



Removing barriers to Natural Gas in transport

UNECE group of experts on gas
Task Force D

22 April 2016

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NGVA Board of Directors (140 members)



Why natural gas in transport?



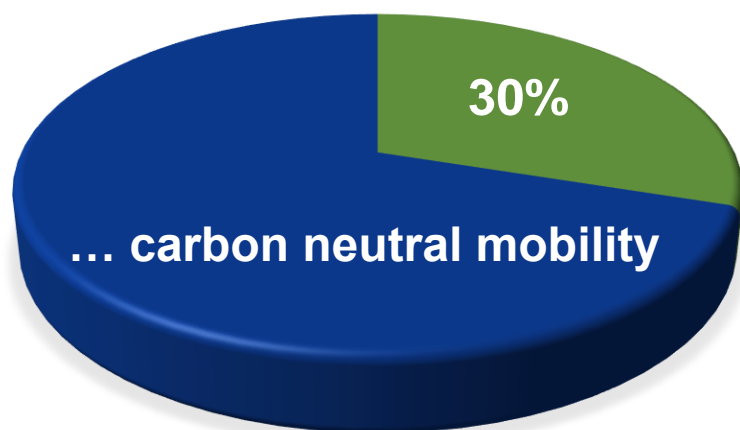
CNG

LNG

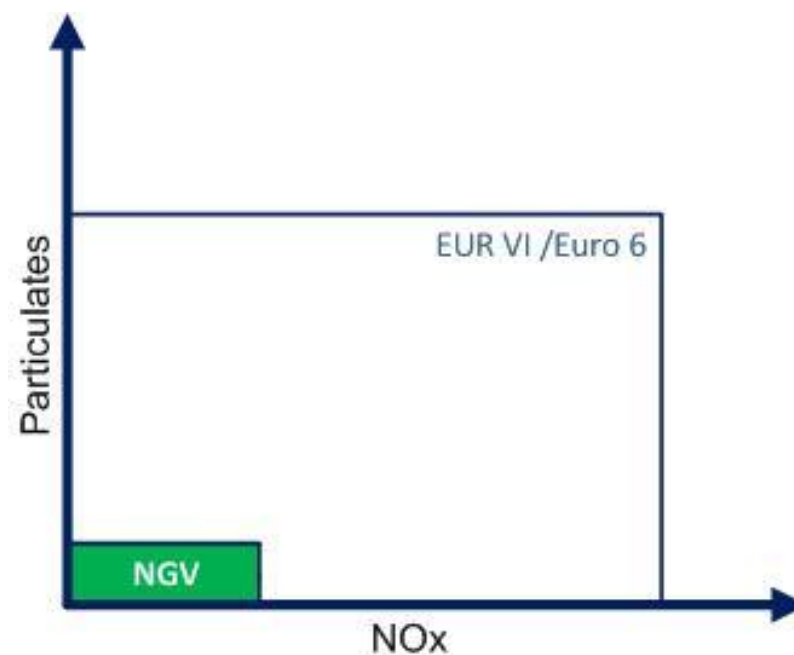
- Cost-effective: lowest CO₂ abatement costs (€/t CO₂)
- Immediate: solution to air quality problems, less noise
- Sustainable: Natural Gas, Biomethane & Power-to-Gas, no blend limitations
- Intermodality: investments in waterborne and road complement each other
- Gas is the available, economical and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

Natural Gas emissions – CO₂ & air quality

Average CO₂ reduction of NG vs oil



NGV pollutant values vs EU limits



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)

