NG/Biomethane Fuel Specification in Europe

CEN/TC 408

Brussels, 23rd May 2013

for sustainable mobility
NGVA europe
Natural & bio Gas Vehicle Association

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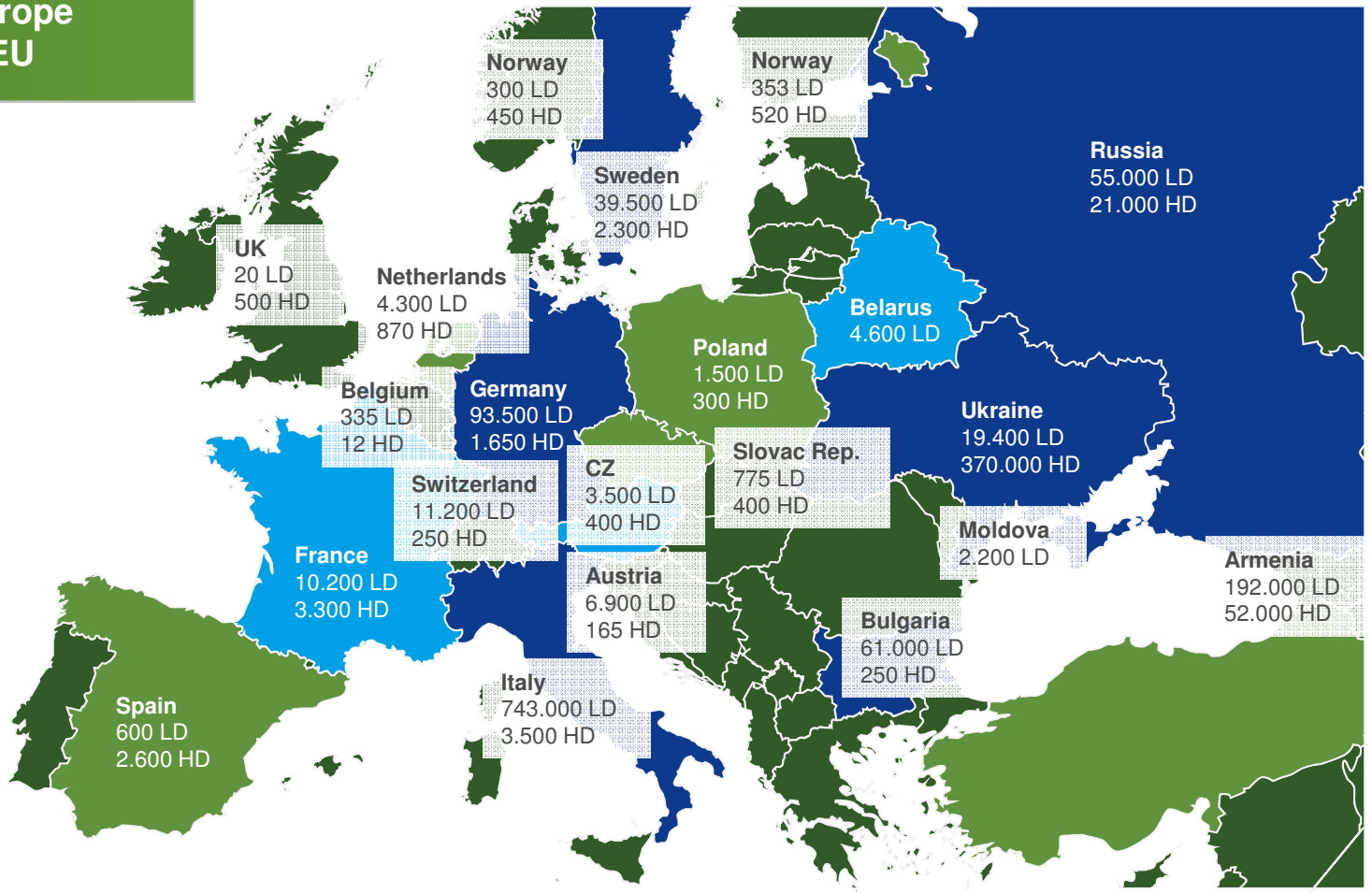
Current European NGV Market

