



# Gaseous fuels for transportation: an overview towards 2020

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Jeep



# Key steps for a Sustainable Mobility

Diversification



Energy sources /  
carriers & security

Availability



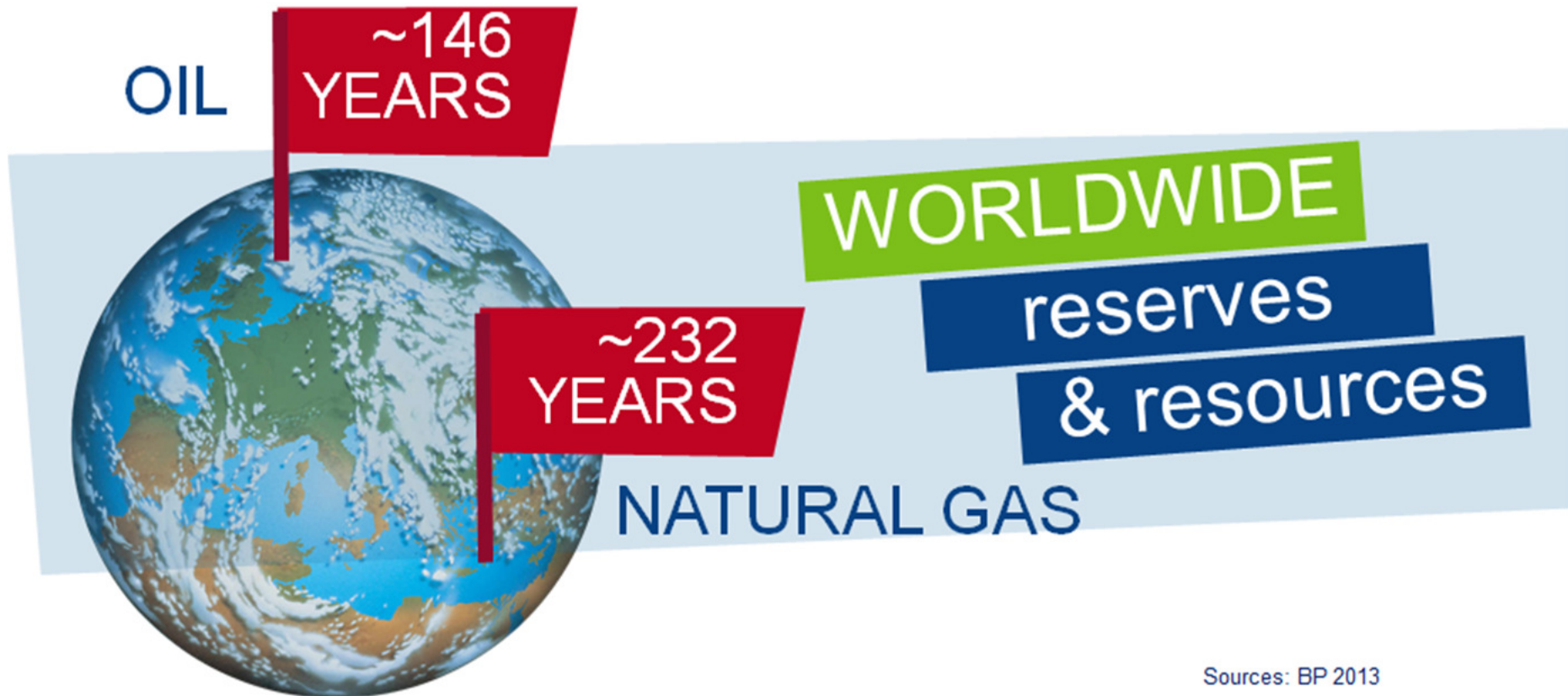
Technologies &  
Infrastructure

Affordability

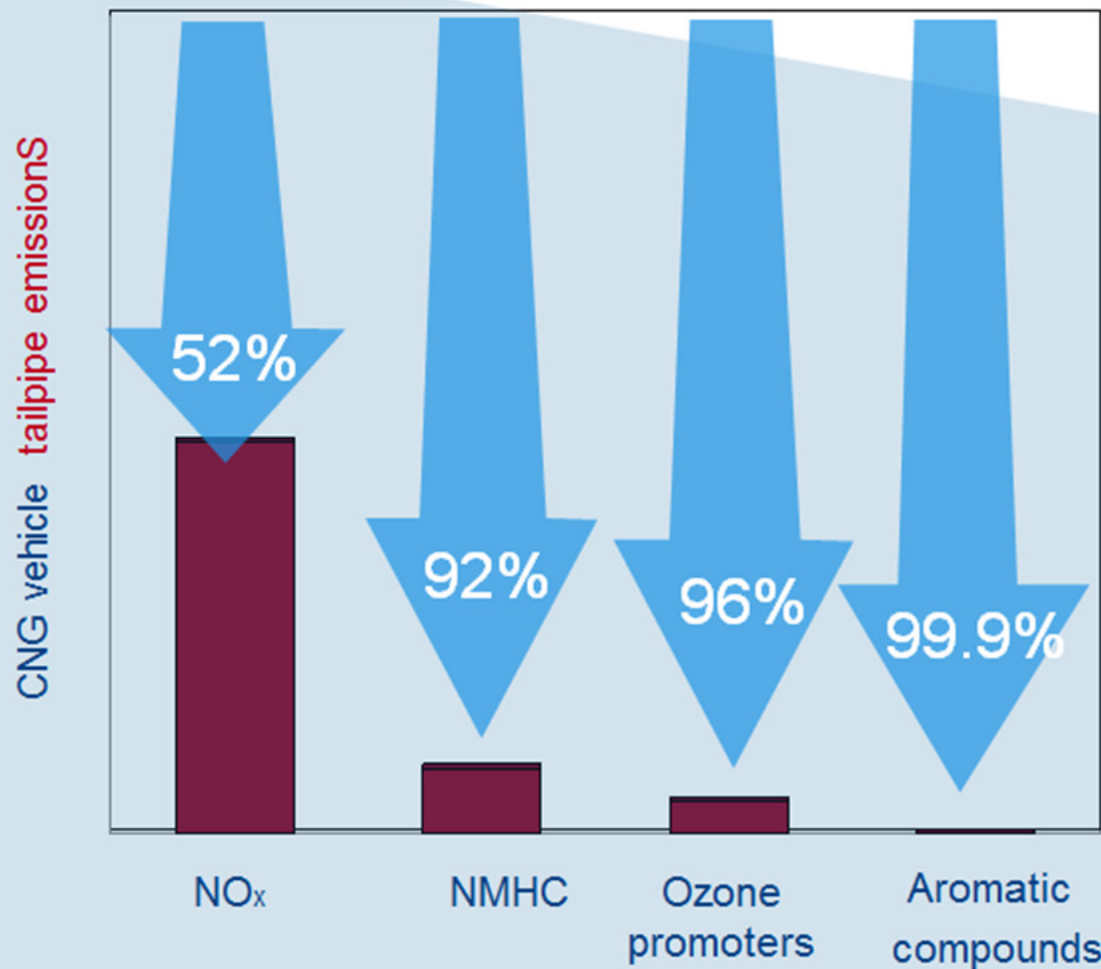


Investments &  
costs

Natural Gas: wider reserves and better geopolitical distribution



