Removing barriers to Natural Gas in transport

UNECE group of experts on gas Taskf Force D

22 April 2016

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Secretary General
NGVA Europe
NGVA Board of Directors (140 members)
Why natural gas in transport?

- Cost-effective: lowest CO2 abatement costs (€/t CO2)
- Immediate: solution to air quality problems, less noise
- Sustainable: Natural Gas, Biomethane & Power-to-Gas, no blend limitations
- Intermodality: investments in waterborne and road complement each other
- Gas is the available, economical and clean alternative to oil

Geneva, 21 April 2016
Natural Gas emissions – CO2 & air quality

Average CO2 reduction of NG vs oil

... carbon neutral mobility

NGV pollutant values vs EU limits

Source: OEMs
EU introduces Real Driving Emissions (RDE)

Introduction of RDE tests as of September 2017:

- First step, NOx “conformity factor” of 2.1 (110%) for new models
- Second step, bring down factor to 1.5 (50%) by 2020
- SCR systems on new diesel models will lead to higher costs, (€1,300 per vehicle)
- CNG will play even stronger role to bring down CO2 emissions

Source: European Commission, ADAC
### Top TEN green cars (Swiss automobile club)

<table>
<thead>
<tr>
<th>rank</th>
<th>brand</th>
<th>modell</th>
<th>capacity in cm³</th>
<th>output in kW / hp</th>
<th>gearbox</th>
<th>fuel type</th>
<th>consumption in l/100 km</th>
<th>CO2 in g/km</th>
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<td>eco up! 1.0 BMT Erdgas CH</td>
<td>999</td>
<td>50 / 68</td>
<td>m5</td>
<td>CNG</td>
<td>2.9</td>
<td>63</td>
<td>Euro6</td>
<td>88.2</td>
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<td>m5</td>
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<td>3.8</td>
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<td>Euro6</td>
<td>75.8</td>
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http://www.verkehrsclub.ch/auto-umweltliste/

Geneva, 21 April 2016
Main barrier: Governments pick a winner

DutchNews.nl

Geneva, 21 April 2016

Source: European Commission, Dutch News.nl, Bundesregierung.de

“Germany will become lead market for electro mobility with 1 Mio electric cars by 2020”

www.bundesregierung.de

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**ROADMAP**

<table>
<thead>
<tr>
<th>Title of the Initiative</th>
<th>Communication on decarbonising the transport sector</th>
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<tbody>
<tr>
<td>Lead DG – Responsible Unit – AP Number</td>
<td>MOVE A3 CLIMA C2 ENER GROW C4</td>
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<tr>
<td>Date of Roadmap</td>
<td>07/04/2016</td>
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<td>Likely Type of Initiative</td>
<td>Communication</td>
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The Council asked for a comprehensive and technology neutral approach for the promotion of emissions reduction and energy efficiency, for electric transportation and for renewable energy sources also after 2020, (…)
NGV applications, low emissions champions

- **CNG buses – success story**
- **Garbage collection – quiet truck**
- **Delivery vehicles – no limits**

- **Cleanest combustion on e-gas**
- **CNG distribution and LNG long-haul trucks – a solution for all**

Geneva, 21 April 2016
Renewable electricity stored in the gas grid with p-t-g technology

Audi A3 TCNG

**Wind Energy**
The starting point for the Audi e-gas project is renewably generated electricity.

**Power grid**
The wind energy is fed into the public power grid.

**Gas network**
The e-gas is stored in the public gas network and can therefore also supply households and industry with energy from renewable sources.

**Electrolysis**
The electrolysis plant, which is operated by wind power, splits water into oxygen and hydrogen.

**Methanation**
The hydrogen reacts with carbon dioxide in a methanation plant. The result: e-gas (synthetic natural gas).

**CNG filling station**
The increasing proportion of e-gas promotes climate-friendly long-distance mobility.
Power-to-Gas (synthetic methane)

Energy storage comparison

**Pumped storage power station**
- approx. 0.04 TWh electricity
- approx. 30 minutes

**45 Mio. Electric vehicles á 10 kWh**
- approx. 0.45 TWh electricity
- 6 hours

**5% hydrogen injected in natural gas grid**
- approx. 1.80 TWh electricity
- approx. 1 day

**10% hydrogen injected in natural gas grid**
- approx. 3.60 TWh electricity
- approx. 2 days

**Synthetic methane injected into natural gas grid**
- approx. 120 TWh electricity
- approx. 2 months

Connected PtG & Biogas plant. Werlte, Germany
Reducing CO2 emissions from HDVs


Principal sources of biomethane

Source: European Commission, IPCC, CNH
Current LNG vehicles market

1,500 LNG Vehicles
Mainly UK, Spain & NL

Source: NGVA Europe
The LNG Blue Corridor project

14 LNG stations to be built, more than 100 trucks on the road
LNG Blue Corridor – mid-term results

- Diesel
  - 29.6 liters
  - 735 g CO₂/km
- LNG
  - 22.9 kg
  - 623 g CO₂/km
  - 16% less CO₂

