CEPS / low hanging fruits

Natural Gas Vehicles can reduce CO₂ by 25%

May 17th 2011 / Dr. A. Dinse
Advantages of Natural Gas / Large Resources, Low Price, Low Emissions

Security of Energy Supplies [Oil-Peak, Diversification]

- Global retail prices* of natural gas low priced:
  - Ø only 25-60% [-0,20 - 0,50 EUR/kg CNG]
  - of the German state-subsidized retail price
- No complex refinery process necessary
  - only cleaning and drying
- Environment-friendly transport in an established infrastructure of pipelines [energy sector]
  - LNG** transport if required
    - [> 3.500 km cost-efficient]
- Forecast: There will be a natural gas glut next years

Low Priced Fuel Costs

The advantage is based in the nature of natural gas

- ~25% CO2-reduction
  - [natural gas vs. gasoline]
- intelligent hydrogen storage
  - [nearly twice the number of hydrogen (H) per carbon (C)]
- higher energy content
  - [factor 1.2 - 1.5]
- higher engine efficiency
  - [motor octane number ~120 MON]
- clean combustion
  - [low pollutant emission]
- fully developed and available technology at reasonable costs
  - [advantage vs. Fuel Cell Vehicles, Electric Battery Vehicles, ...]
- unlimited miscibility with biogas/biomethane...
  - [advantage vs. Ethanol, Biodiesel, ...]
Natural Gas Cars made by Volkswagen / -25% CO₂

Touran, Caddy, Passat [ ... and some more will follow]

Passat Variant TSI EcoFuel 1,4 l Twincharger

110 kW [150 PS] / 5.500 min⁻¹
220 Nm / 1.500 – 4.500 min⁻¹
4,3 kg CNG/ 100 km
117-119 g CO₂/ km
21 kg CNG-Tank

6,8 l/ 100 km [Super 95 ROZ]
158 g CO₂/ km
31 l gasoline tank

-25% CO₂/ km
Germany: ~100,000 CNG-vehicles [~0,25 % of vehicle population > 40 Mio.]
What can we do to improve?

Policy measures to be undertaken / suggestions
- State-subsidised extension of the natural gas station infrastructure, fuel tax, car purchase and company car taxation until the CNG infrastructure is fully established
- Give-up the price fixing between oil and natural gas
- Better LNG-Tankship access to european harbours [global competition]
- Alleviate the feed-in of natural gas from other parties into existing pipeline grids and standardise the distribution grid carriage
- Better public information regarding the advantages of natural gas cars
- Take CNG-vehicles into account as an eco-innovation [→ CO₂-limit]
- Take Biogas into account regarding the CO₂-limit [e.g. bonus]
- Arrange a steering committee [public authorities, oil and gas providers, consumer associations, car manufacturers, suppliers, …] to establish a clear roadmap [Germany → dena (German Energy Agency)]
- …
Thank you very much for your attention!
back up
Natural Gas vs. Oil / Reserves and Resources

Security of Energy Supplies [Oil-Peak, Diversification]

<table>
<thead>
<tr>
<th>Year</th>
<th>Oil Reserves</th>
<th>Oil Resources</th>
<th>Natural Gas Reserves</th>
<th>Natural Gas Resources</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>59</td>
<td></td>
<td>64</td>
<td></td>
</tr>
<tr>
<td>2050</td>
<td></td>
<td>145</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2100</td>
<td></td>
<td></td>
<td></td>
<td>&gt; 500</td>
</tr>
<tr>
<td>2150</td>
<td></td>
<td></td>
<td></td>
<td>&gt; 500</td>
</tr>
</tbody>
</table>

* conventional and non-conventional

Source: BGR [2005]
Development of Oil Prices 1989 to 2011 …

Dollar and Euro per Barrel Brent [endless contract]

Source: faz.net, 24.02.2011
Natural Gas - available, low priced, clean & safe

Low Priced Fuel Costs

• Global retail prices* of natural gas low priced:
  - Ø only 25-60% [~0,20 - 0,50 EUR/ kg CNG]
    of the german state-subsidized retail price

• No complex refinery process necessary
  - only cleaning and drying

• Environment-friendly transport in an established infrastructure of pipelines [energy sector]
  - LNG** transport if required
    [> 3.500 km cost-efficient]

• Forecast: There will be a natural gas glut next years

* 2008
** liquefied natural gas
Natural Gas - available, low priced, clean & safe

The advantage is based in the nature of natural gas

→ ~25% CO₂-reduction
   [natural gas vs. gasoline]
→ intelligent hydrogen storage
   [nearly twice the number of hydrogen (H) per carbon (C)]
→ higher energy content
   [factor 1.2 - 1.5]
→ higher engine efficiency
   [motor octane number ~120 MON]
→ clean combustion
   [low pollutant emission]
→ fully developed and available technology at reasonable costs
   [advantage vs. Fuel Cell Vehicles, Electric Battery Vehicles, …]
→ unlimited miscibility with biogas/ biomethane …
   [advantage vs. Ethanol, Biodiesel, …]
Natural Gas - available, low priced, clean & safe

Worldwide Baseline Trend

Countries with a well established CNG fuel station infrastructure have an appreciable market share of CNG-vehicles!

• For example Argentina:
  → 1,65 Mio. CNG-vehicles, market share 21,7 % [2008]

Countries with an increasing CNG fuel station infrastructure show a disproportionately high rate of increase!

• For example Germany:
  → Triplication of the CNG vehicle population 2010 [vs. 2005] to ~100.000 vehicles
    CNG fuel stations: 100 [2000], 750 [2007], ~900 [2010]

• But: ~3,5 Mio. vehicle readmissions in Germany per year!
  > 40 Mio. vehicle population in Germany! ~0,25%

What can we do to improve?
Natural Gas Cars made by Volkswagen

Touran TSI EcoFuel

Passat TSI EcoFuel

Caddy / Caddy Maxi EcoFuel
Natural Gas Cars made by Volkswagen

Environmental friendly and powerful

Volkswagen R Cup Scirocco powered by Bio-CNG

2,0 l Turbo

225* PS / 6.000 min⁻¹

1,0 bar supercharging pressure

275 Nm / 3.000 min⁻¹

* 275 PS / 1,3 bar boost pressure