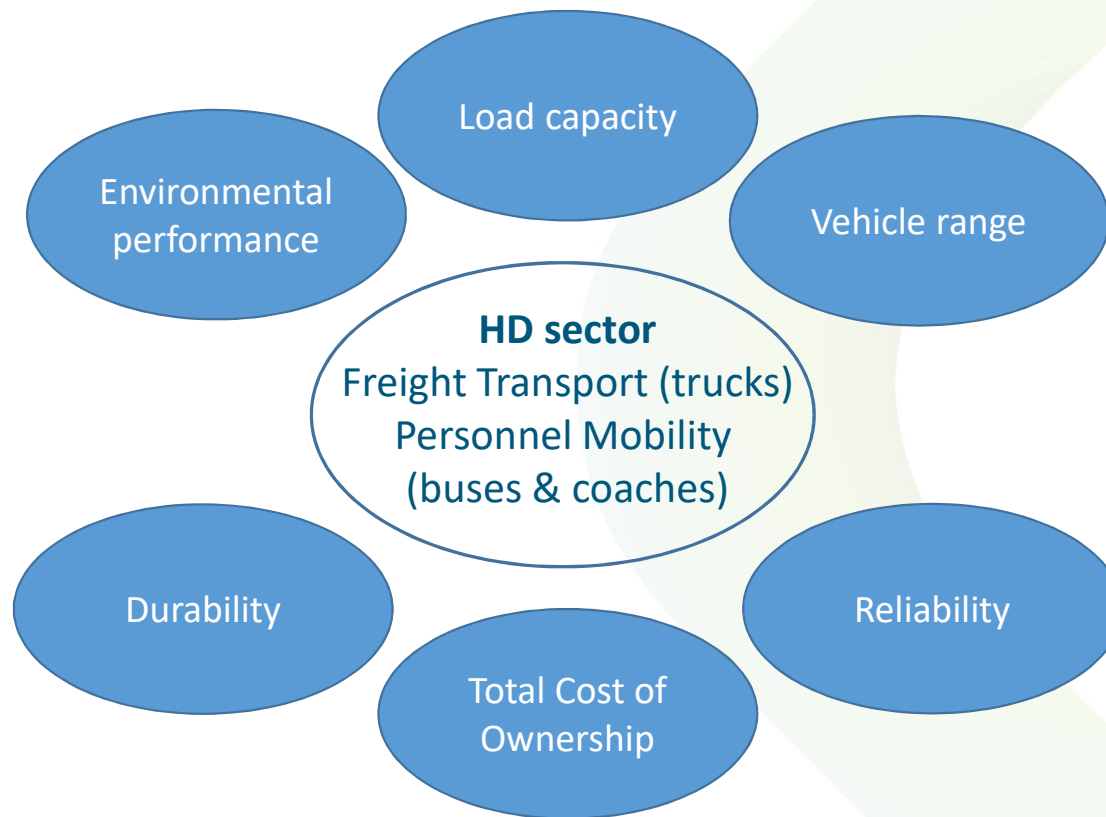


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Base principles for the new CO₂ regulation for HDVs

*Stakeholder meeting on the Impact Assessment on
Heavy-Duty Vehicle CO₂ emission standards*

16 January 2018



In parallel to the progress in efficiency optimisation at vehicle level (vehicle energy demand) future powertrains will be composed by a larger set of solutions:

