

**Proposal for amendments to ECE/TRANS/WP.29/GRPE/2015/13
(Proposal for a new Mutual Resolution (M.R.2) containing
Vehicle Powertrain Definitions)**

The text reproduced below was prepared by the IWG VPSD following the latest discussions and conclusions. The modifications to the current text of ECE/TRANS/WP.29/GRPE/2015/13 are marked in bold for new or strikethrough for deletion.

Proposal

Part A (Explanatory report)

Paragraph 10., amend to read:

"10 It was herewith decided to define the powertrain as the part of the vehicle containing the propulsion energy storage system, the propulsion energy converter and the drivetrain, which provides directly or indirectly the mechanical energy at the wheels for the purpose of vehicle propulsion. The main reason for introducing this powertrain concept was to simplify the definitions, to avoid unnecessary hierarchical levels and to clarify what is actually meant with this expression, as it is regularly used in various existing UN Regulations and UN global technical regulations but, at the same time, perceived differently by various stakeholders and authorities. **For non-road mobile machinery, the powertrain and any of its constitutive parts referred to in the definitions may have other purposes than propulsion.**"

Paragraph 11., amend to read:

"11. Key elements of such powertrain concept are:

- (a) A vehicle shall have only one powertrain;
- (b) The propulsion energy storage systems and the propulsion energy converters are those non-peripheral main parts of the powertrain providing different forms of energy directly or indirectly for the purpose of propulsion, finally as mechanical energy at the wheels. The different powertrain vehicle definitions (Chapter 3) are classified regarding the different structures of energy storage systems and energy converters in a powertrain;
- (c) Inclusion of peripheral **devices** (e.g. electrical capacitor, 12 V battery, starter motor, intake system, fuel delivery system, electric power conditioning device, sensors, actuators, electronic control unit, exhaust after-treatment systems);
- (d) Exclusion of **auxiliary devices** (e.g. auxiliary battery, mobile air conditioning, electric window lift, hydraulic crane, heating system, etc.)."

Figure 1, title, amend to read:

"Powertrain – Basic principles"

Figure 2, title, amend to read:

"Internal Combustion Engine-Vehicle (conventional) - **ICEV**"

Figure 3, title, amend to read:

"Pure Electric Vehicle - **PEV**"

Figure 4, title, amend to read:

"Hybrid Electric Vehicle-Not Off Vehicle Charging (parallel) - **HEV-NOVC**"

Figure 5, title, amend to read:

"Hybrid Electric Vehicle-Off Vehicle Charging (serial, range extender) - **HEV-OVC**"

Figure 6, title, amend to read:

"Hybrid Electric Vehicle-Off Vehicle Charging (combined) - **HEV-OVC**"

Figure 7, title, amend to read:

"Fuel Cell Hybrid Vehicle (Not Off Vehicle Charging) - **FCHV-NOVC**"

Paragraph 14., amend to read:

"14. After discussion in VPSD informal working group it was decided to distinguish between energy storage systems whose output energy is used directly or indirectly for the purpose of vehicle propulsion (e.g. an Internal Combustion Engine (ICE) in a range extender Hybrid Electric Vehicle (HEV)), and other energy storage systems as parts of the powertrain (peripheral **devices**) or as parts of the remaining part of the vehicle (auxiliary **devices**). Without such a differentiation the definitions of Hybrid Vehicle (HV) and HEV are not explicit enough, and a conventional ICE vehicle could be understood as an HEV."

Paragraph 22., amend to read:

"22. The same approach as described in section 1.1. is needed for energy converters. Examples for "other energy converters" are a fuel pump (peripheral **device**) or a mobile air conditioning system (auxiliary **device**), which are not considered as propulsion energy converters."

Paragraph 37., amend to read:

"37. Peripheral devices are part of the powertrain. They can be energy storing, ~~de~~converting, **supplying and/or** consuming devices or other parts, systems and control units, **which are essential to the operation of the powertrain**. They are not understood as propulsion energy storage systems or propulsion energy converters of the powertrain. These devices are not providing different forms of energy directly or indirectly for the purpose of propulsion. Examples of peripheral devices are electrical capacitor, 12 V battery (~~partly~~), starter motor, intake system, fuel delivery system, electric power conditioning device, sensor, actuator, capacitor, electronic control unit, turbo charger, exhaust after-treatment system."

Paragraph 39., amend to read:

"39. The main energy storage systems of a powertrain where the output energy is used directly or indirectly for the purpose of vehicle propulsion, are defined as "propulsion energy storage systems" (see section 1.1.). But there are also other energy storage systems in a vehicle, as peripheral **devices** of the powertrain or auxiliary **devices**."

