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Fuel/Energy Consumption, CO₂ Emissions & Electric Range – Regulation No. 101

Proposal for an amendment to Regulation No. 101

Submitted by the expert from Germany *

The text reproduced below was prepared by the expert from Germany to introduce amendments to Annex 9 of Regulation No. 101 regarding the procedure for the determination of the electric range of hybrid electric vehicles taking into account the use of the fuel consuming engine. Modifications to the current text of the Regulation are marked in bold for new or strikethrough for deleted characters.

* 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.

I. Proposal

Annex 9, paragraphs 4.2.2.1. to 4.2.2.1.5., amend to read:

- "4.2.2.1. To determine the electric range of a hybrid electric vehicle
- 4.2.2.1.1. The applicable test sequence and accompanying gear shift prescription, as defined in paragraph 1.4. of Annex 8, is applied on a chassis dynamometer adjusted as described in Appendices 2, 3, and 4 of Annex 4 of Regulation No. 83, until the end of the test criteria is reached.
- To determine the electric range (De) of OVC HEVs equipped with an operating mode switch the same operating mode position, in accordance with Table 4.1.3 of Annex 8, shall be used as for the determination of CO₂ and fuel consumption.**
- 4.2.2.1.2. To measure the electric range the end of the test criteria is reached when the vehicle is not able to meet the target curve up to 50 km/h, or when an indication from the standard on-board instrumentation is given to the driver to stop the vehicle, or when the battery has reached its minimum state of charge. Then the vehicle shall be slowed down to 5 km/h by releasing the accelerator pedal, without touching the brake pedal and then stopped by braking.
- At a speed over 50 km/h, when the vehicle does not reach the required acceleration or speed of the test cycle, the accelerator pedal shall remain fully depressed until the reference curve has been reached again. **The maximum possible vehicle speed in pure electric operating state in the first combined cycle shall be recorded in the test report and in the drivers' handbook of production vehicles.**
- During this procedure, the electricity balance (E_{Bi}) of the high voltage battery (expressed in Ampere hours), measured using the procedure specified in Appendix 2 to the Annex 8 of this Regulation, and De_i shall be recorded at the instant when the fuel consuming engine starts and the accumulation of De_i shall be stopped. The further accumulation of De_i shall not be started until both the fuel consuming engine has stopped running from any vehicle speed level and the electricity balance of the high voltage battery has returned to the same or any lower level of E_{Bi} as recorded.**
- This procedure is to be followed until the end of the test as defined in paragraph 4.2.2.1.2.**
- 4.2.2.1.4. To respect human needs, up to three interruptions are permitted between test sequences, of no more than 15 minutes in total.
- 4.2.2.1.5. ~~At the end, the measure De of the distance covered using the electrical motor only in km is the electric range of the hybrid electric vehicle. It shall be rounded to the nearest whole number. Where the vehicle operates both in electric and hybrid modes during the test, the periods of electric only operation will be determined by measuring current to the injectors or ignition. At the end, the electric range is the sum of all electric driven cycle portions De_i in km. It shall be rounded to the nearest whole number."~~

II. Justification

1. To prevent adjustments of OVC HEV aiming at extending De just within the corresponding test procedure the determination of CO₂ and fuel consumption and of De shall be undertaken in the same operation mode.
 2. For consumer information on the electric performance the maximum electric speed of the OVC HEC should be recorded both in the test report and the drivers handbook of the vehicle.
 3. If – as foreseen in current regulation - the usage of a fuel consuming engine is allowed for the procedure to determine the electric range of a hybrid electric vehicle, manufacturer might take advantage of using recuperation energy from a higher vehicle speed level that has been provided by the fuel consuming engine or using the fuel consuming engine as electric generator up to this higher speed level. The recuperation/generator energy increases the SOC and the electric range can be extended this way. Therefore, the influence of the fuel consuming engine should be restricted by stopping the accumulation of the electric range until the fuel consuming engine stops running. But the recuperated/generated energy from the fuel consuming engine also needs to be adequately considered. Therefore, the level of electricity balance of the high voltage battery is recorded in the moment when the fuel consuming engine starts. When this or any lower level is reached again, after loading and depleting operations of the high voltage battery, the accumulation of De can be continued. Following this approach no advantages can be taken from usage of the fuel consuming engine regarding the determination of De.
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