rank	brand	modell	capacity in cm ³	outout in kW / hp	gearbox	fuel type	consumption in l/100 km CNG: kg/100 km	CO2 in g/km	emission class	total points
1	VW	eco up! 1.0 BMT Erdgas CH	999	50 / 68	m5	CNG	2.9	63	Euro6	88.2
1	Skoda	Citigo 1.0 Green tec CNG Erdgas CH	999	50 / 68	m5	CNG	2.9	63	Euro6	88.2
1	Seat	Mii 1.0 MPI Ecofuel CNG Erdgas CH	999	50 / 68	m5	CNG	2.9	63	Euro6	88.2
2	Audi	A3 Sportback 1.4 TFSI g-tron S-tronic Erdgas CH	1395	81 / 110	a7	CNG	3.3	71	Euro6	84.2
3	VW	Golf 1.4 TGI BlueMotion DSG Erdgas CH	1395	81 / 110	a7	CNG	3.4	74	Euro6	83.0
4	Lexus	CT 200h Hybrid	1798	100 / 136	as	petrol	3.6	82	Euro6	81.4
5	Seat	Leon 1.4 TGI CNG Erdgas CH	1395	81 / 110	m6	CNG	3.5	76	Euro6	79.8
6	Suzuki	Celerio 1.0 Unico	998	50 / 68	m5	petrol	3.6	84	Euro6	78.8
7	Lancia	Ypsilon 0.9 TwinAir NP Erdgas CH	875	59 / 80	m5	CNG	3.1	69	Euro6	78.4
8	Fiat	Panda 0.9 TwinAir NP Erdgas CH	875	59 / 80	m5	CNG	3.1	68	Euro6	76.8
9	Toyota	Auris 1.8 VVT-i Hybrid	1798	100 / 136	as	petrol	3.5	79	Euro6	76.3
10	Citroen	C1 VTi 68 S&S 5T	998	51 / 69	m5	petrol	3.8	88	Euro6	75.8
10	Peugeot	108 PureTech 68 S&S	998	51 / 69	m5	petrol	3.8	88	Euro6	75.8

Main barrier: Governments pick a winner

DutchNews.nl

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Only electric cars should be sold in Netherlands from 2025

Daily

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



ROADMAP			
TITLE OF THE INITIATIVE	Communication on decarbonising the transport sector		
LEAD DG – RESPONSIBLE UNIT – AP NUMBER	MOVE A3 CLIMA C2 ENER GROW C4	DATE OF ROADMAP	07/04/2016
LIKELY TYPE OF INITIATIVE	Communication		

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, (...)

