EU for a sustainable mobility

A European strategy on clean & energy efficient vehicles
(COM 2010 186 - April 2010)

The Communication sets two paths, both technologically neutral, that should be followed simultaneously.

To promote clean and efficient vehicles based on conventional engines (internal combustion)

To facilitate the implementation of innovative technologies

The following propulsion systems are considered:
- Liquid biofuels and gaseous fuels (CNG, biogas, etc)
- Electric and plug-in hybrid vehicles
EU for a sustainable mobility

**European Strategy: alternative fuels for transportation**
(COM 2013 17 January 24, 2013)

- To guide the technological development and investments in the distribution network
- To allow mobility in all of EU and prevent fragmentation of the market
- The Communication takes into account Natural Gas and biomethane in its various forms (CNG – LNG – GTL)

**Directive that focuses on infrastructure and standards for alternative fuels**
(COM 2013 18 January 24, 2013)

- For CNG, The Commission proposal will ensure that publically accessible refuelling points, with common standards, are available Europe—wide with maximum distances of 150 km by 2020
Natural gas in the international energy scenario – decarbonization

• Target 20 – 20 – 20
  • Reduction by 20% of the emissions of GHG (Green House Gases)
  • 20% energy saving
  • Increase by 20% of the share of recourse to renewable energy sources

• The Roadmap 2050 of European Commission
  • Target by 2050: reduction of CO2 by 80-95% compared to the levels in 1990.
  • Identify the more effective actions to transform the European energy system

• Durban (17° ONU conference on climate – December 2011)
  • Reduction of the emissions of GHG in every country
  • By 2015 legal agreement
  • Reduction of 25-40% GHG emissions by 2020
CNG

• Natural gas → energy source available in Europe + well developed network.
• Environmental benefits: reduction of GHG; emissions and other air pollutants (NOx, PM, NMHC).
• CNG vehicle technology: mature and well-consolidated worldwide.
• Range of available NGV models is growing → OEM LD: Fiat, Mercedes, Opel, Volkswagen;
  • OEM HD: IVECO, VOLVO, MAN, SCANIA.
• Italy → leader of CNG technology
  • Many operators developing market worldwide
  • Regulatory level - committed to keep developing CNG in Italy at the same level of other fuels and following the practices of most EU Countries
  • The Italian NGV sector asked the Ministry of Internal Affairs to push forward on different issues such as: self-service; multi-dispenser with CNG: simultaneous delivery of gaseous and liquid fuel; shorter safety distances
• EU level → proper and favourable fiscal strategy are essential

Biomethane: a new opportunity (raising increasing interest)

• A source of renewable energy;
  • Greater energetic sufficiency;
  • Produced from a wide range of biomass’s;
  • Can be inserted in the distribution network without additional costs;
  • Convertible in liquid gas LNG (commercial vehicles for medium/long distances);
  • Compatible with CNG vehicles already in commerce.
The biggest NGV markets in the world

**IRAN**
CNG Vehicles: ~3,300,000 ~24% of national total market; CNG ref. stations: 1,960

**PAKISTAN**
CNG Vehicles: ~3,100,000 ~48% of national total market; CNG ref. stations: 3,330

**ARGENTINA**
CNG Vehicles: ~2,200,000 ~20% of national total market; CNG ref. stations: ~1,920

**BRAZIL**
CNG Vehicles: ~1,700,000 ~5% of national total market; CNG ref. stations: ~1,790

**INDIA**
CNG Vehicles: ~1,500,000 ~4% of national total market; CNG ref. stations: ~720

**CINA**
CNG Vehicles: ~1,500,000 ~2% of national total market; CNG ref. stations: ~2,800

**ITALY**
CNG Vehicles: ~780,000 ~2% of national total market; CNG ref. stations: >900

**NGV in the world:** ~17.2 million
CNG Ref stations: ~21,400
Expected trend of the NGV market

NGV World Market “S Curve” 1991 to 2020

- 10 Years: 15% Annual Growth
- Past 6 Years: 26% Annual Growth
- Future 13 Years: 18% Annual Growth

- 65M NGVs by 2020 (9% market share)
- Market drivers commence to develop 1.7M NGVs
- Market drivers take hold 7+M NGVs
- Gas Utilities kick start the market
- Today

World wide current oil consumption 85 M bbl/day

Based on projections of 65M NGVs by 2020, 7 million barrels of oil per day could be substituted with natural gas

fonte: John Lyon, former President of IANGV - at NGV 2008 Rio De Janeiro
BACK-UP
Natural gas as fuel: a new opportunity for the automotive sector: Italy