1,7 M NGVs in Europe
1 M NGVs in the EU



- > 20.000
- 5.000 – 20.000
- 1.000 – 5.000
- < 1.000

Source: NGVA Europe, 01.06.2012

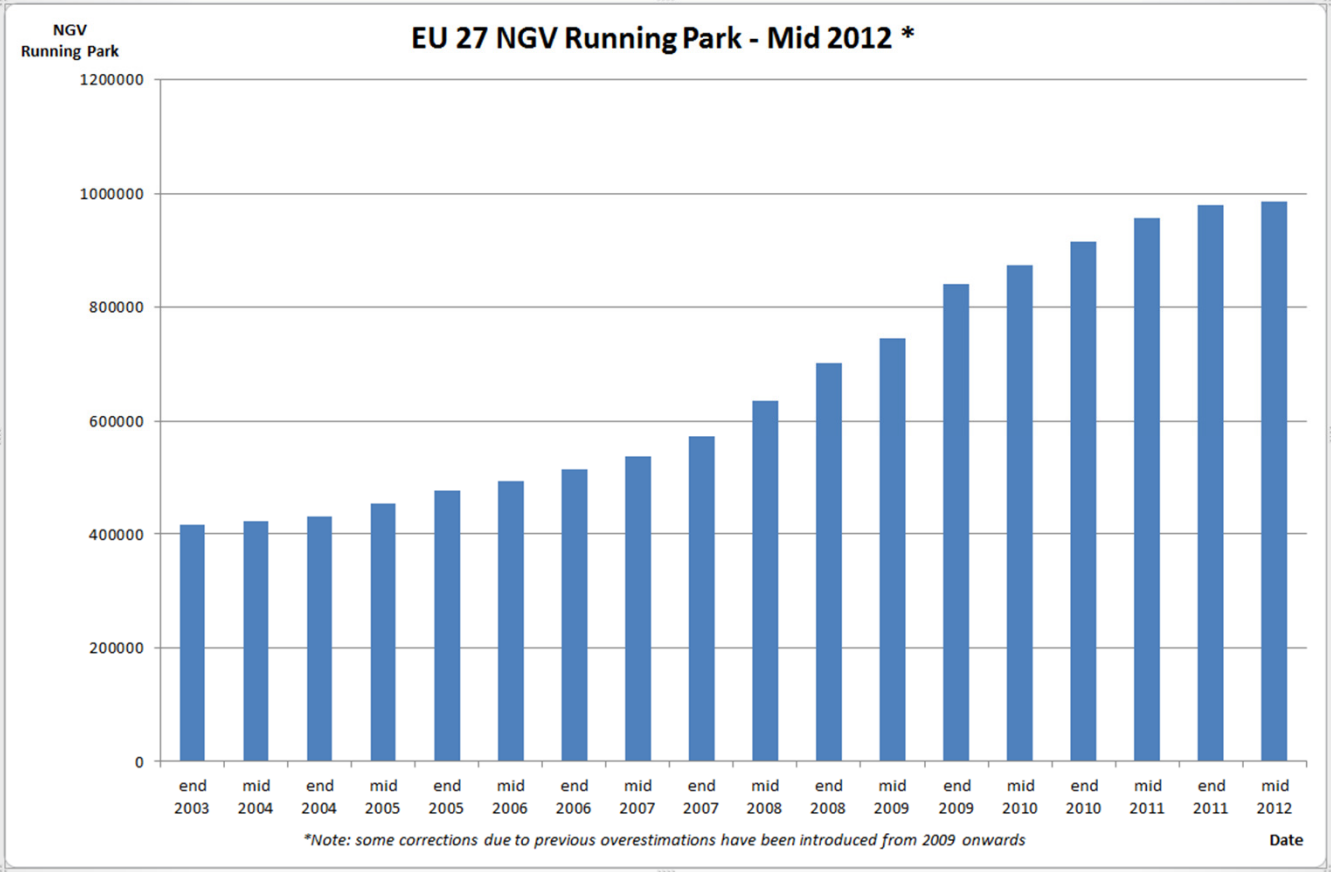
Current European NGV Market

Market Characteristics

- Growing market
- Scattered running park
- Scattered refuelling inf
- Strong industry commitment
- Good political landscape

Main Associated Benefits

- Strategic energy carrier
- Reduced emissions
- Mature & economic technology



The role of the European Commission

Origin of the standardization work:

- The EU will to reduce oil dependency and increase security of energy supply
- The difficulties in achieving committed targets such as those for the RED

Why not exploit NG&Biomethane potential?