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

NGV applications, low emissions champions

CNG buses – success story



Garbage collection – quiet truck



Delivery vehicles – no limits



Cleanest combustion on e-gas



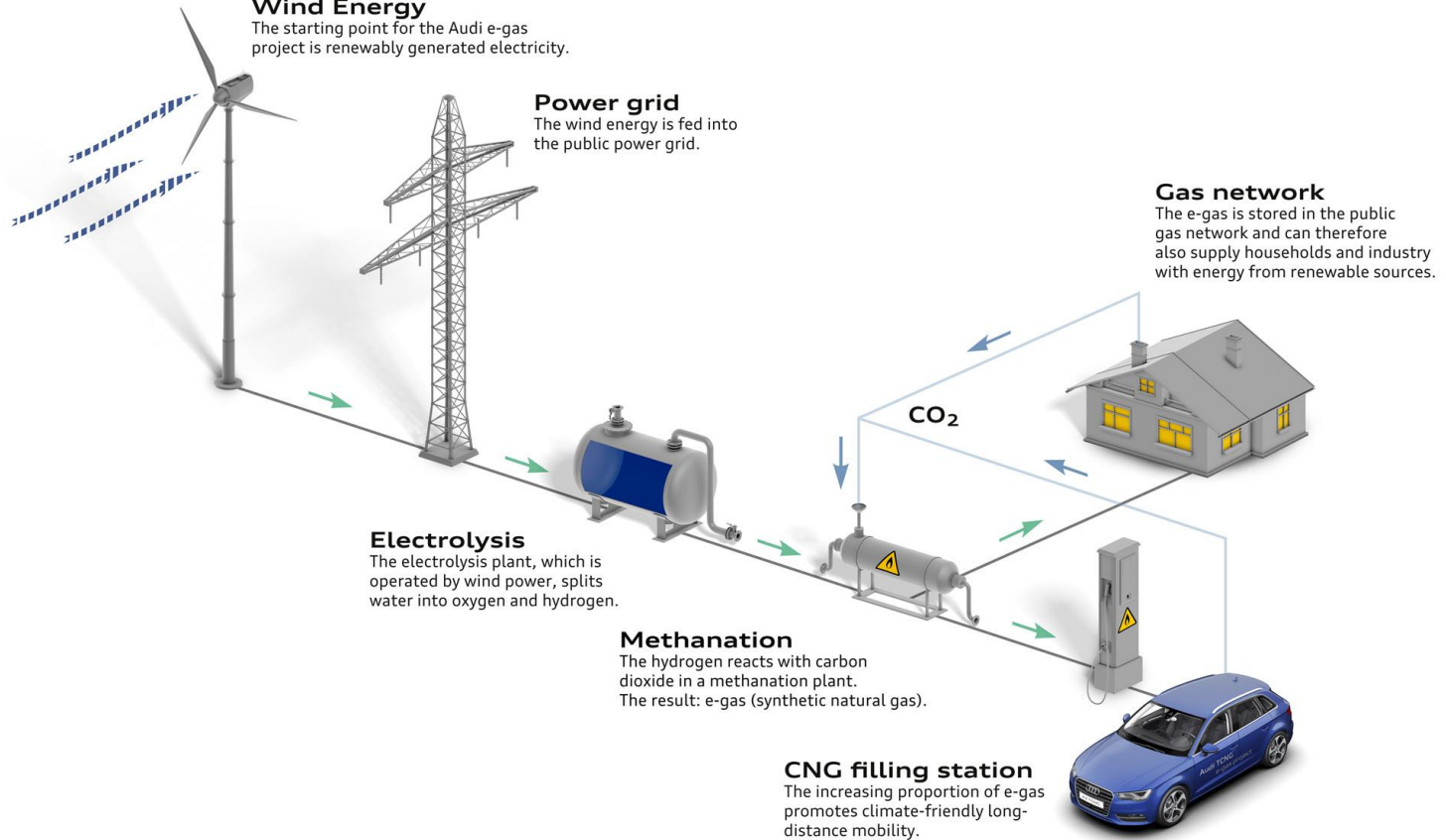
CNG distribution and LNG long-haul trucks – a solution for all



Renewable electricity stored in the gas grid with p-t-g technology

Audi A3 TCNG

09/12



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

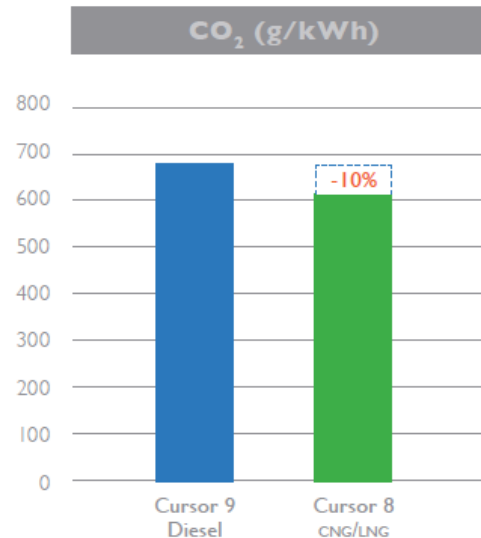
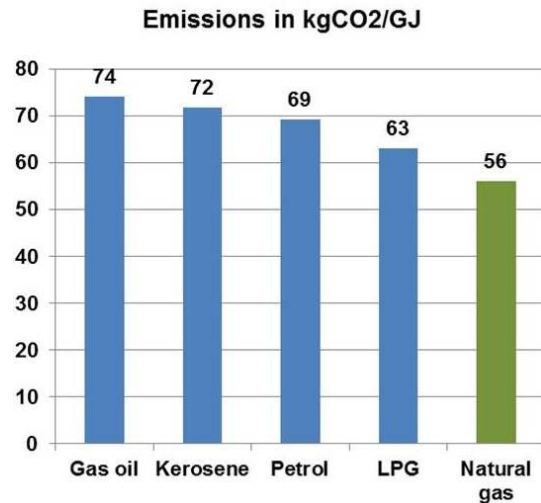
- approx. 120 TWh electricity
- approx. 2 months



