Potential for Natural Gas and BioMethane in Transports

Geneva 2015

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NGVA Europe
European Association for gas in transport

• Main objective is the promotion of Natural Gas & biomethane as fuels for transport
• We represent more than 160 manufacturers and associations (21 Board members)
We all depend on transport
Energy needs may double in 30 years
Worldwide gas reserves

(Unit = $10^9$ m$^3$)

**NG consumption & reserves (2013)**

<table>
<thead>
<tr>
<th>Region</th>
<th>Conventional NG</th>
<th>Unconventional NG</th>
</tr>
</thead>
<tbody>
<tr>
<td>World</td>
<td>3.350 billion m$^3$</td>
<td></td>
</tr>
<tr>
<td>Europe</td>
<td>472 billion m$^3$</td>
<td>~ 2 billion m$^3$</td>
</tr>
<tr>
<td>Reserves</td>
<td></td>
<td></td>
</tr>
<tr>
<td>World</td>
<td>513 years</td>
<td></td>
</tr>
<tr>
<td>Europe</td>
<td>179 years</td>
<td></td>
</tr>
</tbody>
</table>

Source: BP statistical review, BGR, graph works NGVA Europe
Methane & CO₂ – The cleanest fuel on a WTW basis

**THG-Emission WTW in gCO₂ äq/km**

<table>
<thead>
<tr>
<th>Fuel Type</th>
<th>Emission (gCO₂ äq/km)</th>
<th>Reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fossil fuel:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Petrol</td>
<td>164*</td>
<td></td>
</tr>
<tr>
<td>Diesel</td>
<td>156</td>
<td></td>
</tr>
<tr>
<td>LPG</td>
<td>141</td>
<td></td>
</tr>
<tr>
<td><strong>Biogenic fuel:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CNG</td>
<td>124</td>
<td>-24%</td>
</tr>
<tr>
<td>BIO-CNG (20%)</td>
<td>100</td>
<td>-39%</td>
</tr>
<tr>
<td>BIO-CNG (100%)</td>
<td>5</td>
<td>-97%</td>
</tr>
<tr>
<td><strong>Electricity:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hydrogen Fuel Cell</td>
<td>174</td>
<td></td>
</tr>
<tr>
<td>(Basis: EU-Mix)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hydrogen Fuel Cell</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>(Basis: Wind energy)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>E-Mobility</td>
<td>75</td>
<td></td>
</tr>
<tr>
<td>(Basis: EU-Mix)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>E-Mobility</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>(Basis: Wind energy)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Source:: DENA; EUCAR-CONCAWE

**CNG**

best values of all fossil fuels

*Basis: (Petrol, naturally aspirated engine), Fuel-consumption: 7l/100km

23 January 2015
Methane for all type of vehicles and transport modes.

- Significant reduction/avoidance of CO2 emissions
- Integration of renewable methane, Bio-Methane, no blending limitations
- Substantial reduction of Particles and NOx
- Reduction in noise levels
- **Only real alternative to oil available today!**
Number of NGVs per 1000 people (2013 world top 20)

Source: NGVA Europe, Worldwide shares in vehicle market,
European NGV Market

1,1 M NGVs in EU

16000

8000 CNG
1500 LNG

Source: NGVA Europe,
Directive on fuel infrastructure: CNG & LNG

Published in the EU Official Journal October 2014

National policy frameworks within 24 months from implementation.

Detailed provisions:

- CNG in cities/densely populated areas by 2020
- CNG & LNG on TEN-T core network by 2025.
- LNG in sufficient TEN-T seaports by 2025.
- LNG in sufficient TEN-T inland ports by 2030.
- Common technical standards by 2016.
- Unit price per "1 petrol litre equivalent" allowed for comparability of fuel prices.

Source: Gasrec, Bohlen & Doyen, European Commission

NGVA Europe

23 January 2015
LNG Blue Corridors Project
Kick-off 27/05 in Brussels

- 27 industrial partners during a 48-month project
- 100 new LNG trucks and 14 LNG new refuelling stations
- http://www.lngbluecorridors.eu

Source: LNG Blue Corridor project
LNG in shipping
Marine fuel sulphur limit of 0.1% in ECAs
CNG vehicles – low emissions champions

Golf VII TGI
Best selling car of its class

Skoda Octavia g-tec. Downsizing & turbo chgarging + CNG is ideal

New Audi A3 TCNG. Cleanest combustion engine with e-gas

Fiat 500 L & Mercedes-BENZ B-Class
Family Vans 800-1000 km range (upt to 500 km on CNG)
LNG trucks for long distance transport

Diesel vs. CNG / LNG

<table>
<thead>
<tr>
<th>1 Liter</th>
<th>200 bar</th>
</tr>
</thead>
<tbody>
<tr>
<td>CNG</td>
<td>5 litre</td>
</tr>
<tr>
<td>LNG/LBG</td>
<td>1.8 litre</td>
</tr>
<tr>
<td>-162°C</td>
<td>at 1 bar</td>
</tr>
<tr>
<td>-125°C</td>
<td>at 10 bar</td>
</tr>
</tbody>
</table>

Two technologies are available for heavy engines:
- Dedicated, spark ignite 100% gas
- Dual fuel, gas 75%, diesel 25%, high power and efficiency

LNG for longer transports, CNG in cities
Cooperation is the only way forward:

- Politicians, authorities and stakeholders
- Fuel distributors
- Vehicle and component producers
- Transport organizations and buyers

**Must work together to:**

- Set standards for vehicles, emissions, fuels, filling stations and safety
- Create a well functioning market for supply and demand of methane