Specific mandate to CEN: it was not until late 2010 that the EC addressed a specific Mandate (M475) for the development of:

- A European standard for a quality specification for biomethane to be used as a fuel for vehicle engines;
- A Technical Specification or European Norm for a quality specification for biomethane to be injected into natural gas pipelines

Later widened to also cover fossil NG

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CEN/TC 408 in charge of the job:

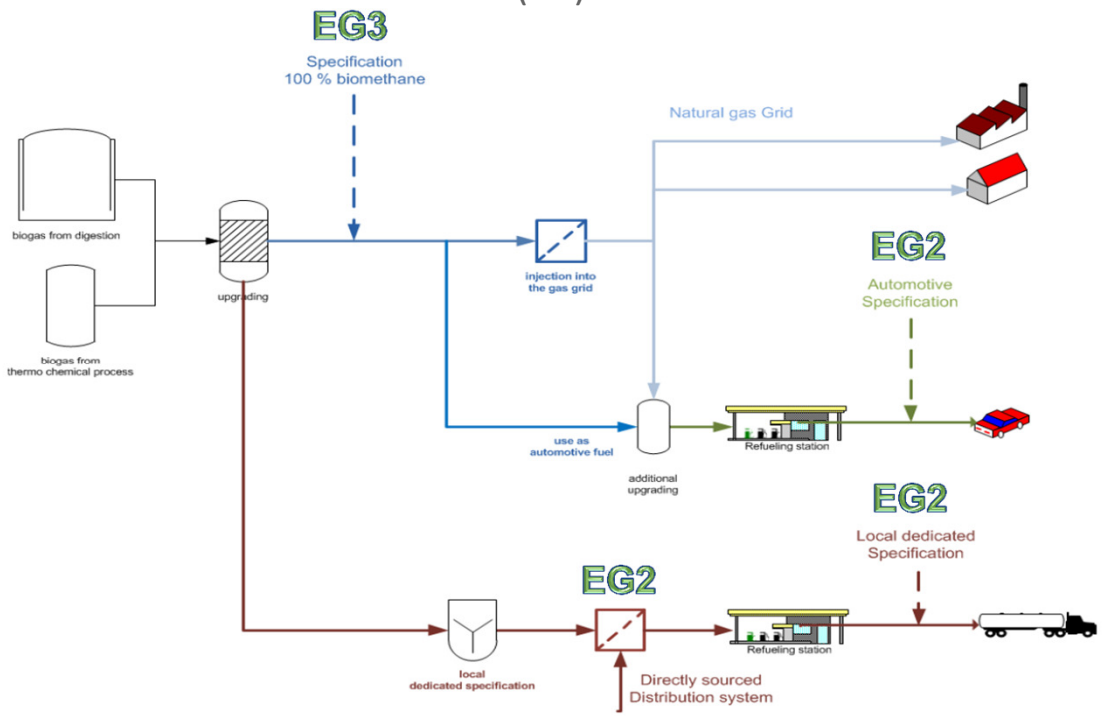
- 8 meetings to date
- First version of the working draft is ready for internal committee voting
- First official WD will be out for CEN enquiry during autumn
- Next meeting will be held between 6th – 7th June 2013 in Rotterdam (NL)

Committee structure:

- Chairman: Erik Buthker – NL
- Secretariat: AFNOR
- EG2 coordination: NGVA Europe
- EG3 coordination: GDF Suez

Three internal expert groups

- EG1: bio-content determination
- EG2: NG/Biomethane as a fuel
- EG3: Biomethane grid injection



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Expert Group 2 Composition:

Wide variety of experts: Volkswagen, Volvo, Scania, Bosch, Swedish Gas Technology Centre, E-ON Ruhrgas, ENI, RWE, Swiss Gas and Water Association, HERA-AMASA, PSA Group, NGVA Europe…

Remarkable characteristics:

- Parallel mandate (M400) for the pipeline NG specification. Work dealt with via CEN/TC 234
- Liaison with ISO/TC 252 on NG refuelling stations (Martin Seifert from SVGW is the Chairman)
- Main encountered positions/interests: between the gas industry and the vehicle manufacturers

First draft:

CEN/TC 408
Date: 2013-04
TC 408 WI 00408001
CEN/TC 408
Secretariat: AFNOR

Parameter	Unit	Limit values		Test method
		Injection	Fuel	See normative references

To what extent can the grid and fuel specifications can differ from each other? In the next slides an overview of the main open topics will be offered