Connected PtG & Biogas plant. Werlte, Germany

Reducing CO2 emissions from HDVs

Commission Communication on reducing CO2 emissions from Heavy-Duty Vehicles:
http://ec.europa.eu/clima/policies/transport/vehicles/heavy/documentation_en.htm



Principal sources of biomethane



House waste



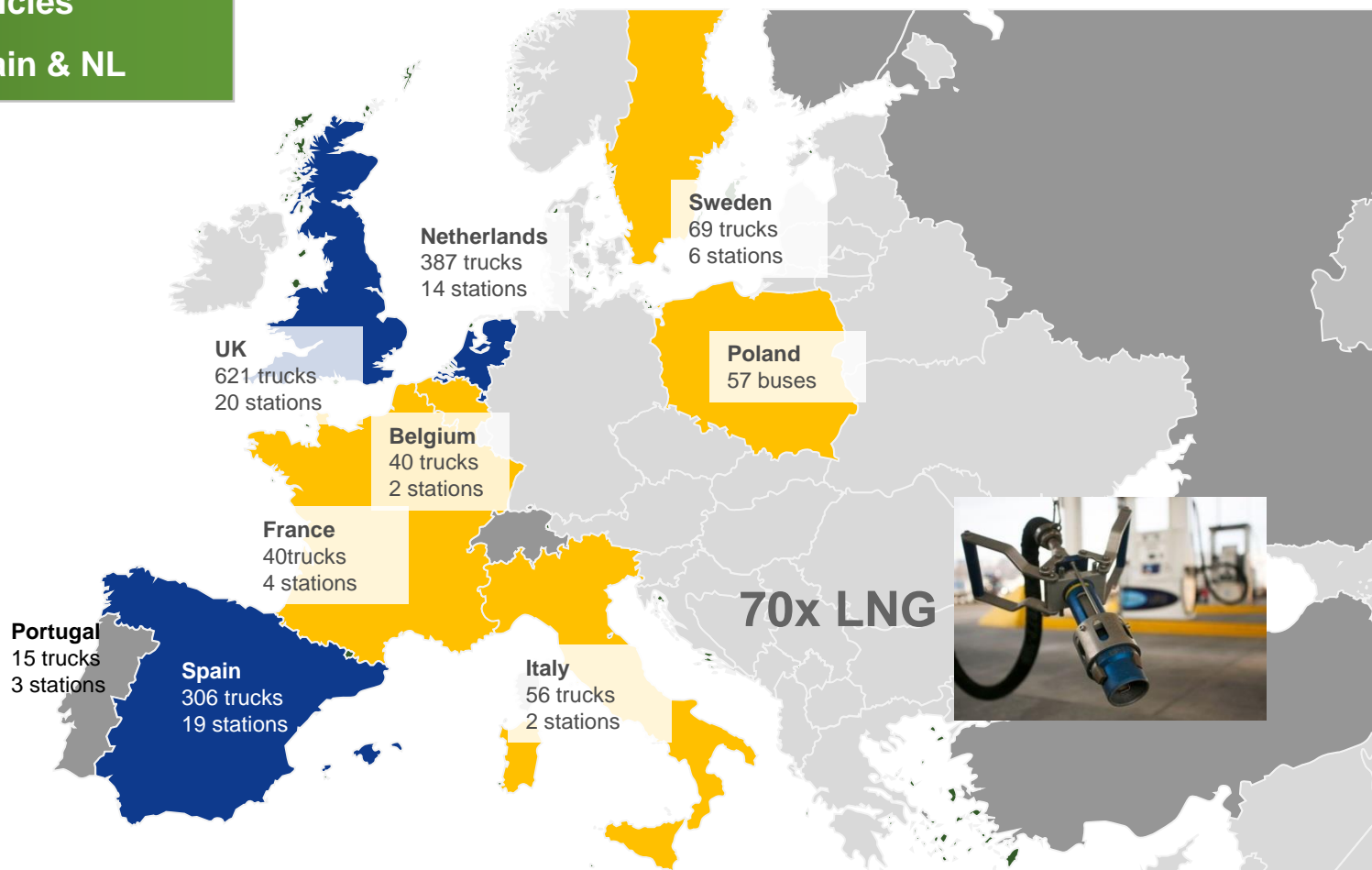
Landfill



Source: European Commission, IPCC, CNH

Current LNG vehicles market

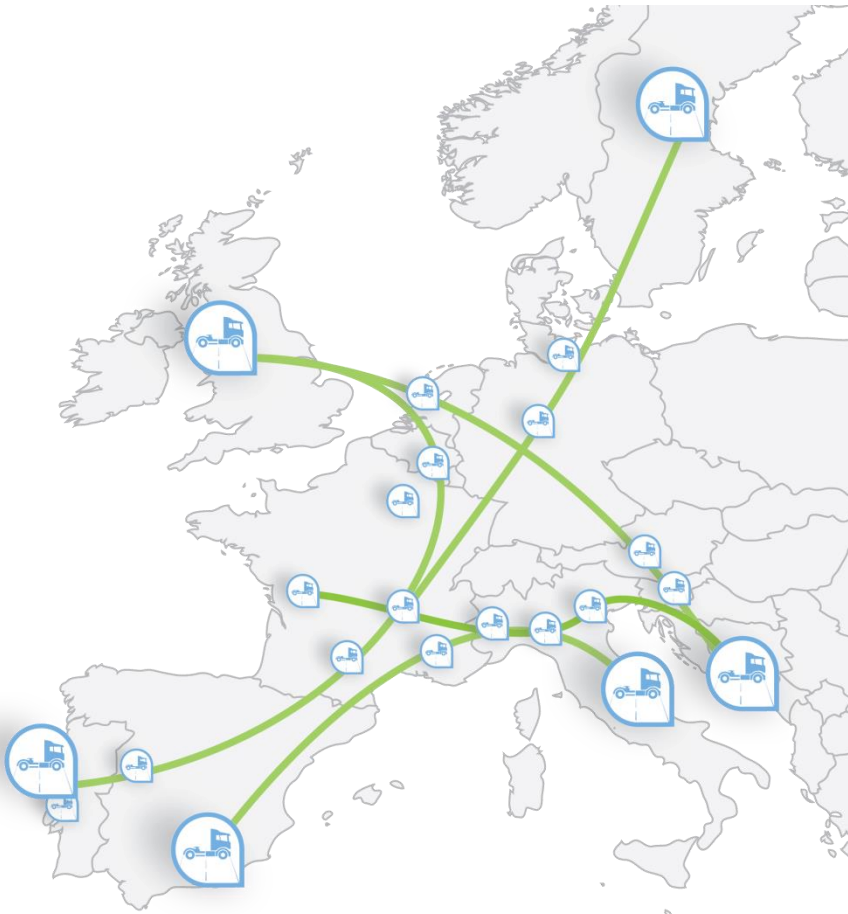
1.500 LNG Vehicles
Mainly UK, Spain & NL



