobility Europea**

Regno Unito: UK H2 Mobility

Regno Unito: UK H2 Mobility

UK H_2Mobility: a joint industry-government project evaluating the potential and developing a rollout strategy for H_2 transport in the UK

UK Government departments	Department for Transport; Energy & Climate Change; BIS Department for Business Innovation & Skills
Car OEMs	Daimler; Hyundai; Nissan; Tata; Jaguar; Land Rover; Toyota; Vauxhall
Hydrogen providers/ producers and utilities	Air Liquide; Air Products; ITM Power; BOC; SSE
Technology providers	Intelligent Energy; Johnson Matthey
Public-private partnerships	New Energy World
Fuel retailers	M

Companies interviewed in Phase 1A

Fuel retailers	Shell; Sainsbury's; TESCO
Fleet operators and lease companies	ARVAL BNP Paribas Group; BT Fleet; DHL; DHL Supply Chain; Lex Autolease
Valuation companies	CAP
Grid operator	nationalgrid

Goal

- Evaluate the potential for **hydrogen as a transport fuel** and develop a **rollout strategy** that will contribute towards
- Decarbonising surface transport
- Creating new economic opportunities
- Diversifying energy supply
- Reducing local environmental impacts

Regno Unito: UK H2 Mobility

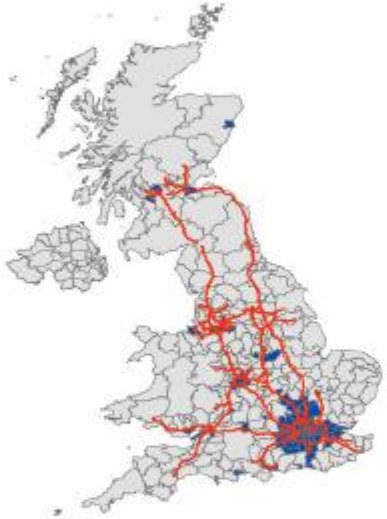
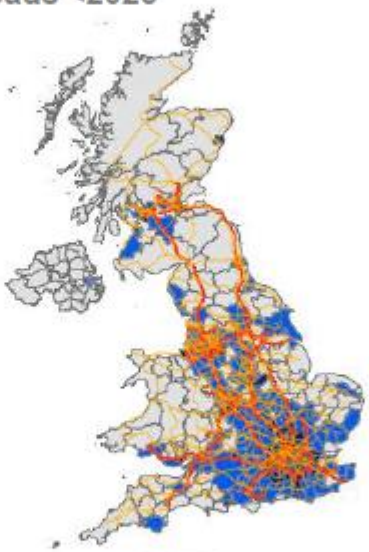
UK H_2Mobility is following a stage-gated approach

	Phase 1a: Role of hydrogen transport in the UK	Phase 1b: Hydrogen rollout strategy development	Phase 2: Business case development	Phase 3: Implementation plan
Core activities	Establish a robust evidence base for the role of H_2 in the UK market	Develop strategy for H_2 rollout in the UK and stress-test alternative scenarios to prove robustness of plans	Develop an agreed business case	Facilitate coordinated action to deliver the vision for hydrogen rollout
Timeline	Dec 2011-Mar 2012	Apr 2012-Dec 2012	Jan 2013-Aug 2013	Aug 2013-Dec 2013
End products	▪ A blueprint for hydrogen rollout in the UK, stress tested against key sensitivities ▪ Range of infra-structure and vehicle rollout scenarios, including likely investments and revenues	▪ A detailed plan for structuring rollout of hydrogen vehicles and infrastructure in the UK ▪ Public report summarising activities of the consortium	▪ An agreed business case for a hydrogen infrastructure in the UK ▪ An implementation plan for rollout of hydrogen vehicles and refuelling infrastructure in the UK	▪ Commercial, synchronised deployment of fuel cell electric vehicles and hydrogen refuelling infrastructure in the UK
Status	✓	✓	underway	

Regno Unito: UK H2 Mobility

3 HRS deployment will cover metropolitan areas and connecting roads from 2015, with large-scale rollout after 2020

Tier 1 roads
Tier 2 roads
Tier 1 Tier 2 Tier 3

	Seeding of Tier 1 regions[1] – major cities and connecting roads in 2015	Coverage extended to Tier 2 regions and all major roads <2025	Full population coverage by 2030
			
