

## **Proposal for amendments to ECE/TRANS/WP.29/GRPE/2016/12 on a proposal for a new regulation (Heavy Duty Dual-Fuel Engine Retrofit Systems)**

The text reproduced below was prepared by experts from the European Liquefied Petroleum Gas Association (AEGPL) to amend ECE/TRANS/WP.29/GRPE/2016/12. The modifications to the current text are marked in bold characters.

### **I. Proposal**

*Part A, paragraph 2., Figures 1, 3 and 4 under Engine Family 5 (PT EGR) and Family 6 (T EGR):*

- substitute "Engine Test" with "Simplified Test" and
- add a related footnote to read: "*Engine test is required if any of the engines belonging to the original family to which the desired extension is addressed has an EGR rate higher than the highest EGR rate within the current application range*"

*Annex 6, paragraph 10.1., amend to read:*

"10.1. Tests and requirements

An engine representative of the desired extension of the application range shall be tested in accordance with the provisions set out in paragraph 5.2.2. or 10.1.1. at the choice of the dual-fuel engine retrofit system manufacturer.

Engine tests in accordance with paragraph 5.2.2. are always required for the extension of an application range with an engine family equipped with EGR **if any of the engines belonging to the original family of the representative engine above has an EGR rate higher than the highest EGR rate within the current application range.**

The tests in accordance with paragraph 10.1.1. shall be carried out on a representative engine equipped with a member of the dual-fuel engine retrofit system family.

The same tests shall be performed in diesel mode and in dual-fuel mode in such a way that the operating points and conditions are as similar as possible.

The NO<sub>x</sub>, Non-Methane Hydrocarbons (NMHC), CO and PM emission test results in dual-fuel mode shall be lower than or equal to the results in diesel mode.

**In case the CO or NMHC emissions in dual-fuel mode are higher than those in diesel mode the approval authority may consider other methods to relate them to the original emission limits. A factor equal to two applied to diesel emissions is considered as meeting this provision if the emission results in dual fuel mode over the ETC cycle of the initial type approval do not exceed twice the emission results in diesel mode."**

## II. Justification

1. *Preamble and Annex 6, paragraph 10.1., second clause:* In the case of EGR engine families, the extension of the application range should be permitted through PEMS testing only in the most conservative case, i.e. when all the engines of the original family to which the extension is addressed have an EGR rate lower than the lowest EGR rate within the engines belonging to the current application range.

2. *Annex 6, paragraph 10.1., last clause:* Dual fuel technology permits to obtain a significant reduction of PM, NO<sub>x</sub> and CO<sub>2</sub> compared to diesel mode, but is penalized on hydrocarbon and CO emissions.

Therefore, for such pollutants measured over a PEMS test, the respect of a one-to-one comparison between dual-fuel results and diesel ones would be unfeasible.

As regards NMHC, it is worth noting that higher emission in dual-fuel mode are the consequence of the slip of propane and butane from the engine. Propane and Butane are non-toxic, have a very low global warming potential and are not dangerous to the health. Therefore, NMHC emitted by engines in dual-fuel mode (diesel-LPG) do not have significant environmental effect.

Since the control strategy of the retrofit system tested during both the first approval (engine test) and the following extensions of the application range (PEMS) is the same, being one of the fundamental criteria of the retrofit system family, it is reasonably expected that the ratio of NMHC and CO emission results measured in dual fuel mode and in diesel mode will remain very close in the two different testing procedures (engine test and PEMS).

CO and NMHC emissions in diesel mode are very low compared to original emission limits, typically below 25% of the limit, hence the comparison of the emission results in dual-fuel mode with the doubled results in diesel mode provides a sound proof that the original emission limits are well achieved in dual fuel mode.

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