# Natural Gas: an intrinsically clean fuel

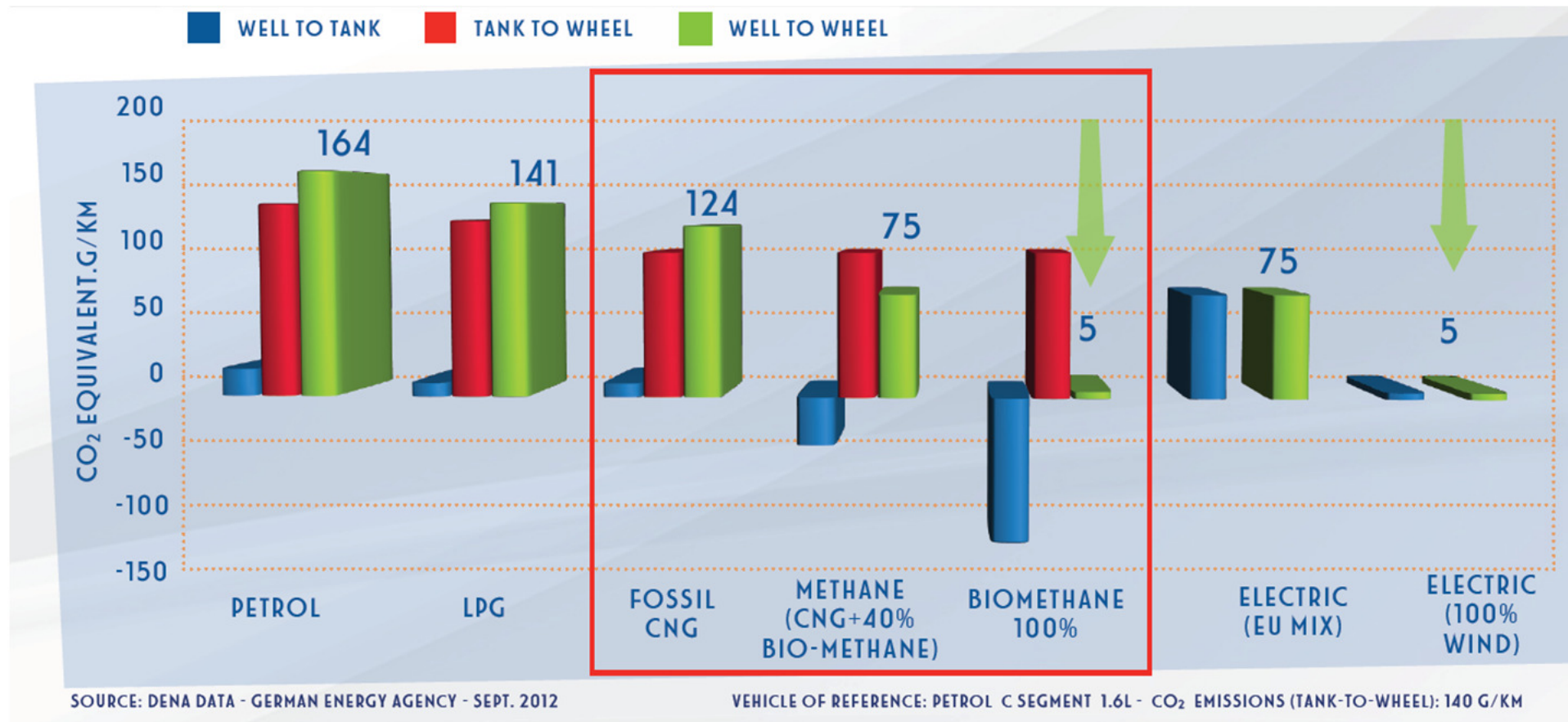


local air quality

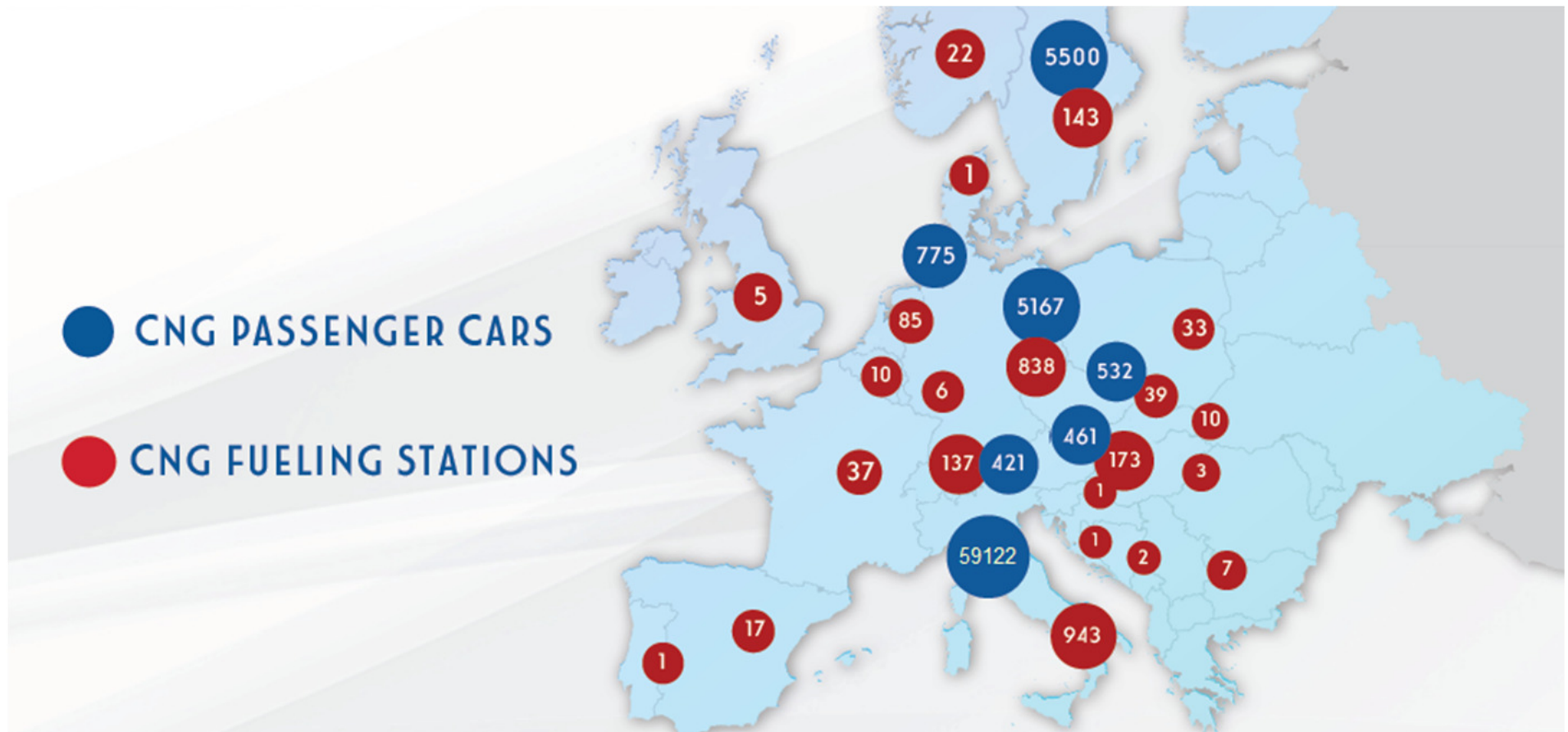
- Reduced SMOG forming emissions
- Practically zero evaporative emissions
- Baseline: Conventional Petrol



