



HYCHAIN MINITRANS

**“Development of Innovative Fuel Cell Vehicle Fleets to Initiate
Use of Hydrogen as an Alternative Fuel in Early Markets”**

**HarmonHy Final Conference
4th Oct. 2006
Frederic Barth – Air Liquide**



The HYCHAIN Minitrans Project- Early Markets in Transport





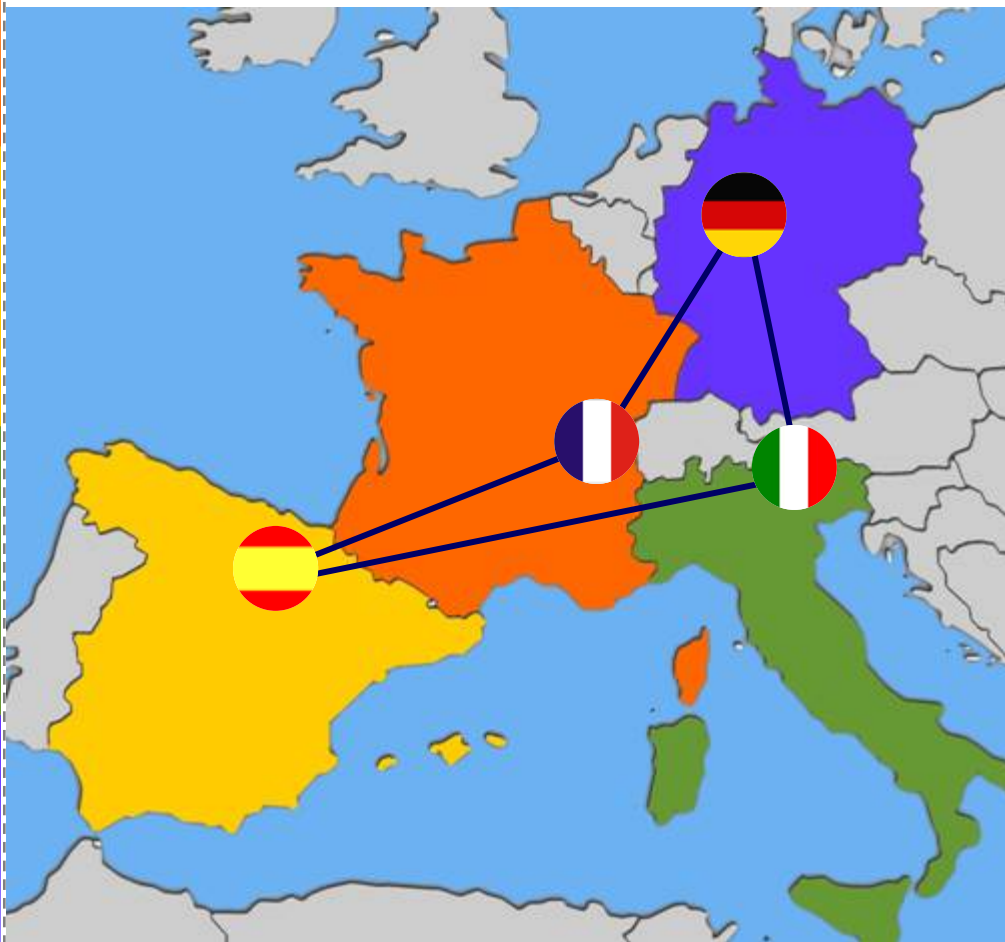
HYCHAIN MINITRANS – MAIN OBJECTIVES

1. Introduce **low power** (up to 10 kW) **fuel cell captive fleets** in selected **early market niches for transport to enhance public awareness and acceptance** in four European Regions (in France, Spain, Germany and Italy)
2. Demonstrate a significant number of Common fuel cell “**power modules**” (158) coming from four European fuel cell manufacturers in transport applications, to achieve a minimum **critical mass** for **early industrialization**, gaining a significant **reduction of costs**.
3. Set up a **micro-infrastructure** for hydrogen refueling including logistics, maintenance services, monitoring, training
4. **Address cross-cutting actions** such as regulations & standards, costs issues, environmental impact, safety, policy encourage, etc.



HYCHAIN Minitrans - Identified end users

Deployment of Fleets in each region



North Rhine Westphalia
Region of Emscher-Lippe
Agglomeration Community
44 vehicles



Rhône-Alpes
Grenoble Alpes Agglomeration
Community
47 vehicles



Emilia Romagna
City of Modena
22 vehicles



Castilla y León
Cities of Soria and León
45 vehicles





HYCHAIN MINITRANS – EC Context



A Project of the European Partnership “Hydrogen for Transport”



HyLIGHTS – Coordination action
Monitoring and Preparation of « Lighthouse projects »