- > 200
- > 25
- Demos
- None

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



- 735 g CO₂/km

- LNG

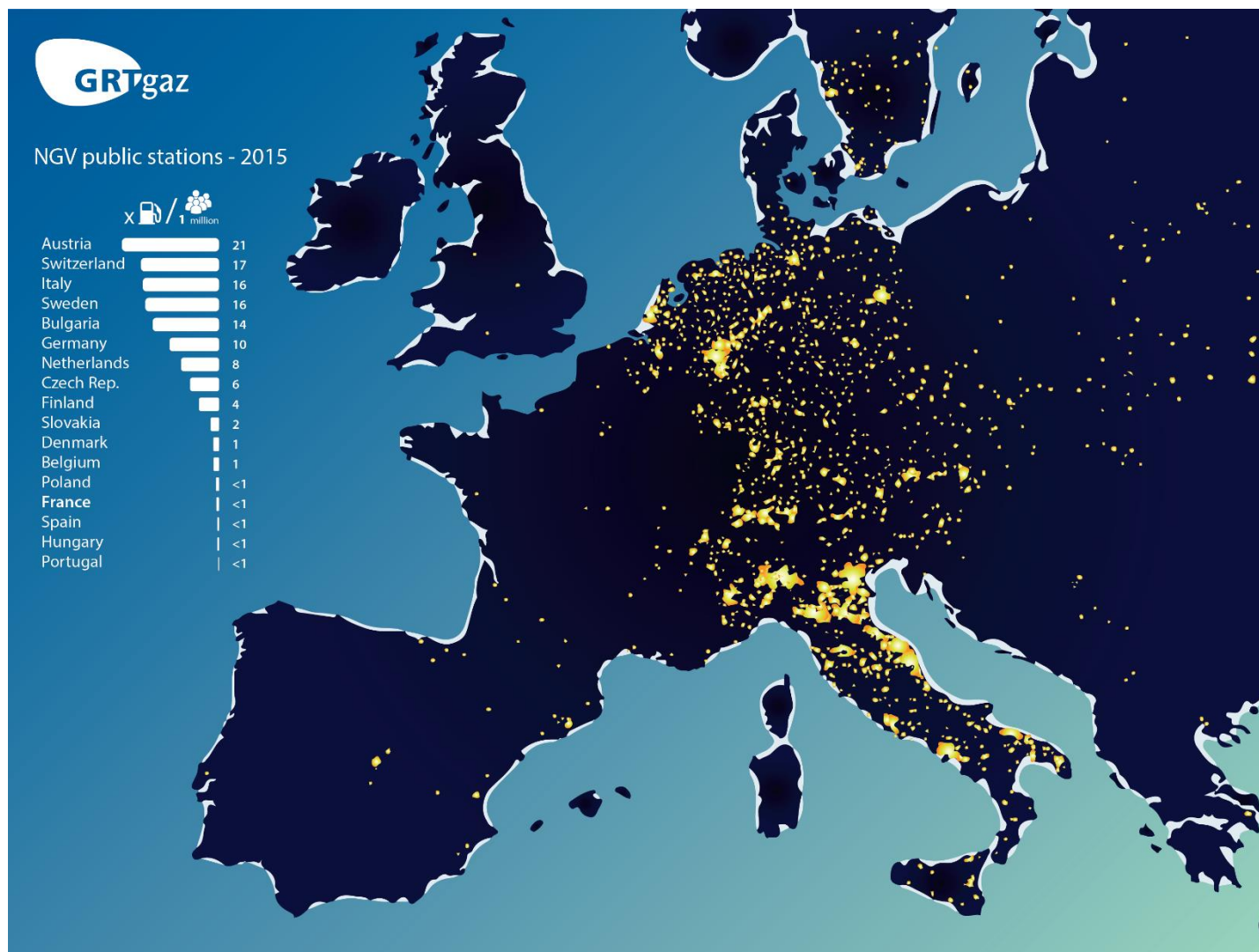


- 623 g CO₂/km

16% less CO₂



NGV distribution across Europe



Source: GRTgaz

CNG stations Switzerland (134 stations)

6x in Geneva



Source: map.ngva.eu

Directive on deployment of alternative fuels infrastructure (2014/94/EU)



Member States have to develop National Policy Frameworks until 18 November 2016



LCNG station, Gasrec, UK



CNG station, Bohlen & Doyen, Germany

Source: European Commission



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, 94/214/EU, the "DAFI".