Source: LNG Blue Corridor
NGV distribution across Europe

NGV public stations - 2015

- Austria: 21
- Switzerland: 17
- Italy: 16
- Sweden: 16
- Bulgaria: 14
- Germany: 10
- Netherlands: 8
- Czech Rep.: 6
- Finland: 4
- Slovakia: 2
- Denmark: 1
- Belgium: 1
- Poland: <1
- France: <1
- Spain: <1
- Hungary: <1
- Portugal: <1

Source: GRTgaz
CNG stations Switzerland (134 stations)

6x in Geneva

Source: map.ngva.eu
Member States have to develop National Policy Frameworks until 18 November 2016

Detailed provisions for CNG and LNG:

- CNG in cities and densely populated areas by 2020.
- CNG & LNG at least on TEN-T core network by 2025. (150 km + 400 km indic. distances).
- LNG in sufficient TEN-T seaports by 2025.
- LNG in sufficient TEN-T inland ports by 2030.
- Common technical standards by 2016.
- Consumer information: "1 petrol litre equivalent" for better comparability of fuel prices shall be used.
NGVA country report & national template

NGVA Report Q10
A Gap-analysis of the DAFI implementation

This report is a gap-analysis of the national status of the implementation of the European Directive for Alternative Fuels Infrastructure, 94/22/EC, the "DAFI".

It is based on 10 questions to the NGV Industry on the use of Natural Gas and Biogas as a vehicle fuel in relation to the objectives and ambitions in the Directive.

Source: NGVA Europe European Commission

Appendix A - Suggested Template for National Policy Frameworks

6.3.2 Natural Gas Refuelling Station

Table 6.8: Planned Number of Natural Gas Refuelling Points in the TEN-T Comprehensive Network

<table>
<thead>
<tr>
<th>ROAD NAME</th>
<th>2020</th>
<th>2025</th>
<th>2030</th>
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<tbody>
<tr>
<td></td>
<td>Number</td>
<td>Max Distance</td>
<td>% of completion</td>
</tr>
<tr>
<td>Road name</td>
<td>CNG</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Road name</td>
<td>LNG</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

http://ec.europa.eu/transport/themes/urban/studies/urban_en.htm

Source: NGVA Europe European Commission
How favourable is the price delta on gas?

Source: NGVA Europe
Barriers & solutions (summary)

What are the barriers?
- Political and regulatory framework: lack of incentives and level-playing field
- Technology availability and promotion: lack of factory produced vehicles
- Cost and Economics: uncertain tax policy and low oil prices
- Intermodality: simultaneous use of LNG for inland navigation and trucks
- Terminology and branding: different names and signs exist for CNG and LNG
- Consumer information: Lack of price/energy content transparency (litres, kg, kWh)

How to overcome these barriers?
- Maintain level playing field for alternatives fuels, no “silver bullet” exists
- National and long term planning for natural gas as a fuel, tolerate is not enough
- Incentives to NGV buyers and users, fleets trigger investments in refuelling stations
- Sustained tax regime (= maintain price differential of 30-50% vs petroleum fuels)
- Soft adoption measures (road toll, parking, preferential access, public procurement)
- Recognition of life-cycle emissions of NG-bio blends in fuel efficiency standards
- R&D support to deploy full NGV potential (vehicles, engines, components)

Extracted from:

Source: UNECE, GEG task force D
Special tasks for the industry

- Improve NGV engines (efficiency, horse power), OEM products, point of sale
- Development of technical standards (UNECE R.110 consistent with ISO)
- Terminology and branding must convey familiarity to customers
- Training courses for users and operators of NGVs and stationary equipment

Special tasks addressed to the natural gas industry:
- Strong commitment from production, transportation, distribution and retailing
  Drive NGVs and build stations – it’s a business case !!!
- Gas composition compliant with vehicles, limit sulphur-based odorisation
- Reliable figures (studies) on well-to-tank (WTT) emissions of natural gas

Extracted from:

“Strong coalition of all stakeholders and collaboration UNECE, IGU, IEA, etc. Learn and exchange information between task forces A (methane emissions), B (natural gas and renewables), C (LNG), D (barriers to NG in transport)”

Source: UNECE, GEG task force D
NGV roadmap 2030

- 20% of the total new LDV and HDV sales NGV
- 50% of new bus sales NGV
- 20 Mio CNG cars
- 300,000 CNG buses
- 400,000 NGV trucks (300,000 LNG, 100,000 CNG)
- 4,000 L-CNG refuelling points (1,000 stations à 4 dispensers)
- 10,000-15,000 CNG stations
- Gas sales around 40 bcm (50:50 CNG and LNG)
- The share of bio-methane has the potential to increase to 10-20%
Main task for all: EDUCATION

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