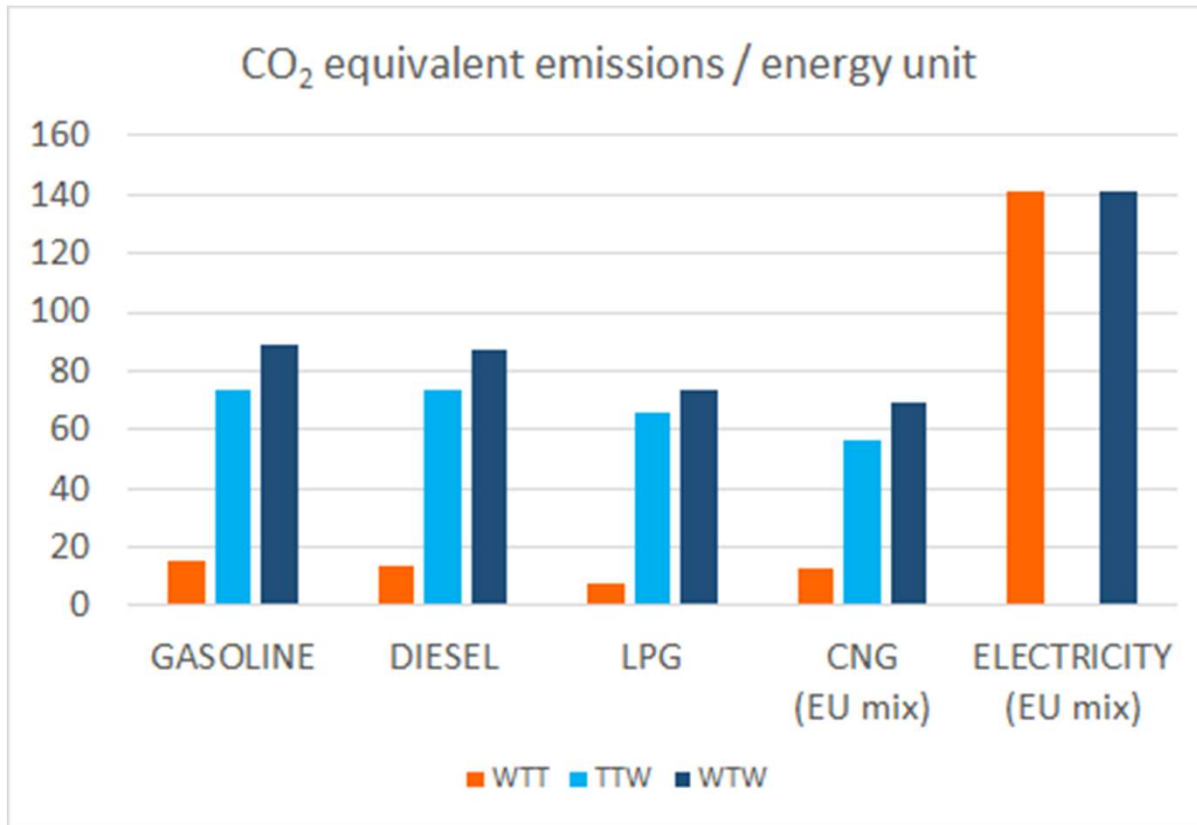
- 1 – Diesel engines will remain a key technology for some decades
- 2 – HD electrification will progressively be introduced
- 3 – Natural Gas will play a growing role as CNG/LNG and through renewable gas
Continuous progress in engine efficiency (<http://www.hdgas.eu/project/>)
- 4 – Advanced liquid biofuels (e.g. HVO) important also to feed existing circulating fleet

How to assess not only efficiency and fuel economy BUT also the GHG impact from different technologies supported by fossil, renewable fuels and energy carriers ?

Decarbonisation addresses a GLOBAL concern and, when looking to the transportation sector, it is fundamental to consider the entire process of GHG generation from the entire chain.



This reveals fundamental when assessing GHG impact from future combinations of fuels/energy carriers and new powertrains, also including electrified ones.