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



Appendix A - Suggested Template for National Policy Frameworks

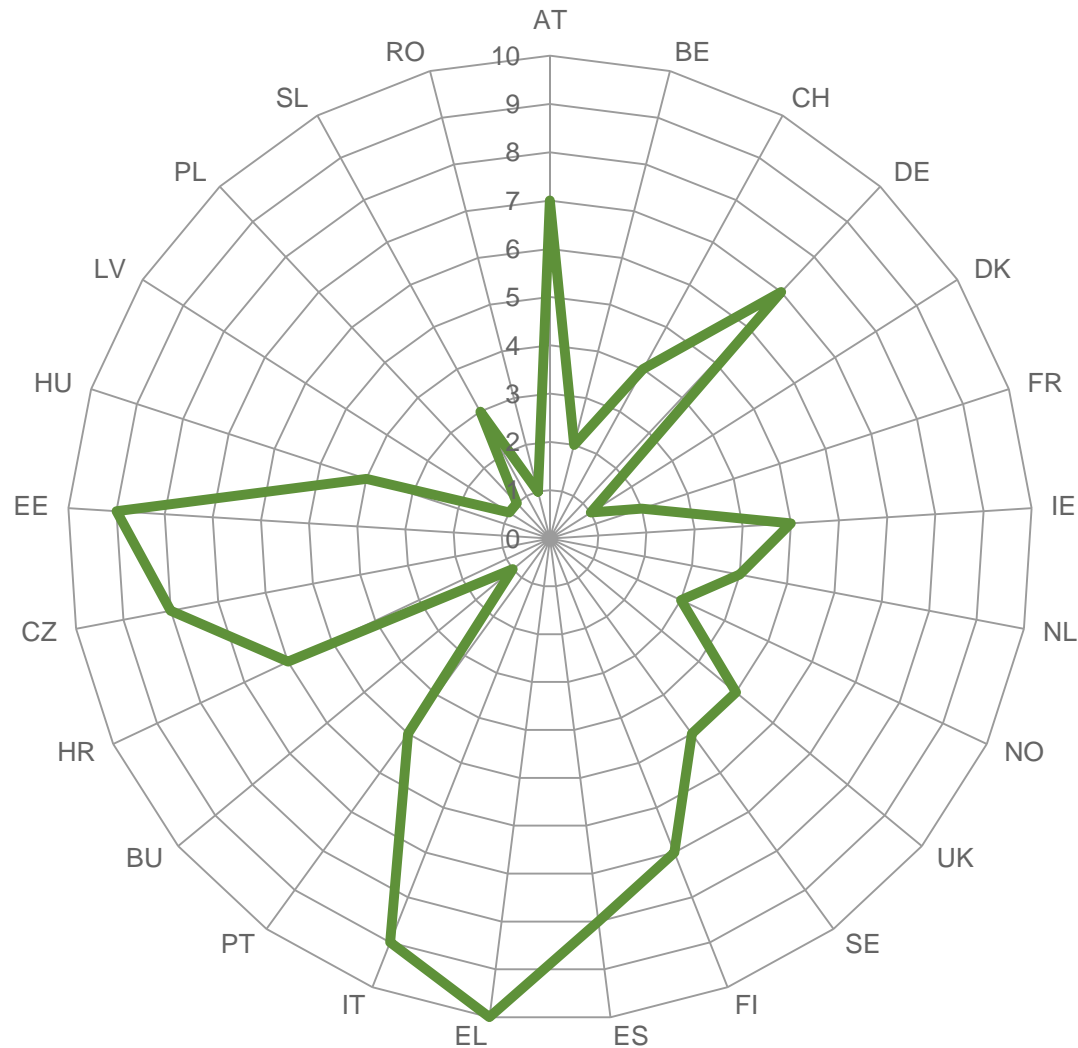
6.3.2 Natural Gas Refuelling Station

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

		2020			2025			2030		
ROAD NAME		Number	Max Distance	% of completion	Number	Max Distance	% of completion	Number	Max Distance	% of completion
Road name	CNG									
Road name	LNG									

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

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:

http://www.unece.org/fileadmin/DAM/energy/se/pdfs/nat_gas/geg/geg3_Apr2016/GEG.3.2016.INF.3_Remov.Barriers_NG.Transp.pdf

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:

http://www.unece.org/fileadmin/DAM/energy/se/pdfs/nat_gas/geg/geg3_Apr2016/GEG.3.2016.INF.3_Remov.Barriers_NG.Transp.pdf

