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APPLICATION OF ECE REGULATIONS TO HYBRID VEHICLES

Transmitted by the Expert from France

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A. INTRODUCTION

1. ECE REGULATIONS CONCERNED:

Regulation No. 83 - Emissions of M1 and N1 categories of vehicles
Regulation No. 85 - Measurement of the net power
Regulation No. 101 - Emission of CO₂ and fuel consumption measurement
and eventually:

Regulation No. 10 - Electromagnetic compatibility
Regulation No. 51 - Noise of M and N categories of vehicles
Regulation No. 68 - Measurement of maximum speed
Regulation No. 100 - Safety of battery electric vehicles

2. SCOPE: vehicles of categories M1 and N1.
3. AIM:
 - 3.1. Ensure continuity and coherence between Regulations from a pure thermal vehicle to a pure electric vehicle.
 - 3.2. Hybrid vehicle regulations should take into account their specific characteristics:
 - (i) very low exhaust emissions,
 - (ii) very low CO₂ emissions.

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B. PROPOSAL

1. DEFINITIONS AND CATEGORIES OF HYBRID VEHICLES

A hybrid vehicle is a vehicle fitted with at least a thermal engine and at least an electric engine.

The hybrid vehicle classification should, in particular, take into account the following criteria:

- (a) externally electric chargeable,
- (b) range during pure electric mode.

Pure electric vehicle	Hybrid vehicle				Pure thermal vehicle
	Electric vehicle with a range extender	Electric hybrid vehicle		Thermal vehicle with electric assistance	
Externally electric chargeable	Externally electric chargeable	Externally electric chargeable	Not externally electric chargeable	Not externally electric chargeable	-
Minimum range in pure electric mode on complete cycle	Minimum range in pure electric mode on complete cycle	Minimum range in pure electric mode on urban cycle	Minimum range in pure electric mode on urban cycle	No range in pure electric mode	

1.1. Definition of a pure electric vehicle

Vehicle in which on-board electric energy is used for traction purpose and which is dependent of external electric infrastructure.

1.2. Definitions of different hybrid vehicle categories

1.2.1. Electric vehicle with a range extender

Pure electric vehicle principle, for which the range is extended by an on-board thermal source, occasionally used, and which is characterized by the following:

- (a) Possibility of charging directly to electric network,
- (b) A normal functioning in pure electric mode,
- (c) A "sufficient" range in pure electric mode, on ECE + EUDC cycle,
- (d) A limited fuel tank capacity,
- (e) Eventually, a thermal power limitation.

1.2.2. Electric hybrid vehicle

Electric hybrid vehicles:

- (a) Can run on a pure electric mode,
- (b) Have a "sufficient" urban range in electric mode.

They are divided in two sub-categories:

1.2.2.1. Externally electric chargeable vehicles

1.2.2.2. Not externally electric chargeable vehicles

1.2.3. Thermal vehicle with electric assistance

Hybrid vehicle without external charging possibility and with no range in pure electric mode.

2. AMENDMENTS TO EXISTING ECE REGULATIONS

2.1. Regulation No. 83 - Emissions of M1 and N1 categories of vehicles

All the requirements of this Regulation could be adapted and apply to hybrid vehicles just like to thermal vehicles:

(i) 20 °C emissions,

and eventually:

(ii) -7 °C emissions,

(iii) on-board diagnostics (OBD)

(iv) evaporation emissions, etc.

State of charge of the battery should be taken into account.

Eventually, the proper balance of the different functioning modes should be taken into account.

2.2. Regulation No. 85 - Measurement of the net power

Electric and thermal engine power measurements are already taken into account in this Regulation.

A combination of the electric power and the thermal power is to be considered in order to reach real functioning conditions.

Measurement of the maximum absorbed power on a chassis dynamometer could be considered, if it would be easier to perform.

2.3. Regulation No. 101 - Emission of CO₂ and fuel consumption measurement

2.3.1. Fuel consumption

Adaptation of the electric and thermal methods of fuel consumption measurements in this Regulation.

Fuel consumption labelling:

(i) Electric: expressed in Wh/km,

(ii) Thermal: expressed in l/100 km.

2.3.2. CO₂ emission

Adaptation of the electric and thermal methods of CO₂ measurement in the Regulation.

State of charge of the battery should be taken into account.

Eventually, the proper balance of the different functioning modes should be taken into account.

2.3.3. Minimum range in electric mode

The minimum ranges for each category are to be defined (cycle and distance).

2.4. Other ECE Regulations

Regulation Nos. 10 (Electromagnetic compatibility), 51 (Noise), 68 (Measurement of maximum speed) and 100 (Safety of battery electric vehicles) should be taken into account and adapted to hybrid vehicles, if necessary.