# «Well-to-Wheel» CO<sub>2</sub> emissions



## New CNG Passenger cars sold in 2012



# FGA CNG product portfolio



**500L**  
0.9 TWINAIR  
TURBO 80 HP  
CO<sub>2</sub> = 105 G/KM

**PUNTO**  
1.4 FIRE 70 HP  
CO<sub>2</sub> = 115 G/KM

**PANDA**  
0.9 TWINAIR  
TURBO 80 HP  
CO<sub>2</sub> = 86 G/KM

**QUBO**  
1.4 FIRE 70 HP  
CO<sub>2</sub> = 114 G/KM

**DOBLÒ**  
1.4 T-JET 120 HP  
CO<sub>2</sub> = 134 G/KM

**YPSILON**  
0.9 TWINAIR  
TURBO 80 HP  
CO<sub>2</sub> = 86 G/KM



PROFESSIONAL



**PUNTO VAN**  
1.4 FIRE 70 HP  
CO<sub>2</sub> = 115 G/KM

**FIORINO**  
1.4 FIRE 70 HP  
CO<sub>2</sub> = 114 G/KM

**DOBLÒ CARGO**  
1.4 T-JET 120 HP  
CO<sub>2</sub> = 134 G/KM

**DUCATO**  
3.0 TURBO 136 HP  
CO<sub>2</sub> = 239 G/KM

**PANDA VAN**  
0.9 TWINAIR  
TURBO 80 HP  
CO<sub>2</sub> = 86 G/KM

# Bridging Hydrogen as transportation fuel



NG technologies represent a significant opportunity to make the H<sub>2</sub> carrier enter the transportation sector.

Gaseous blends, currently tested at 30% v/v H<sub>2</sub>, could take advantage of the increasing market demand and the circulating NGV fleet as well as of the continuous development of the filling distribution network.

Apart from the natural reduction in CO<sub>2</sub> tailpipe emissions, pollutant emissions and engine efficiency can also take advantage from the H<sub>2</sub> fraction.

Nevertheless an adaptation of the storage/injection system materials could be needed to guarantee full compatibility to hydrogen.