# of HRS	~65	~330	~1,150
	Initial seeding in **major population centres**	Extend coverage to enable close-to-home refuelling to **50% of the population** and long distance **travel**	Extend close-to-home refuelling to the **whole of the UK**, including less populated regions

1 Defined as most attractive regions for FCEV deployment based on vehicle density and per capita income

Regno Unito: UK H2 Mobility

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The UK H_2Mobility analysis provides a long-term vision for a hydrogen rollout strategy for the UK along six dimensions

1 Consumer perspective

2 Fuel cell electric vehicle (FCEV) demand

3 Hydrogen refuelling station (HRS) network

4 Hydrogen production mix

5 Economics & sustainability

6 Benefits of hydrogen mobility

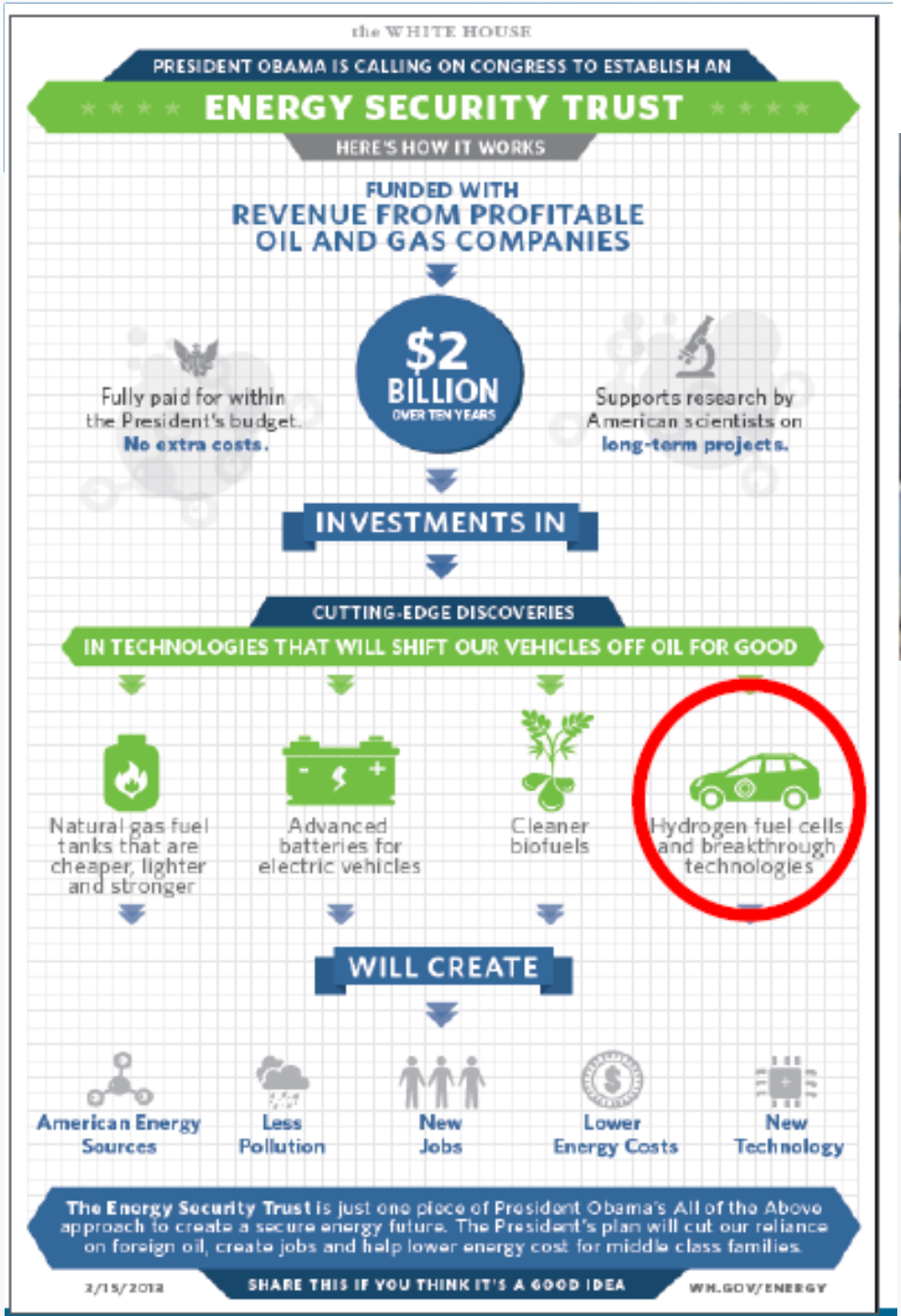
Now is the right time

FCEVs will be available from 2015

Several international markets have started to develop strategies for the roll-out of hydrogen as transport fuel