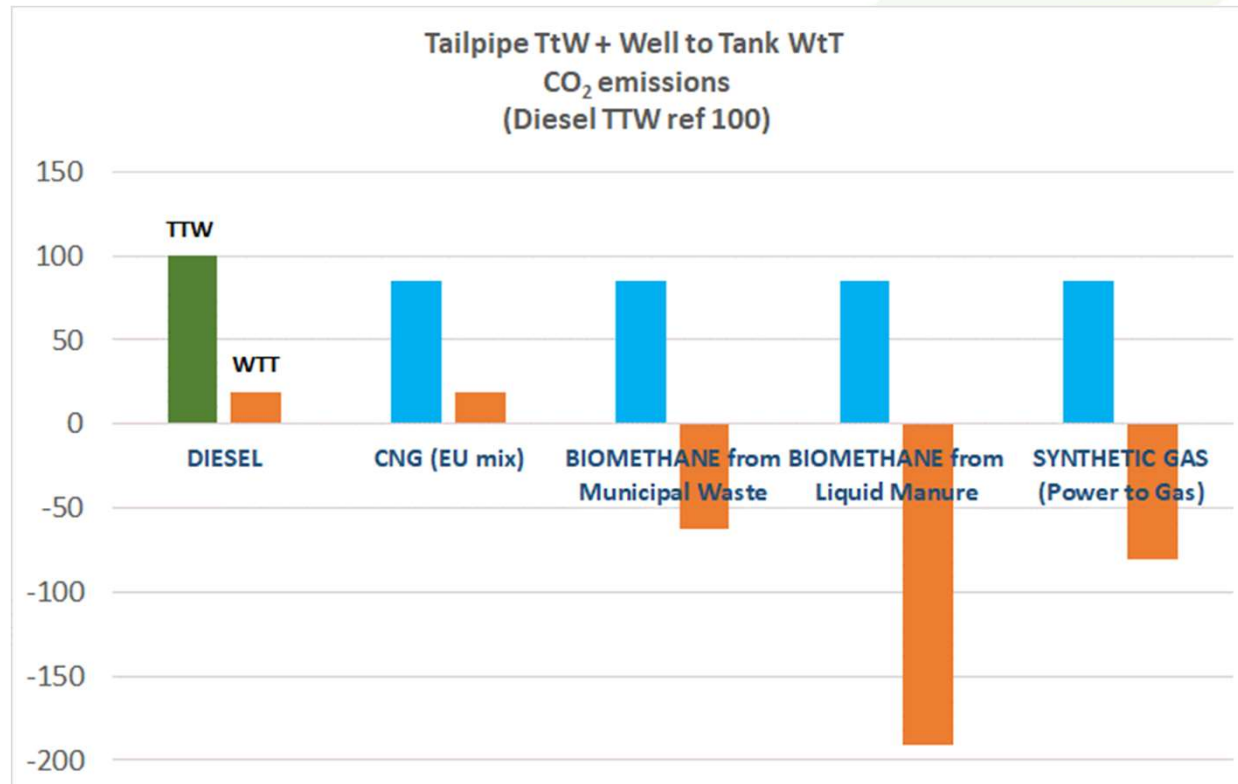


Source: JEC WtW Study – Version4c

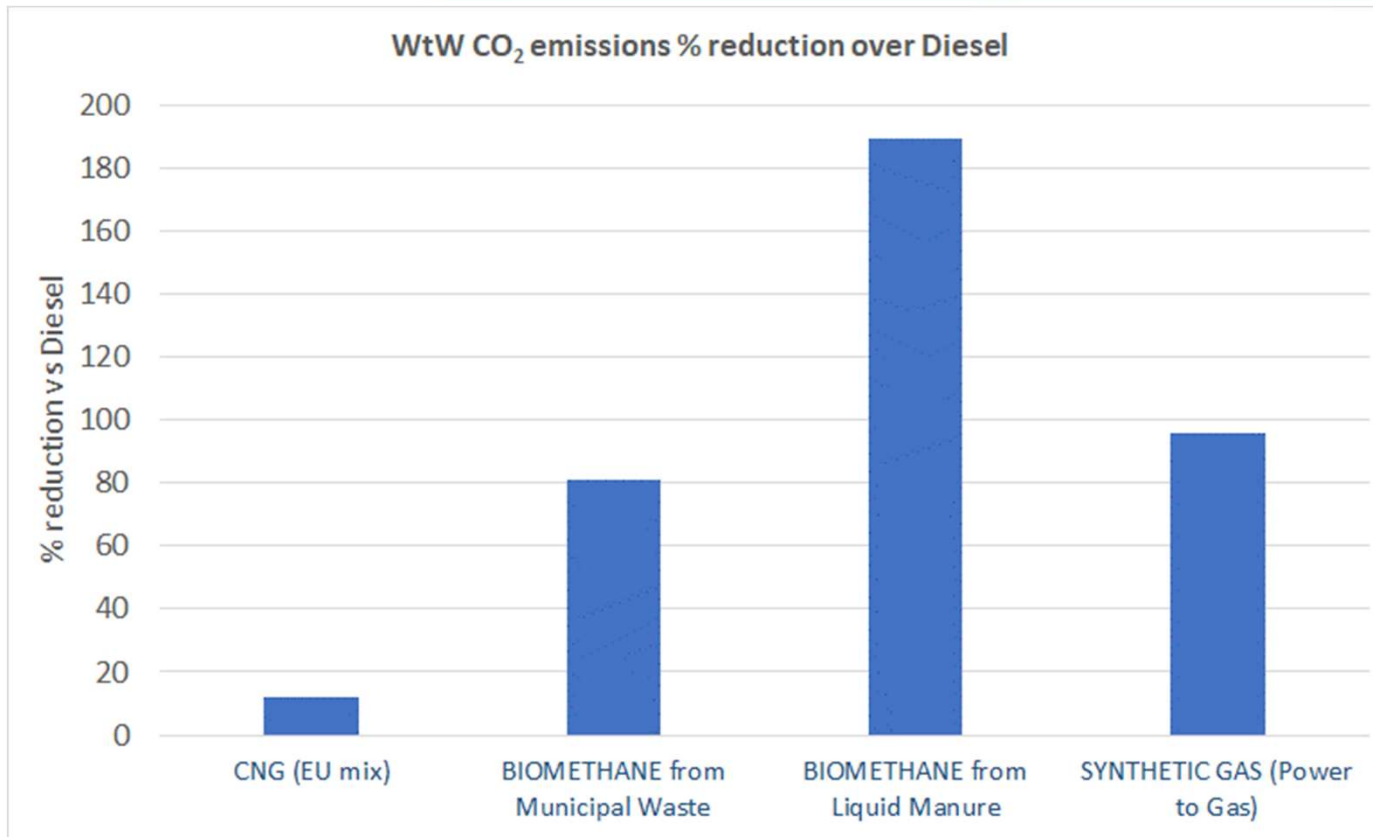
CO₂ “equivalent” includes also CH₄ and N₂O emissions

Fuel and Energy carrier effect based on H/C ratio and production pathway

Powertrain efficiency excluded



Source: NGVA elaboration on Thinkstep report (May 2017)

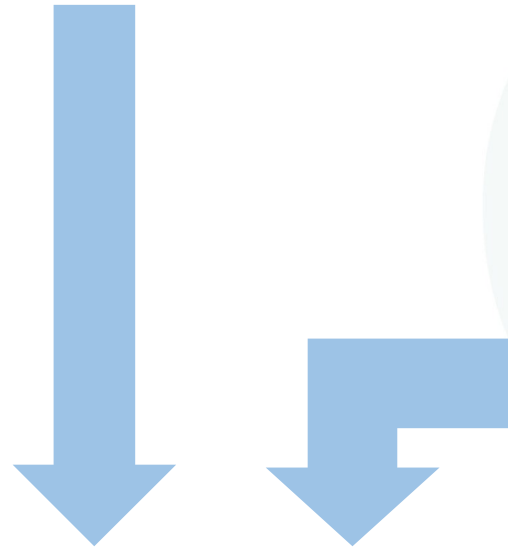


Source: NGVA elaboration on Thinkstep report (May 2017)

Proposal is based on the following approach:

- 1) Type approval procedure is not affected and remains based on vehicle tailpipe emissions calculation according to VECTO sw tool;
- 2) A **CO₂ Correction Factor (CCF)** is proposed to correct the CO₂ fleet value: the CCF will be function of the certified percentage of renewable gas.
- 3) The renewable gas certification can be provided at Member State level or, in the specific case of fleets, whenever possible, directly from the vehicle manufacturer.