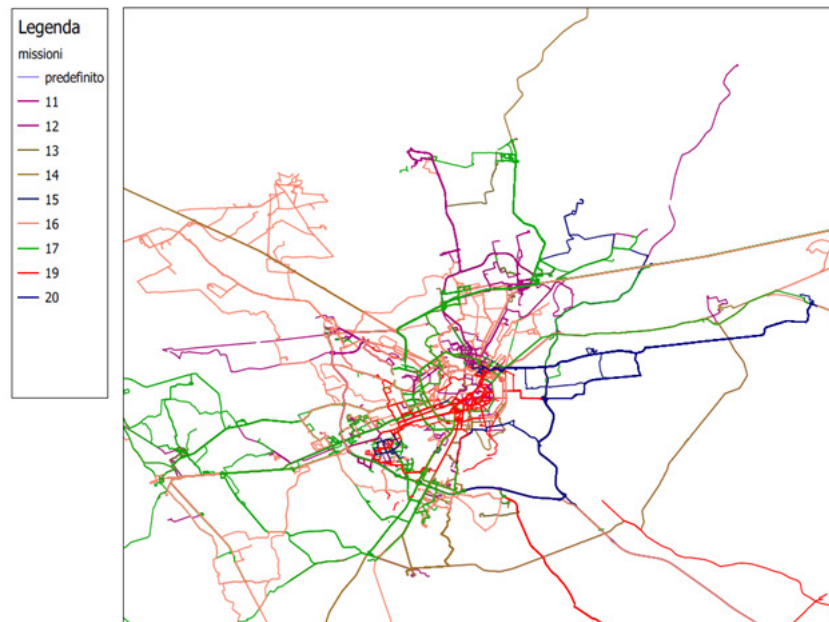


# Using natural gas/hydrogen blends



## Regione Lombardia – MYGAS project

Experimental fleet based on 20 Fiat Panda  
fed with natural gas / hydrogen blends



Regione  
Lombardia



## Natural Gas / Hydrogen blends



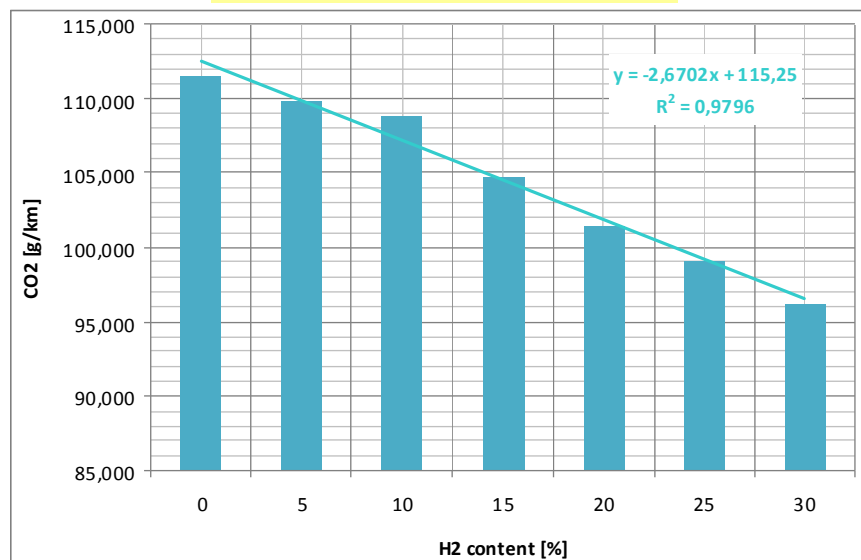
The entire fleet has overcome more than 440.000 km without any direct issues related to the use of the natural gas/hydrogen blend.

# Supporting legislation

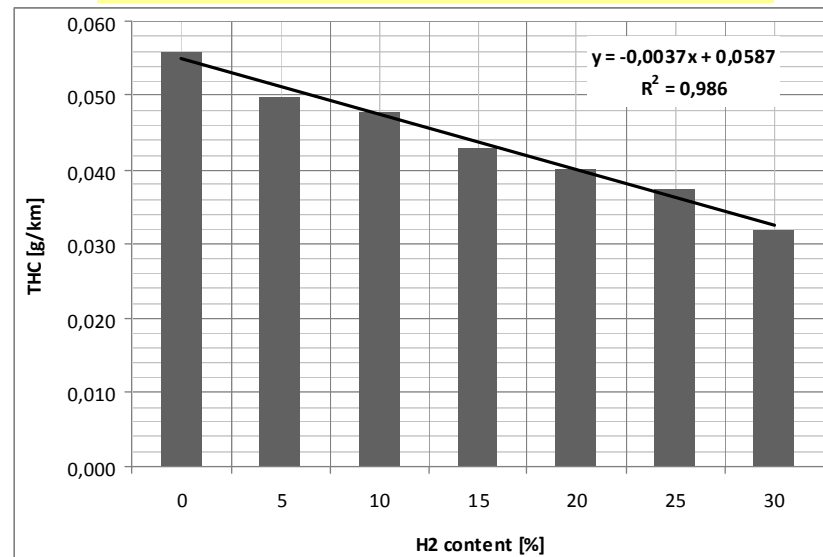


One of the fleet vehicles has been used as study case by JRC in Ispra to test and validate the methodology of computation of the pollutant emissions within the 630/2012 Regulation (Euro5/6 homologation). Regulation 79/2009 devoted to hydrogen powered vehicle homologation also include HCNG blends.