Tutto nasce dalla testa

La proposta del Presidente Obama ha lo scopo di supportare la ricerca nel campo delle tecnologie "cost effective" come veicoli elettrici avanzati, biocombustibili "nazionali", celle a combustibile, gas naturale prodotto "in casa"



USA: PPP H2USA

H2USA

Maggio 2013: lancio della partnership pubblico privata denominata H2USA per superare gli ostacoli alla creazione delle infrastrutture idrogeno in modo tale da promuovere l'introduzione commerciale e la più ampia diffusione dei veicoli a celle a combustibile

"I soci fondatori"

- American Gas Association
- Association of Global Automakers
- California Fuel Cell Partnership
- Electric Drive Transportation Association
- Fuel Cell and Hydrogen Energy Association
- ITM Power
- Massachusetts Hydrogen Coalition
- Mercedes-Benz USA
- Nissan North America Research and Development
- Proton OnSite
- Toyota Motor North America

USA: PPP H2USA

Recent development of the United States' tremendous shale gas resources has not only helped directly cut electricity and transportation costs for consumers and businesses, but is also helping to reduce the costs of producing hydrogen and operating hydrogen fuel cells.

Massive shale gas fields will provide a plentiful source of hydrogen, and H2USA stakeholders say they will work together to leverage these low cost natural gas resources.

USA: PPP H2USA

Last year, Chu admitted he'd changed his mind about hydrogen fuel cells.

The California Fuel Cell Partnership has committed to bringing 70 hydrogen stations to the state by 2016.

"Fuel cell technologies are an important part of an all-of-the-above approach to diversify America's transportation sector, reduce our dependence on foreign oil and increase our competitiveness in the global market," (David Danielson, Assistant Secretary for Energy Efficiency and Renewable Energy)

Programmi USA: Veicoli a celle a combustibile

ENEA
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Hydrogen, Fuel Cells & Infrastructure Technologies Program

Controlled Hydrogen Fleet and Infrastructure Demonstration and Validation Project

- ***DaimlerChrysler - 30 veicoli (27 F-Cell, 3 Sprinter van) BP, DTE, NextEnergy - 8 stazioni di rifornimento (California e Michigan)***
- ***Ford Motor - 26 veicoli (Focus FVC) BP - 7 stazioni di rifornimento i(California, Florida e Michigan)***
- ***General Motors - 40 veicoli (Hydrogen3) Shell Hydrogen LLC - 5 stazioni di rifornimento (Washington D.C., New York, California e Michigan)***
- ***Hyundai Motor- Kia Motors - 32 veicoli (HyundayTucson e Kia Sportage) Chevron Technology Ventures LLC - 6 stazioni di rifornimento (California)***

