Transmitted by GFV

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3(d) agenda item)

Proposal for an amendment to Regulation No. 83

Submitted by the informal GFV group

I. Proposal

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 I test 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, add new appendixes to read :

Appendix 1

Bi-fuel gas vehicle - Calculation of LPG energy ratio

1. Measurement of the LPG mass consumed during the Type I 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 ± 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=0.538kg/liter**

Appendix 2

Bi-fuel vehicle - Calculation of NG/biomethane energy ratio

1. Measurement of the CNG mass consumed during the Type I test 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 ± 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:

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

Where:

G_{CNG}	**the CNG energy ratio**
M_{CNG}	**the CNG mass consumed during the cycle (kg)**
FC_{norm}	**the fuel consumption calculated in accordance with par. 1.4.3., letter (c), of Annex 6 to Regulation No. 101**
dist	**distance travelled during the cycle (km)**
d	**density d=0.654kg/m^3**

II. Justification

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.
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.

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

In particular, the limit of 60secs presently applied to the entire test cycle has been restricted to starting-up phase of the engine while, over the cycle, a minimum limit has been fixed to gas energy ratio.

A standard calculation method of the gas energy ratio is provided, based on a direct measurement of the gas consumption and a conservative calculation of the total energy consumed during the cycle.

This is founded on the assumption that only gas is burned during the cycle in line with what is already applicable in accordance with the present regulation (the use of petrol is allowed within the time limit of 60secs)

Indeed, such an assumption ensures a conservative condition to the calculation of total energy consumed as well as of pollutant emissions.

Correction factors of pollutant emissions are, in fact, only slightly dependent on fuel type and, the error committed under this hypothesis is conservative - and negligible - with respect to the real case, where a minor use of petrol is done.

For further clarifications see document GFV-16-02.