## CO<sub>2</sub> tailpipe emissions



## Unburned hydrocarbon emissions





# Vehicle performance

## Quattroruote – «Emissioni zero» - May 2010



### MISCELA FRIZZANTE

Aspettando l'auto a idrogeno, ancora lontana, si può tagliare la CO<sub>2</sub> aggiungendo il più leggero tra gli elementi chimici al gas naturale

di Roberto Boni



# GAS: L'IDROMETANO

## PRESTAZIONI

RILEVATE SULLA NOSTRA PISTA DI VAIRANO (PV)

Editoriale Domus Sistema di Qualità certificato Iso 9001:2008

### VELOCITÀ E REGIMI

	Benzina	Metano	Miscela
Velocità max (km/h)	138,809	128,041	130,011
Regime a velocità max (giri/min)	5.563 in IV	5.132 in IV	5.211 in IV

### CONSUMI - Percorrenze in V

Velocità in km/h	km/litro	km/kg	km/kg
80	18,6	26,0	28,4
90	16,7	24,2	25,4
<b>100</b>	<b>15,2</b>	<b>21,7</b>	<b>23,6</b>
110	13,9	20,1	21,9
Resistenza a 100 km/h (kW/CV)	16,4/22,3	16,4/22,3	16,4/22,3
Rendimento a 100 km/h (%)	25,7	25,6	26,0

### MEDIE D'USO - Percorrenze (autonomia)

Tipo di percorso	km/litro (km)	km/kg (km)	km/kg (km)
Città	11,3 (339)	17,4 (210)	18,3 (170)
Statale	15,7 (471)	23,7 (285)	25,1 (233)

### ACCELERAZIONE

Velocità in km/h	Tempo in secondi		
0-60	6,3	7,2	7,1
<b>0-100</b>	<b>17,5</b>	<b>22,5</b>	<b>21,5</b>
<b>400 m da fermo</b>	<b>20,2</b>	<b>21,5</b>	<b>21,3</b>
Velocità d'uscita (km/h)	105,9	98,4	99,6
<b>1 km da fermo</b>	<b>38,4</b>	<b>41,2</b>	<b>40,7</b>
Velocità d'uscita (km/h)	128,3	118,5	120,3

### RIPRESA in V - A minimo carico

Velocità in km/h	Tempo in secondi		
70-90	9,8	12,1	11,9
<b>70-110</b>	<b>22,3</b>	<b>28,6</b>	<b>28,2</b>
<b>1 km da 70 km/h</b>	<b>35,5</b>	<b>37,1</b>	<b>37,0</b>
Velocità d'uscita (km/h)	124,1	117,4	117,4

### DATI GENERALI RILEVATI

Massa della vettura in prova (kg)	1.080	1.080	1.080
Ripartizione ant.-post. (%)	57-43	57-43	57-43

# Regione Piemonte - Piattaforma Automotive Biomethair project



Project start : march 2013

Project duration : 28 months

## BIOMASS CONVERSION PROCESS

**CNG DEDICATED MINI-HYBRID  
POWERTRAIN**

**Production of Natural  
Gas / Hydrogen blends  
from Municipal Waste  
conversion**

**ADVANCED  
CNG STORAGE  
TECHNOLOGIES**





## Experience on HD platforms Iveco Daily applications



LDV for A22 Brennero  
Bolzano



Refuse collect fleet  
Dolomiti energia (Trento)

Both applications running on 30% v/v hydrogen blend

# Conclusions



- The experiences carried out on the different engine/vehicle platforms have demonstrated the technical feasibility of the solution;
- Experimental data confirmed the reduction in CO<sub>2</sub> and pollutant emissions as well as a slight increase in combustion efficiency;
- The HCNG blend approach is based on mature (cost effective) vehicle technologies and can take advantage of the current and increasing CNG filling distribution network all over Europe;
- Thanks to the opportunity to couple Biomethane and «green» Hydrogen, this approach could represent a significant complementary step to meet the EU target of use of renewables energy sources in the transportation sector.