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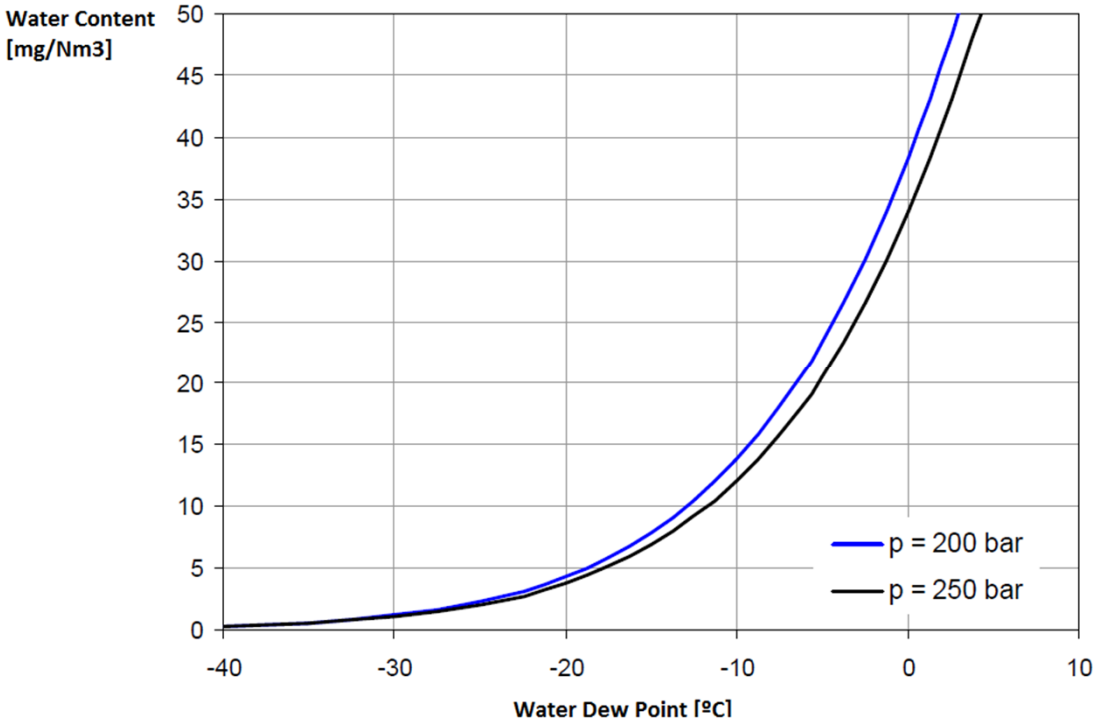
Main points under discussion:

- Water content/ dew point: both parameters are important for safety (corrosion) and driveability (potential water condensation). As these two parameters are correlated (ISO 18453), limiting one of those should be enough:



ECE Regulation 110 sets a 32 mg/m3 limit just for safety. It has proven to not be enough for cold climates. Thus a variable limit for different climatic zones is being proposed:

Zone A: 0 ºC at 200 bar
Zone B: -10 ºC at 200 bar
Zone C: -20 ºC at 200 bar
Zone D: -30 ºC at 200 bar

This implies that, for many stations, there will have to be a drying equipment

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Main points under discussion:

- Hydrogen Sulphide: associated corrosive issues and combustion by-products sticking engine valves (as reported by Bosch).

  ECE Regulation 110 sets a limit of 23 mg/m^3 for safety/ corrosion. Several documents have been shared by different experts. A proposed limitation of 5 mg/Nm3 is currently being proposed, which is in line with the gas grid requirement being developed by CEN/TC 234/WG 11

$H_2S \leq 5$ mg/Nm^3
The same as for pipeline spec!

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Main points under discussion:

➡ Oxygen: associated potential corrosion in connection to other components.

ECE Regulation 110 sets a limit of 1% v/v. The discussion for the grid specification/injection is not yet finished, but it seems to be leading to a variable limitation depending on the proximity to i.e. underground NG storages.

	Austria	France	Germany	Netherlands	Sweden	Switzerland	
O_2	< 0,5 %	<0,01%	<0,5%	<0,5%	<1%	<0,5%	<0,5%

NCS Injection Requirements in Different European Countries. Source: Marcogaz

For biomethane, some problems might occur, especially when the biogas source is from landfill

$O_2 \leq 1\%$ v/v
It seems this will be less strict than for the grid/injection spec

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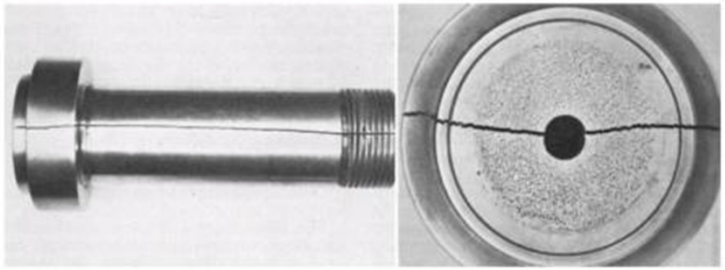
Main points under discussion:

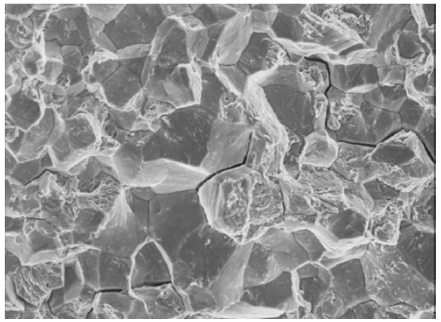
- Hydrogen: associated fragility (embrittlement) issues due to the high solubility of hydrogen molecules, especially at high pressures.