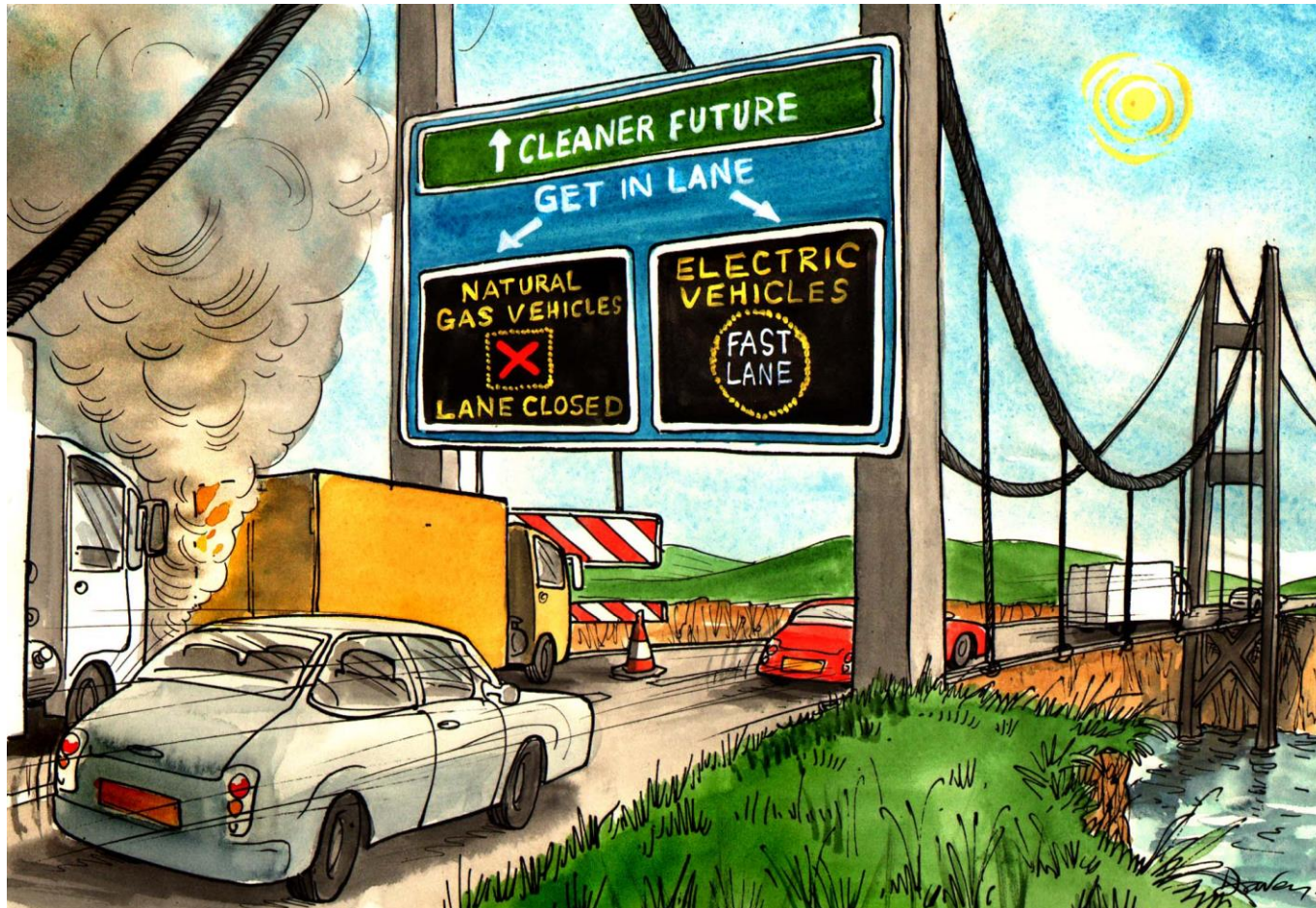
“Strong coalition of all stakeholders and collaboration UNECE, IGU, IEA, etc.
Learn and exchange information between task forces A (methane emissions),
B (natural gas and renewables), C (LNG), D (barriers to NG in transport)”

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



Source: <https://www.transportenvironment.org/publications/natural-gas-vehicles-%E2%80%93-road-nowhere>

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