In Italy new OEM NGV sales and CNG vehicle conversions in the first half of 2012 are very positive despite the elimination of former financial incentives. A growth of 36% on sales is confirmed with 43,300 new NGVs (OEM + conversions as of June 2012). The share of new OEM NGV on the total sales of new vehicles has increased from 2.21% in 2011 to 3.60% in 2012, with a 4.52% peak in April.[source: Centro Studi Promotor]

<table>
<thead>
<tr>
<th>year</th>
<th>new OEM LD Vehicles</th>
<th>New OEM NGV LD</th>
<th>NGV share of new OEM</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006</td>
<td>2,657,600</td>
<td>29,180</td>
<td>1.10%</td>
</tr>
<tr>
<td>2007</td>
<td>2,843,495</td>
<td>65,302</td>
<td>2.30%</td>
</tr>
<tr>
<td>2008</td>
<td>2,493,743</td>
<td>87,007</td>
<td>3.22%</td>
</tr>
<tr>
<td>2009</td>
<td>2,407,152</td>
<td>139,991</td>
<td>5.82%</td>
</tr>
<tr>
<td>2010</td>
<td>2,196,298</td>
<td>84,780</td>
<td>3.86%</td>
</tr>
<tr>
<td>2011</td>
<td>1,977,059</td>
<td>43,779</td>
<td>2.21%</td>
</tr>
<tr>
<td>2012 as of September</td>
<td>1,076,168</td>
<td>43,825</td>
<td>3.60%</td>
</tr>
</tbody>
</table>

NOTES:
Source of data: Ministry of Transport
In 2008 and 2009 special incentives were offered by Government for purchase of new OEM NGV
### Economic weight of the sector: Italy

<table>
<thead>
<tr>
<th>Added Value</th>
<th>2008</th>
<th>2009</th>
</tr>
</thead>
<tbody>
<tr>
<td>M€/year</td>
<td>1.350</td>
<td>1.620</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Employment</th>
<th>2008</th>
<th>2009</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employees</td>
<td>8.500</td>
<td>10.210</td>
</tr>
</tbody>
</table>

- NGV Manufacturers
- NGV manufacturer storage system
- NGV component manufacturers and fuel systems
- Engineering and filling station services
- Component manufacturers for filling stations
- Research institutes, Associations
- Sale of natural gas
New CNG Passenger Cars sold: 2012
NGV environmental advantages

Particulate matter

<table>
<thead>
<tr>
<th></th>
<th>Euro 3</th>
<th>Euro 4</th>
<th>Euro 5</th>
<th>EEV</th>
<th>CNG</th>
</tr>
</thead>
<tbody>
<tr>
<td>Value</td>
<td>0,10</td>
<td>0,02</td>
<td>0,02</td>
<td>0,02</td>
<td>0,004</td>
</tr>
</tbody>
</table>

NOx

<table>
<thead>
<tr>
<th></th>
<th>Euro 3</th>
<th>Euro 4</th>
<th>Euro 5</th>
<th>EEV</th>
<th>CNG</th>
</tr>
</thead>
<tbody>
<tr>
<td>Value</td>
<td>5,00</td>
<td>3,50</td>
<td>2,00</td>
<td>2,00</td>
<td>0,38</td>
</tr>
</tbody>
</table>

*EEV - Enhanced Environmentally-friendly vehicle*
Well to Wheel analysis

WTW GHG emissions in g CO₂ eq./km

<table>
<thead>
<tr>
<th>Fuel Type</th>
<th>Emissions (g CO₂ eq./km)</th>
<th>Reduction (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Petrol (with partial filter)</td>
<td>164</td>
<td>-24%</td>
</tr>
<tr>
<td>Diesel (EU natural gas mix)</td>
<td>156</td>
<td>-39%</td>
</tr>
<tr>
<td>Autogas (EU natural gas mix)</td>
<td>141</td>
<td>-97%</td>
</tr>
<tr>
<td>Natural gas with 20% Biomethane</td>
<td>124</td>
<td></td>
</tr>
<tr>
<td>Natural gas with 100% Biomethane</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>Ethanol (manure)</td>
<td>111</td>
<td></td>
</tr>
<tr>
<td>Biodiesel (based on rapeseed)</td>
<td>95</td>
<td></td>
</tr>
<tr>
<td>Hydrogen (EU power mix)</td>
<td>174</td>
<td></td>
</tr>
<tr>
<td>Hydrogen (100% wind power)</td>
<td>75</td>
<td></td>
</tr>
<tr>
<td>F-Mobility (EU power mix)</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>F-Mobility (100% wind power)</td>
<td>5</td>
<td></td>
</tr>
</tbody>
</table>

*Reference vehicle: gasoline engine (induction engine), consumption 7l per 100 km

Source: DENA – German Energy Agency