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**Economic Commission for Europe****Inland Transport Committee****World Forum for Harmonization of Vehicle Regulations****158<sup>th</sup> session**

Geneva, 13-16 November 2012

Item 4.10.2 of the provisional agenda

**1958 Agreement – Consideration of draft amendments  
to existing Regulations submitted by GRPE****Proposal for Supplement 3 to the 06 series of amendments to  
Regulation No. 83 (emissions of M<sub>1</sub> and N<sub>1</sub> vehicles)****Submitted by the Working Party on Pollution and Energy\***

The text reproduced below was adopted by the Working Party on Pollution and Energy (GRPE) at its sixty-fourth session (ECE/TRANS/WP.29/GRPE/64, para. 22). It is based on ECE/TRANS/WP.29/GRPE/2012/6/Rev.1, as amended by informal document GRPE-64-21. It is submitted to the World Forum for Harmonization of Vehicle Regulations (WP.29) and to the Administrative Committee AC.1 for consideration.

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\* In accordance with the programme of work of the Inland Transport Committee for 2010–2014 (ECE/TRANS/208, para. 106 and ECE/TRANS/2010/8, programme activity 02.4), the World Forum will develop, harmonize and update Regulations in order to enhance the performance of vehicles. The present document is submitted in conformity with that mandate.

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 15 litres.
- 2.23. "Bi-fuel vehicle" means a vehicle with two separate fuel storage systems that is designed to run on only one fuel at a time. The simultaneous use of both fuels is limited in amount and 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)."

Annex 4a, paragraph 6.4.1.3., 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."

Annex 12, paragraph 3.2.5., amend to read:

- "3.2.5. Without prejudice to paragraph 6.4.1.3. of Annex 4a, during the Type I test, it is permissible to use petrol only or simultaneously with gas when operating in gas mode provided that the energy consumption of gas is higher than 80 per cent 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 a new Appendix 1, to read:

## "Annex 12 - 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 of measuring the weight of the LPG storage container during the test in accordance with the following:  
  
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:

$$G_{\text{LPG}} = M_{\text{LPG}} * 10,000 / (FC_{\text{norm}} * \text{dist} * d)$$

Where:

$G_{\text{LPG}}$ : the LPG energy ratio (%);

$M_{\text{LPG}}$ : the LPG mass consumed during the cycle (kg);

$FC_{\text{norm}}$ : the fuel consumption (l/100 km) calculated in accordance with paragraph 1.4.3. (b) of Annex 6 to Regulation No. 101. If applicable, the correction factor  $cf$  in the equation used to determine  $FC_{\text{norm}}$  shall be calculated using the H/C ratio of the gaseous fuel;

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

$d$ : density  $d = 0.538 \text{ kg/liter}$ ."

*Annex 12, insert a new Appendix 2, to read:*

## "Annex 12 - 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 of measuring the CNG storage container during the test in accordance with the following:

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:

$$G_{\text{CNG}} = M_{\text{CNG}} * cf * 10,000 / (FC_{\text{norm}} * \text{dist} * d)$$

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 ( $\text{m}^3/100 \text{ km}$ ) calculated in accordance with paragraph 1.4.3. (c) of Annex 6 to Regulation No. 101;

dist: distance travelled during the cycle (km);

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

cf: correction factor, assuming the following values:

cf = 1 in case of  $G_{20}$  reference fuel;

cf = 0.78 in case of  $G_{25}$  reference fuel."

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