Vehicle Type approval based on VECTO
(tailpipe CO₂ emissions)

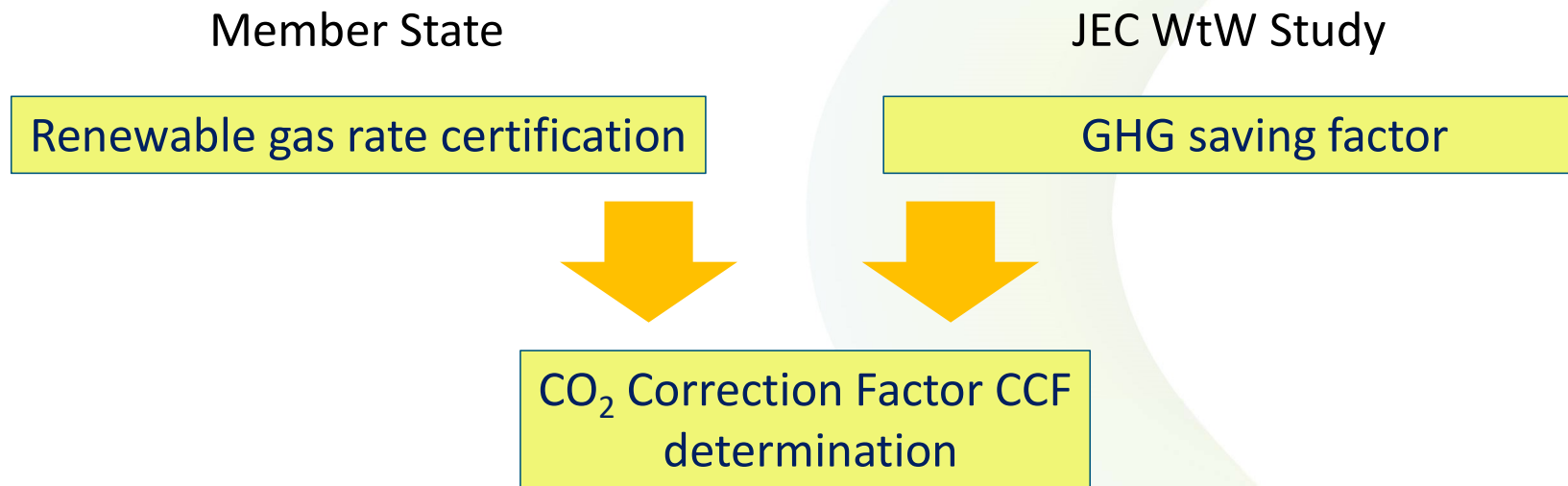


Renewable gas rate certification



CO₂ Correction Factor CCF

Corrected CO₂ fleet calculation



Well-to-Wheels analysis of future automotive fuels and powertrains in the European context
 WELL-TO-TANK Report
 Version 4a, April 2014

WTT APPENDIX 2

1.2 Biogas and synthetic methane

Pathway		Energy expended (MJ/MJ final fuel)										WTT GHG emitted (g CO ₂ eq/MJ final fuel)								% saving	
Code	Description	Total	Fossil	Nuclear	Renewable	Fraction renewable	Production & conditioning at source	Transformation at source	Transportation to market	Transformation near market	Conditioning & distribution	Range	Total	Production & conditioning at source	Transformation at source	Transportation to market	Transformation near market	Conditioning & distribution	Range		Total GHG inc. combustion
CBG																					
OWCG1	Municipal waste	0.99	0.18	0.15	0.67	67.3%			0.92	0.07	0.84	1.13	14.8				11.5	3.3	11.3	18.1	14.8
OWCG21	Liquid manure (closed storage)	2.01	0.15	0.09	1.77	88.3%	0.00	0.02	1.92	0.07	1.98	2.03	-69.9	-82.4	1.4		7.9	3.3	-71.3	-68.8	-69.9
OWCG22	Liquid manure (open storage)	2.17	0.15	0.09	1.93	88.9%	0.00	0.02	2.08	0.07	2.14	2.19	-45.2	-87.1	1.5		37.1	3.3	-46.6	-44.2	-45.2
OWCG4	Maize (whole plant)	1.28	0.29	0.10	0.89	69.5%	0.14	0.02	1.05	0.07	1.25	1.30	40.8	27.4	1.4		8.7	3.3	40.4	85.7	40.8
OWCG5	Barley/maize (double cropping) whole plant	1.22	0.23	0.10	0.89	72.9%	0.09	0.01	1.05	0.07	1.19	1.24	26.8	14.1	0.6		8.7	3.3	24.3	38.4	26.8
RECG1	Synthetic methane	1.06	0.04	0.03	1.00	94.0%	0.00				0.10	0.89	0.07	0.98	1.15		3.3	0.0	0.0	0.0	3.3