The HYCHAIN Minitrans- Project timetable

**Development
& Fabrication**

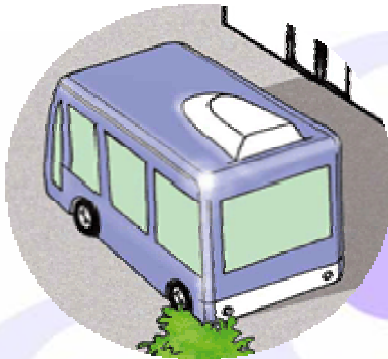
**Demonstration
& Validation**

**Clean
mobility**

2006

2008

2010



Vehicles



Logistics

**Fuel cell vehicles and Set up the
hydrogen infrastructure**



**Obtain public acceptance
Kick start a first business model**



The fleet: 158 vehicles



40 Tricycles
(0.25 kW fuel-cell)



34 Wheelchairs
(0,35 kW fuel-cell)



40 Scooters
(1.0 kW fuel-cell)



44 Utility Vehicles
(2.5 kW fuel-cell)



10 minibuses
(10 kW fuel-cell)



« Even Exchange » Hydrogen Storage

Wheelchair



2L @ 700bars cartridge

Scooter



2L @ 700bars cartridge

Clip'On cartridge



Tricycle



2L @ 700bars cartridge

Utility Car



20L @ 300bars cylinder



Cargo Bike

Product distribution at public events, Post service ...

✓ Respectful of the environment

✓ Increased range





✓ Innovative design



✓ Power available for additional services (cooling, lighting ...)

✓ Instant energy refill

✓ No registration nor license

Multifunctional tricycle		Hawk Bikes (Germany)
250 W Fuel cell		Masterflex (Germany)
2 Litres cartridge @ 700 bar		Air Liquide (France)
Electronic, integration		Masterflex (Germany)



Wheelchair

**Residential homes for elderly, hospitals,
museums, and other public spaces**





✓ **Increased range**

✓ **Reduced weight**



✓ **Reliable range**

✓ **Instant energy refill**

Electric wheelchair		Meyra (Germany)
0.35 kW Fuel Cell		Axane (France)
2 x 2 Litres cartridge @ 700 bar		Air Liquide (France)
Integration, engineering and testing		Besel (Spain)



Scooter




Courier service, municipal police and other municipal services ...

✓ **Cleaner and quieter** than combustion engine scooters



✓ **Improved performance** compared to electric scooters powered by batteries

✓ **Instant energy refill**

Original scooter	 Derbi (Spain)
2 kW Fuel cell	MES –DEA (Switzerland)
3 x 2 Litres cartridge @ 700 bar	 Air Liquide (France)
Power train, integration, engineering and testing	 Besel/Rucker (Spain)



Utility Vehicle

City Council Maintenance Services, Transportation of goods in city centers ...

✓ **No emissions**







✓ **Increased range** compared to battery powered vehicle

✓ **Detachable generator for auxiliary mobile power**

✓ **Immediate energy refill**

✓ **Increased payload** compared to battery powered vehicle

Base vehicle		VEM (Italy)
2.5 kW Fuel cell system		Axane (France)
2 x 20 litres cylinder @ 300 bars		Air Liquide (France)
Integration		VEM (Italy)



Fuel Cell Portable power generator

Maintenance services, Public events ...

✓ Zero emission and silent operation



✓ Lighter than conventional power generators

✓ Indoor and outdoor use
(with adequate ventilation)

✓ Reduced maintenance

✓ Excellent quality of current

3 kW Fuel Cell System

1 x 20 litres @ 350 bars

Axane (France)

Air Liquide (France)



Shuttle bus

Public transport, historical areas, natural parks, university campus, industrial areas, airports, commercial centers ...