Membri

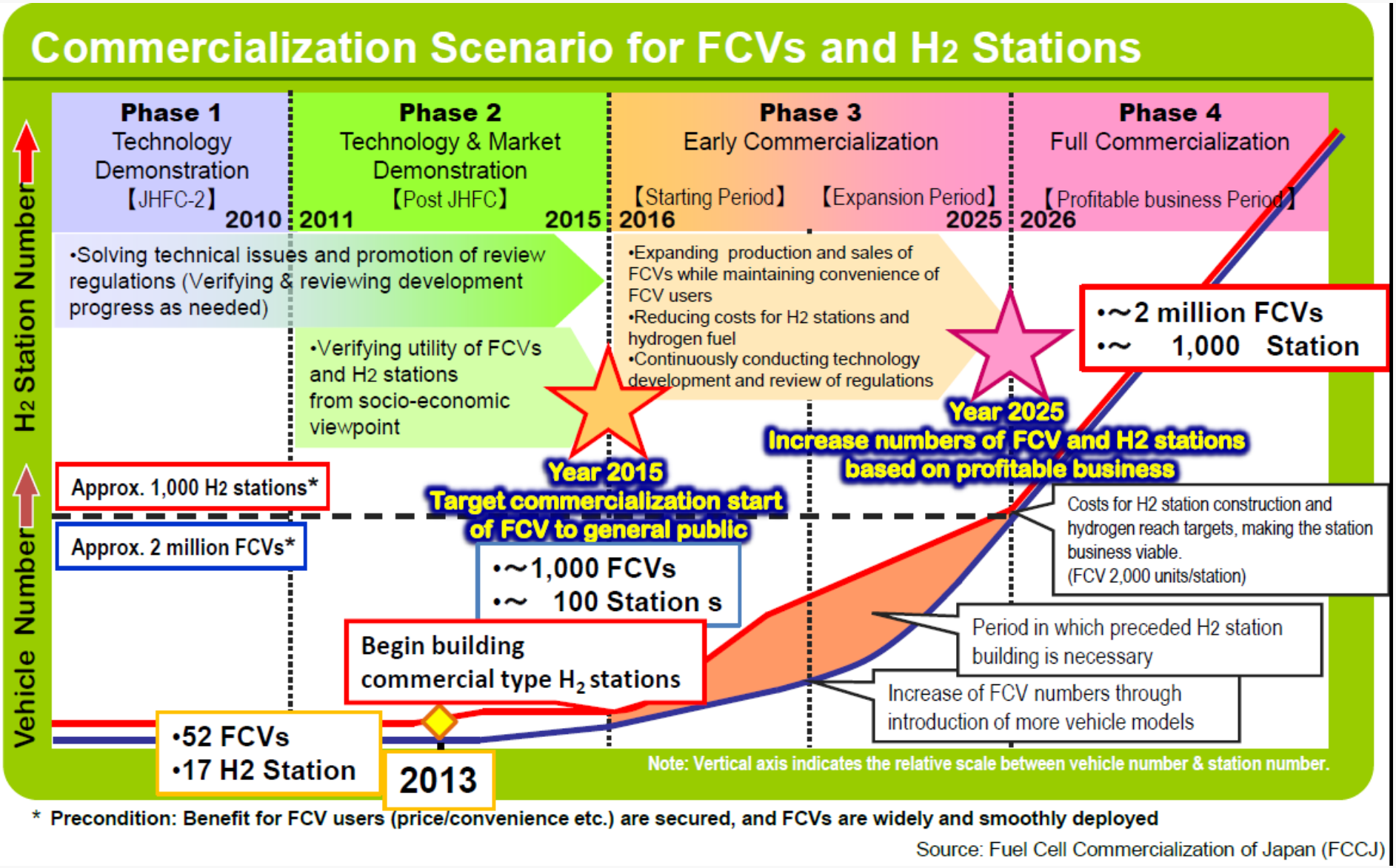
- DaimlerChrysler
- Ford
- General Motors
- Honda
- Hyundai
- Nissan
- Toyota
- Volkswagen
- BP
- Chevron
- Shell Hydrogen
- Ballard Power Systems
- UTC Power
- California Air Resources Board
- California Energy Commission
- National Automotive Center
- South Coast Air Quality Management District
- U.S. Department of Energy
- U.S. Department of Transportation
- U.S. Environmental Protection Agency

Membri associati

- AC Transit
- Air Products and Chemicals
- Hydrogenics Corporation
- ISE Corporation
- Pacific Gas & Electric
- Praxair
- Proton Energy Systems
- Santa Clara VTA
- Sunline Transit Agency
- ZTEK Corp.
- UC Davis Institute of Transportation Studies

- ***Provati su strada 175 veicoli, tra cui 9 autobus***
- ***Realizzate 25 stazioni di rifornimento di idrogeno***

Giappone : Roadmap per H2 e FCEV



* Precondition: Benefit for FCV users (price/convenience etc.) are secured, and FCVs are widely and smoothly deployed