  ECE Regulation 110 set a limit of 2% v/v to prevent this aspect. The discussion for the grid specification is not yet finished as GERG is working on it, but will probably aim to a similar level. Some examples:

	Austria	France	Germany	Netherlands	Sweden	Switzerland	
H_2	< 4 %	<6%	#5 %	/	<0,5%	<5%	<5%

NCS Injection Requirements in Different European Countries. Source: Marcogaz





$H_2 \leq 2$ % v/v
Pipeline requirement to be still to be decided, but current discussions are in the same line!

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Main points under discussion:

- Siloxanes/Silicon: its combustion by-products create problems for ICEs like accumulation (leading to engine knocking), abrasion of internal parts, causes malfunction of critical components such as lambda sensors, etc

Available documentation: several documents have been prepared, documenting different technological requirements (NGVA Europe in charge of gathering input on this). Most strict requirements seem to be for automotive ICEs and microturbines: values ranging from 0,05 mg/Nm^3

Current barriers: no agreed sampling and test methods, making existing measurement programs and requirements difficult to compare. DNV KEMA and GERG will work on this

Siloxanes/Silicon is seems to be an issue only for some types of biogas, mainly from landfill and waste-water treatment. Thus, the preliminary/indicative limitation to be proposed (initially of 0,1 mg/Nm^3) should be properly assessed by national fuel quality programs layed down in the future (no need to control if no biomethane from those sources, and taking into consideration potential dilution effects)

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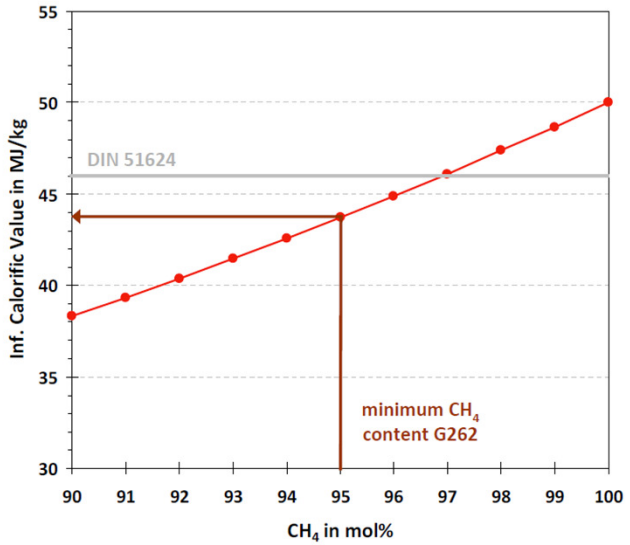
Main points under discussion:

➡ Calorific Value and Methane Number: critical parameters affecting the combustion behaviour of the fuel

Initially, after the first period of discussions, the group agreed upon fixing a minimum low heating value of some 44 MJ/kg (the German DIN 51624 sets 46 MJ/kg) in order not to have problems with biomethane as:



Calorific Value:

Volvo now proposed to have WI limited instead of LCV

Methane Number:

It is impossible to adjust the whole NG grid to the needs of the vehicles. Solution found and agreed is via the creation of two different grades: 65 (typical minimum MN for grid) and 80 (high grade or typical for non-blended biomethane and some LNGs

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Main points under discussion:

➡ Sulphur: poisoning effect on after-treatment systems. Problem is:

Vehicle manufacturers request 10 mg/m^3, value that can't be assured by the gas industry. The reason lays on the current odorisation practices, which is mainly based on the addition of sulphur-based components to the pipeline, like THT and mercaptanes.

Different requests can be found between different manufacturers as the engine technology and thus the after-treatment used have a great impact on the sulphur sensitivity.

At the same time, reports from the NG industry reflect that typical levels are generally below 30 mg/Nm^3, so the limitation they are proposing is:

- 20 mg/Nm^3 for non-odorised NG
- 30 mg/Nm^3 for odorised NG

Main problem: this decoupling has a stron impact in the cost of most refuelling stations, as those connected to the NG grid

Thank you for your attention

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