Paragraph 45., amend to read:

"45. The main energy converters of a powertrain, whose output energy is used directly or indirectly for the purpose of vehicle propulsion, are defined as "propulsion energy ~~storage systems~~**converter**" (see section 1.2.). This means for example that an ICE of a range extender HEV is understood as a propulsion energy converter of the powertrain. This clarification is important for the classification of range extender vehicles as hybrid vehicles for regulatory purposes. But there are also other energy converters in a vehicle, as peripheral **devices** of the powertrain or auxiliary **devices**."

Subtitle 4., amend to read:

"4. **Auxiliary devices**"

Paragraph 49., amend to read:

"49. **Auxiliary devices** are not part of the powertrain. They are energy consuming, **converting, storing** or supplying devices of the vehicle outside the powertrain, used for other purposes. Examples of **auxiliary devices** are auxiliary battery, mobile air conditioning, hydraulic crane, electric window lift or heating system. The historical approach is to measure and limit the emissions and the efficiency of a vehicle regarding its powertrain. Emissions and efficiency of **auxiliary devices** are to be treated separately."

Subtitle 5.1., amend to read:

"5.1. Internal Combustion Engine vehicle (**ICEV vehicle**)"

Subtitle 5.2., amend to read:

"5.2. Hybrid vehicle (**HV**)"

Paragraph 55., amend to read:

"55. It was discussed whether ICE vehicles with a stop/start system (sometimes called "micro hybrid") can be considered as EVs. If the stop/start system is designed so that the starter electric motor is only connected to the ICE for the purpose of initiating the start of the combustion process (like for conventional vehicles), and there is no direct or indirect connection of the starter electric motor for the transmission of mechanical energy to the drivetrain, such a vehicle should not be considered as an EV, because the stop/start system is a peripheral **device**, and not a propulsion energy converter. Otherwise already a conventional ICE vehicle must be considered as an EV/HEV, because the 12 V battery and the starter electric motor might have been considered as second energy storage system and energy converter. In case the starter electric motor contributes partly or continuously, directly or indirectly mechanical energy to the drivetrain, it should be considered as EV/HEV (e.g. boost function/mild hybrid)."

Subtitle 5.4., to be deleted.

Paragraph 60., to be deleted.

Paragraphs 61. to 63., renumber as paragraphs 60. to 62.

Section 6.1., amend to read:

"6.1. List of acronyms/abbreviations

EV	Electrified Vehicle
HEV	Hybrid Electric Vehicle
HV	Hybrid Vehicle
ICE	Internal Combustion Engine
ICEV	Internal Combustion Engine Vehicle
FC	Fuel Cell
FCV	Fuel Cell Vehicle
FCHV	Fuel Cell Hybrid Vehicle
NOVC	Not off vehicle charging
OVC	Off vehicle charging
...	"

Part B (Vehicle powertrain definitions)

Paragraph 1., amend to read:

"1. "Powertrain" means the total combination in a vehicle, of propulsion energy storage system(s), propulsion energy converter(s), the drivetrain(s), ~~including peripheral devices and excluding auxiliaries,~~ providing the mechanical energy at the wheels for the purpose of vehicle propulsion, **plus peripheral devices.**"

Paragraph 1.1.2., amend to read:

"1.1.2. "Rechargeable energy storage system" means a propulsion energy storage system that stores electrical or mechanical energy and which may be re-energised ~~[or regenerated].~~"

Paragraph 1.1.3., amend to read:

"1.1.3. "Category of propulsion energy storage system" ~~means~~ **means** (i) a fuel storage system, or (ii) a rechargeable electric energy storage system, or (iii) a rechargeable mechanical energy storage system."

Paragraph 1.2.1., amend to read:

"1.2.1. "Internal combustion engine" means a propulsion energy converter ~~designed to transforming~~ **designed to transform**ing chemical energy (input) into mechanical energy (output) with an internal combustion process;"

Paragraph 1.2.4., amend to read:

"1.2.4. "Category of propulsion energy converter" ~~means~~ **means** (i) an internal combustion engine, or (ii) an electric machine, or (iii) a fuel cell."

Paragraph 1.3., amend to read:

"1.3. "Drivetrain" means the connected elements of the powertrain for transmission of the mechanical energy between the propulsion energy converter(s) and ~~at~~ the wheels."

Paragraph 1.4., amend to read:

"1.4. "Peripheral devices" ~~are means~~ **are means** energy consuming, **converting, storing** or supplying devices, where the energy is not primarily used for the purpose of vehicle propulsion, or other parts, systems and control units, which are **essential to the operation** ~~part~~ of the powertrain."

Paragraph 4., amend to read:

"4. "Auxiliary devices" ~~are not part of the powertrain and are means~~ **are means** energy consuming, **converting, storing** or supplying devices **or systems** which are installed in the vehicle for **purposes** other ~~purposes~~ than the propulsion of the vehicle **and are therefore not considered to be part of the powertrain.**"