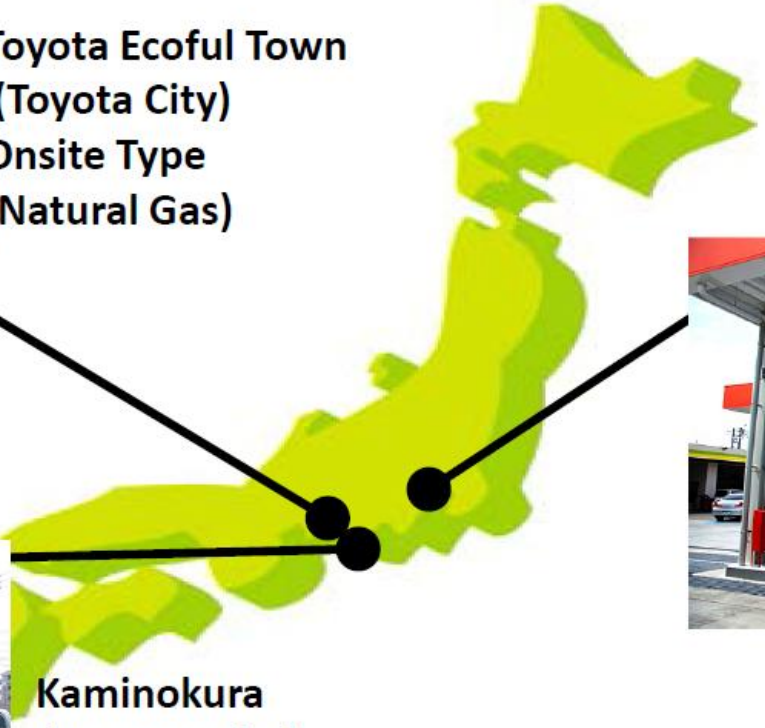
Source: Fuel Cell Commercialization of Japan (FCCJ)

Distributori idrogeno in Giappone

Source: The Research Association of Hydrogen Supply/Utilization Technology (HySUT

Le tre nuove stazioni ed altri incentivi!!!

Toyota Ecoful Town
(Toyota City)
Onsite Type
(Natural Gas)



Ebina
(Ebina City)
Offsite Type

Kaminokura
(Nagoya City)
Onsite Type
(LPG)

Nuovi incentivi per ulteriori HRS, circa 36 M€ nel 2013
Forte Supporto a stabilire standard per le HRS e per le FCEV

Giappone: FCEV per alimentare la casa!!

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FCV2H test

Honda FCX Clarity

* Maximum rating 9kW
Potential electric power supply of 60kWh (roughly 6 days worth of electric power for an average household)

Kita-kyushu eco-house

Portable inverter box

Community Energy Management System (CEMS)

Lo sviluppo del SUV Hyunday FC in Corea

200 SUVs & 9 Buses
> 4 million km

US DOE Fleet
('04 ~ '09)
32 SUVs

1st Domestic Fleet
('06 ~ '10)
30 SUVs, 4 Buses

2nd Domestic Fleet
('09 ~ '12)
100 SUVs

Global Demonstration
('12 ~'15)

- 2000 ~ 2002
  - Santa Fe FCEV (75 kW)
  - Member of CaFCP ('00~)