GHG emissions from «fossil» reference Eu-mix
69.3 g CO₂/MJ



	WtW GHG emissions	GHG saving factor
	g CO ₂ / MJ	%
CNG EU mix	69,3	---
Municipal waste	14,8	79%
Liquid manure (closed digestion)	-69,9	201%
Liquid manure (open digestion)	-45,2	165%
Maize (whole plant)	40,8	41%
Barley/maize - double cropping (whole plant)	26,8	61%
Synthetic methane	3,3	95%

Methane capture effect from Liquid manure

CO₂ Regulation

Clean Vehicles
Directive

Alternative
Fuels
Infrastructure
Directive

It is fundamental to maintain a harmonized approach among the measures contained in the Mobility Package

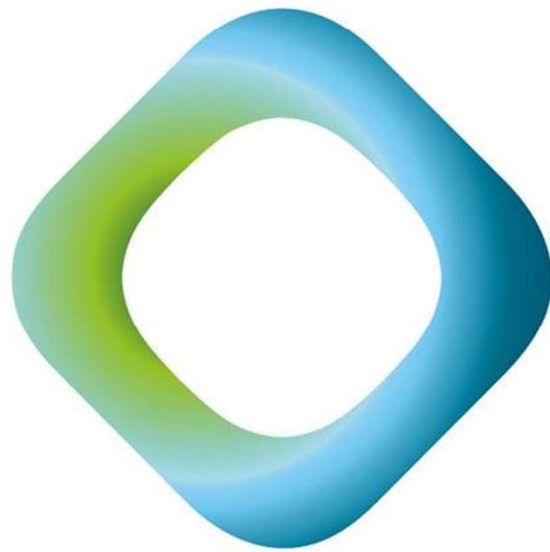
Criteria for the development of the infrastructure for Alternative Fuels must be also reflected in the definition of a Clean Vehicle

Criteria for the definition of clean vehicle (heavy-duty):

Vehicle Categories	Alternative fuels
M3, N2, N3 vehicles	Electricity*, hydrogen, natural gas including biomethane, in gaseous form (compressed natural gas (CNG)) and liquefied form (liquefied natural gas (LNG))

- HDVs with zero-emissions at tailpipe or HDVs using natural gas provided they are fully operated on biomethane, which should be demonstrated by a contract to procure bio-methane or other means of accessing biomethane, shall be counted as 1 vehicle contributing to the mandate. All other shall be counted as 0.5 vehicles contributing.
- introduces a minimum procurement target based on alternative fuels and introduces the empowerment to change to an emission-based threshold approach by delegated act once CO₂-emission performance standards for heavy duty vehicles have been adopted at European level

- HD sector will rely on a combination of fuel/powertrain technologies, according to the different mission profiles and needs.
- Natural Gas is a pragmatic available solution: CNG/LNG engines are high efficient and clean, and renewable gas is a fast accelerator towards decarbonisation.
- The future scenario where different powertrain and fuels/energy carriers will ask for new criteria to assess GHG emissions: looking to the 2030 target, a focus at least at IN-USE (WtW) emissions is needed.
- The proposal does not affect the Type Approval procedure: the CO₂ homologation value will result according to the VECTO sw tool computation.
- The CO₂ contribution coming from renewable gas enters in the calculation of the average fleet emissions based on a certification issued from Member States or, alternatively, by the vehicle manufacturer in case of specific fleets.



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