✓ No noise, no emissions


✓ Can use exclusively renewable energies



✓ Quick refill time

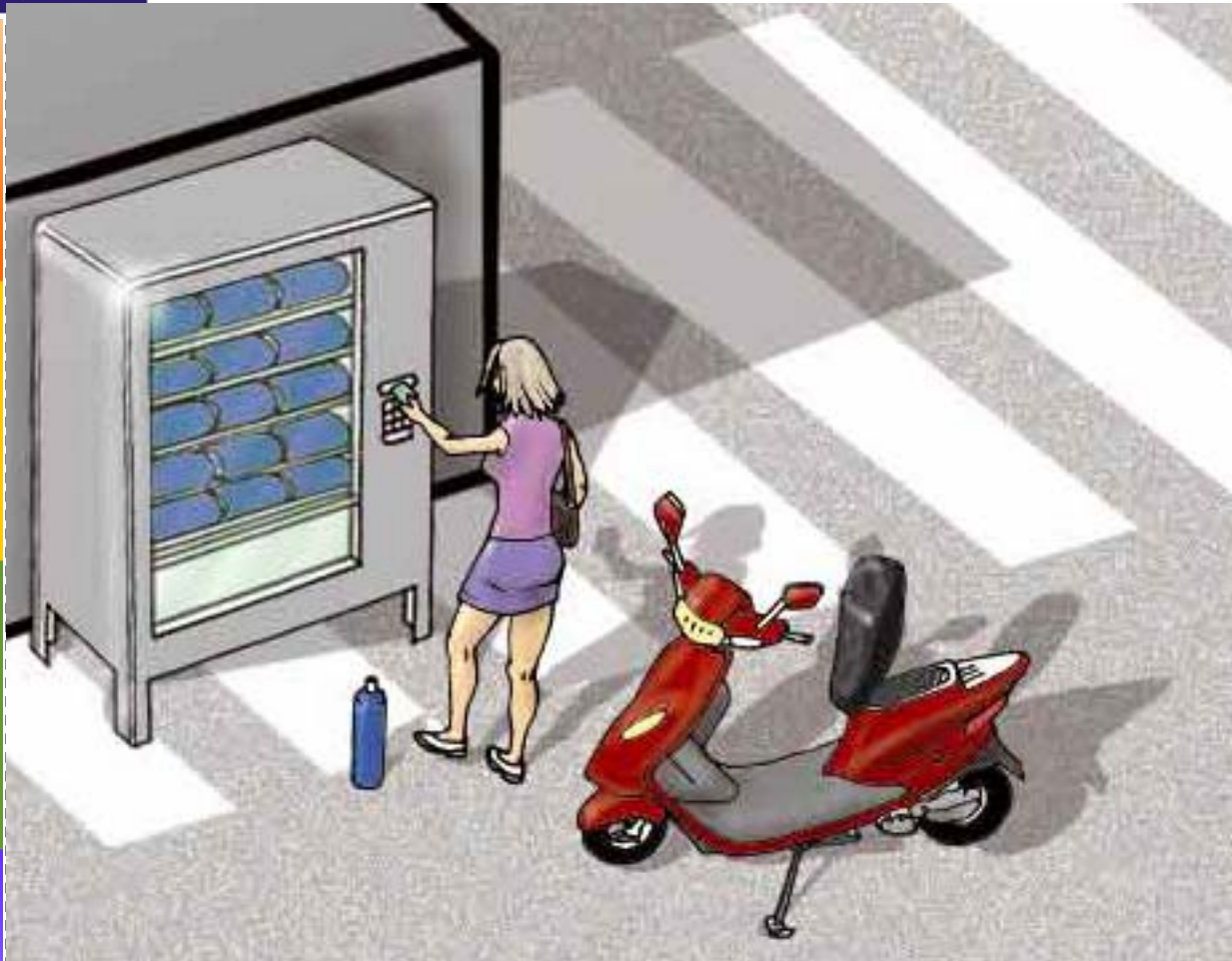
✓ Reduced maintenance

✓ Increased autonomy > 18h (currently 4-8 h)

Hybrid Minibus		Tecnobus (Italy)
10 kW Fuel Cell		Enkat (Germany)
150 litres @ 350 bar		Dynetek (Germany)
Electronic and integration		Enkat (Germany)



A comprehensive Hydrogen Infrastructure





Vehicle homologation framework

	Reference Regulation and Standards	Regulatory Approval framework	Approval Authority	Notified body	Vehicle Registration
Utility vehicle VEM (I)	<ul style="list-style-type: none"> - No EC type approval yet - R100 – Electrical vehicles - <i>EC Draft Regulation relating to H2 powered vehicles</i> 	1) National Type Approval of electrical version 2) Single Vehicle Approval of H2 vehicle	Italian (1)(2) French (1)(2) German (1)(2) Spanish(1)(2)	Italian (1)(2) French (1)(2) German (1)(2) Spanish(1)(2)	Italian French German Spanish
Scooter Rücker/ Derbi (E)	<ul style="list-style-type: none"> - 2002/24/EC - Type approval of two and three wheel vehicles - No EC regulation for H2 powered 2&3 wheel vehicles 	1) EC Type approval of electrical vehicle 2) Single Vehicle Approval of H2 vehicle	Spanish (1)(2) French (2) Italian (2)	Spanish (1)(2) French (2) Italian (2)	Spanish French Italian
Wheelchair Besel (E)	<ul style="list-style-type: none"> - 93/42/EEC – medical devices – Class I device - EN 12184 	None (self- declaration of conformity)	None	Spanish (to Confirm Class 1)	None
Tricycle Masterflex (D)	<ul style="list-style-type: none"> - <i>Not submitted to 2002/24/EC Type approval of two and three wheel vehicles</i> 	None (self- declaration of conformity)	None	None	None



Regulatory hurdles for the deployment of fleets in Europe ?

- 700 bar H2 cartridge : OK – covered by TPED and ADR
- Utility vehicle and busses
 - ✓ EC type-approval to included trucks and busses – *amendment in progress*
 - ✓ EC regulation on H2 vehicles – *needed, in drafting stage*
- Two and three wheel vehicles
 - ✓ EC type-approval : OK
 - ✓ **No regulation for homologating H2 powered 2&3 wheel vehicles !**
- Wheelchair : OK – Medical devices directive



THANK YOU !

www.hychain.org