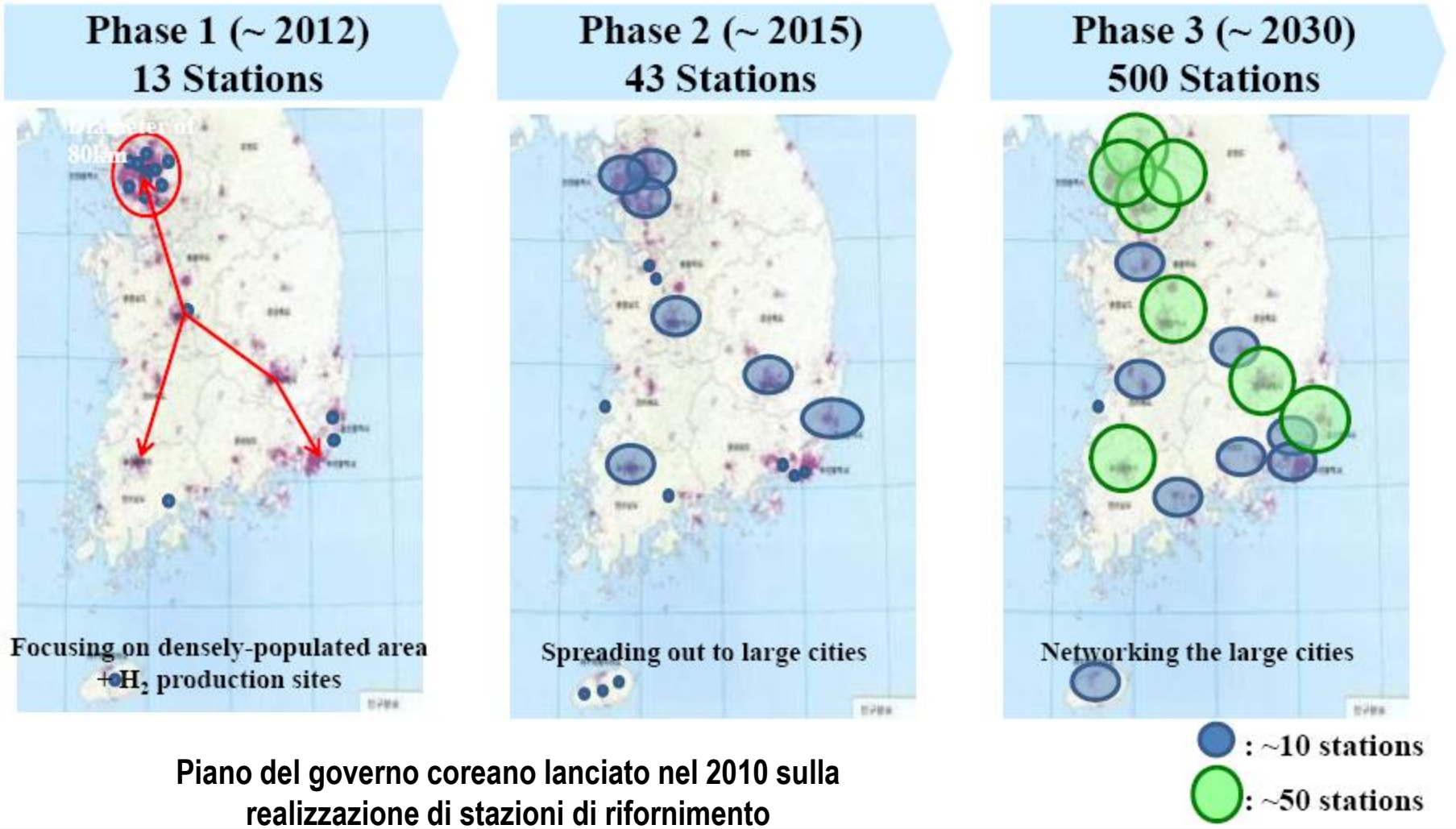
- 2004 ~ 2005
  - Tucson FCEV (80 kW)

- 2006
  - Tucson FCEV I (80 kW In House Stac
  - FC-BUS (160 kW In House Stack)

- 2007
  - Tucson FCEV-II (100 kW)
  - FC-BUS I (200 kW)
- Borrego
- FC-BUS II (200kW

- 2008 ~ 2009
- Tucson ix35 FCEV (100kW)
  (Small Production)
- 2012 ~

Lo sviluppo della rete idrogeno in Corea



Piano del governo coreano lanciato nel 2010 sulla realizzazione di stazioni di rifornimento

Anno	2012	2013	2015	2020
N. Cumulato di stazioni di servizio	13	18	43	168

Some projects in development (1)

- **Brazilian Hydrogen Fuel Cell Buses for Urban Transport Project in São Paulo:** three new buses with hydrogen fuel cell are being manufactured with improvements on the previous prototype design. Delivery of the first bus is scheduled for the end of this year, while the delivery of the other two buses is scheduled for the first half of 2014. Hydrogen production (based on water electrolysis) and supply infrastructure is under commissioning process;

Hydrogen & fuel Cell Development in India

H_2 Dispensing station in New Delhi

H-CNG fuelled 3 wheeler

Hydrogen –Diesel dual fuel SUV

H_2 fuelled 3 Wheeler

H_2 Fuel Cell Bus

Fuel Cell system as power back up for telecom tower

Italia?

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E L'italia?

Tante iniziative regionali e locali ma non c'è una

"piattaforma nazionale"

Ne discutiamo oggi

Grazie

Per l'attenzione