

**INFORMAL GROUP ON GASEOUS FUELLED VEHICLES  
Within the UN GRPE (WP29)  
PROPOSED AMENDMENT**

**Name of Organisation submitting Amendment/Work Item**

AEGPL

**Person submitting Item**

Salvatore Piccolo

**Address/phone/email coordinates**

AEGPL

Rue Belliard 15-17

1040 Brussels

Belgium

T: + 32 2 893 11 25

F: + 32 2 893 11 29

[s.piccolo@federchimica.it](mailto:s.piccolo@federchimica.it)

**Regulation name and reference number**

Regulation 83

**Name of Amendment/Work Item**

Proposal for an amendment to Regulation 83 introducing modifications to definition of bi-fuel vehicle and new associated requirements.

**Specific language for Amendment/Work Item**

English

**Rationale: (Why is it important/required?)**

The proposed amendments are aimed at redefining the class of bi-fuel vehicles to permit the simultaneous use of gas and petrol in gas mode.

In order to avoid overemployment of petrol, provisions are provided to limit its use in amount and duration.

These modifications are needed primarily for the approval of some bi-fuel vehicles equipped with petrol direct injection systems: where, in order to safeguard the petrol injectors, a certain amount of petrol may need to be injected also in gas mode, especially when particular temperature conditions are reached.

**Please submit new work items to:**

Andre Rijnders, Chairman (RDW, Netherlands) [arijnders@rdw.nl](mailto:arijnders@rdw.nl)

Acting secretariat(s)

Jeffrey Seisler (IANGV/Clean Fuels Consulting) [jseisler@cleanfuelsconsulting.org](mailto:jseisler@cleanfuelsconsulting.org)

Salvatore Piccolo (on behalf of AEGPL) [s.piccolo@federchimica.it](mailto:s.piccolo@federchimica.it)

**Changes are made on bold characters and/or via strikethroughs:**

*Paragraphs 2.22.1., 2.23. and 2.23.1., amend to read:*

- 2.22.1 "Mono-fuel gas vehicle" means a vehicle that is designed primarily for permanent running on LPG or NG/biomethane or hydrogen, but may also have a petrol system for emergency purposes or starting only, where the **capacity of the petrol tank does not exceed contain more than 15 litres of petrol.**
- 2.23. "Bi-fuel vehicle" means a vehicle with two separate fuel storage systems that ~~can run part-time on two different fuels and~~ is designed to run on only one fuel at a time. **The simultaneous use of both fuels is limited in amount or duration.**
- 2.23.1. "Bi-fuel gas vehicle" means a bi fuel vehicle that can run on petrol (**petrol mode**) and also on either LPG, NG/biomethane or hydrogen (**gas mode**).

*Par. 6.4.1.3. of Annex 4a, amend to read:*

6.4.1.3 In cases where LPG or NG/biomethane is used as a fuel it is permissible that the engine is started on petrol and switched to LPG or NG/biomethane after a predetermined period of time which cannot be changed by the driver. **This period of time shall not exceed 60 seconds.**

*Par. 3.2.5. of Annex 12, amend to read:*

**3.2.5** ~~During the Type I test the vehicle shall only use petrol for a maximum of 60 seconds when operating in gas mode.~~ **Without prejudice to paragraph 6.4.1.3. of Annex 4a, during the Type test 1 it is permissible to use petrol simultaneously with gas when operating in gas mode provided that the energy consumption of gas is higher than 80% of the total amount of energy consumed during the test. This percentage shall be calculated in accordance with the method set out in Appendix 1 (LPG) or Appendix 2 (NG/biomethane) of this Annex.**

*Annex 12, insert new appendixes:*

**Appendix 1**

**Bi-fuel gas vehicle - Calculation of LPG energy consumption**

**1. Measurement of the LPG mass consumed during the Type 1 test cycle**

**Measurement of the LPG mass consumed during the Type 1 test cycle shall be done by a fuel weighing system capable to measure the weight of the LPG storage container during the test in accordance with the following:**

(a) an accuracy of  $\pm 2$  per cent of the difference between the readings at the beginning and at the end of the test or better;

Precautions shall be taken to avoid measurement errors.

Such precautions shall at least include the careful installation of the device according to the instrument manufacturers' recommendations and to good engineering practice

Other measurement methods are permitted if an equivalent accuracy can be demonstrated.

## 2. Calculation of the LPG energy ratio

The fuel consumption value shall be calculated from the emissions of hydrocarbons, carbon monoxide, and carbon dioxide determined from the measurement results assuming that only LPG is burned during the test.

The LPG ratio of the energy consumed in the cycle is then determined as follows:

$$G_{LPG} = M_{LPG} * 100 / (FC_{norm} * dist * d)$$

Where:

$G_{LPG}$  the LPG energy ratio

$M_{LPG}$  the LPG mass consumed during the cycle (kg)

$FC_{norm}$  the fuel consumption calculated in accordance with par. 1.4.3., letter (b), of Annex 6 to Regulation No. 101. If applicable, the correction factor  $c_f$  shall be calculated using the H/C ratio of the gaseous fuel.

dist distance travelled during the cycle (km)

d density  $d=0.538$ kg/liter

## Appendix 2

### Bi-fuel vehicle - Calculation of NG/biomethane energy consumption

#### 1. Measurement of the CNG mass consumed during the cycle

Measurement of the CNG mass consumed during the cycle shall be done by a fuel weighing system capable to measure the CNG storage container during the test in accordance with the following:

(a) an accuracy of  $\pm 2$  per cent of the difference between the readings at the beginning and at the end of the test or better;

Precautions shall be taken to avoid measurement errors.

Such precautions shall at least include the careful installation of the device according to the instrument manufacturers' recommendations and to good engineering practice

Other measurement methods are permitted if an equivalent accuracy can be demonstrated.

## 2. Calculation of the CNG energy ratio

The fuel consumption value shall be calculated from the emissions of hydrocarbons, carbon monoxide, and carbon dioxide determined from the measurement results assuming that only CNG is burned during the test.

The CNG ratio of the energy consumed in the cycle is then determined as follows:

$$G_{\text{CNG}} = M_{\text{CNG}} * 100 / (FC_{\text{norm}} * \text{dist} * d)$$

Where:

$G_{\text{CNG}}$  the CNG energy ratio

$M_{\text{CNG}}$  the CNG mass consumed during the cycle (kg)

$FC_{\text{norm}}$  the fuel consumption calculated in accordance with par. 1.4.3., letter (c), of Annex 6 to Regulation No. 101

$\text{dist}$  distance travelled during the cycle (km)

$d$  density  $d=0.654\text{kg/m}^3$

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