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## **2<sup>nd</sup> EVE-Session**

# **US – Baltimore September 13/14**

Presentation by chairs of related IWG

Vehicle Propulsion System Definitions  
(VPSD)



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# Background / ToR

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## Background:

Terms of Reference for an Informal Working Group under GRPE to develop a frame system of terms, definitions and classifications regarding vehicle propulsion systems (VPSD-IWG)

Document: WP29-165-26



# Background / ToR

Some existing and future (developed) UN Regulations and UN GTRs contains terms, definitions and classifications regarding:

- Vehicle propulsion type (e.g. EV, FCV)
- Energy converter (e.g. ICE, FC, Electric Motor)
- Energy storage system (e.g. fuel tank, battery)
- External energy source (fuel, electric energy)  
*-- so called „reference fuel“ in vehicle approval regulations --*



# Background / ToR

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In some cases these classifications and definitions are different in regulations, and the current activities to develop regulations for innovative power trains and alternative fuels may lead to a more inconsistent situation, if no coordination happens.



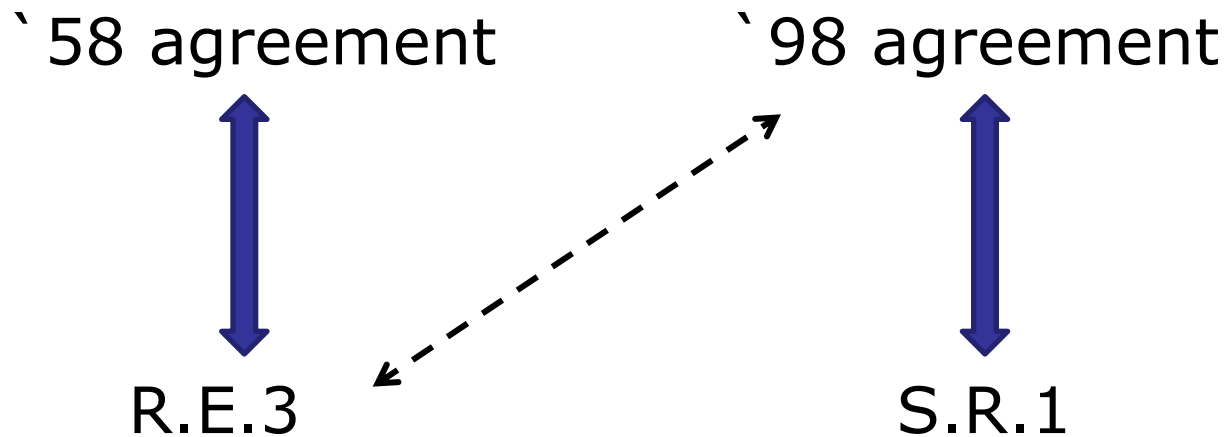
# Background / ToR

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A frame-system of a classification with the main terms and definitions introduced in S.R.1 and R.E.3 would be helpful. It should build a frame that ensures consistency for all definitions used in UN Regulations or UN Global Technical Regulations by providing a general and principle systematic (not too detailed), that enables the addition of future technologies at later stages.



# Background / ToR



(they include e.g. vehicle classes, fuel specifications)



# Background / ToR

Mainly the following informal groups are working on related regulations, or using terms and definitions in this field:

- **GRPE - WLTP - DTP - informal group**
- GRPE - HDH - informal group
- GRPE - GFV - informal group
- GRPE - EVE - informal group
- WP.29 - EFV - Task Force Group
- GRB - QRTV
- GRSP - ELSA/RESS





# Terms of reference

- (a) The IWG on Vehicle Propulsion Systems Definitions (IWG-VPD) under GRPE chaired by Germany, participation is open for everybody.
  
- (b) The IWG-VPD will work in close cooperation with WLTP-DTP and the WLTP drafting manager.  
*-- and with other IWG and GR's --*



# Terms of reference

- (c) The IWG-VPSD shall:
1. Review existing UN Regulations and UN GTRs concerning terms, definitions and classifications regarding vehicle propulsion systems.
  2. Review the related definitions in the current draft of the WLTP GTR.
  3. Develop a proposal for a frame system of terms, definitions and classifications regarding vehicle propulsion systems for the introduction into R.E.3 and S.R.1.



# Terms of reference

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- (c) The IWG-VPSD shall:
4. Provide status reports to WP.29, AC.3 and the concerned GRs.
  5. Transmit a draft proposal (informal document) to WP.29 and AC.3 for the June 2013 session, aiming on the adoption of the working document at the November 2013 session.



# Principles

- Use of existing definitions  
*-- don't create new definitions – if possible --*
- Only necessary definitions  
*-- needed for the clear understanding of requirements in UN-R's or GTR's –*
- Only a frame system in S.R.1 & R.E.3  
*-- more detailed definitions in UN-R's or GTR's –*  
*-- frame system should enable consistency*



# Propulsion system or powertrain

- Option 1 (like in ISO standards):  
Propulsion System = Powertrain + Energy Storage System  
Power Train = Energy Converter + Drive Train
- **Option 2 (like in (UN-R 83), UN-R 101)**  
Power Train = Energy Storage System + Energy Converter + Drive Train



# Fuel / Energy

- Carbon based Fuels
  - *Petrol, Diesel, Ethanol, Bio-Diesel, LPG, LNG, CNG, Bio-Methane* --
  - *Mixtures* --
- Hydrogen (Fuel) - (or other synthetic non carbon fuels)
- Mixtures (H<sub>2</sub> & Carbon Based Fuels)
- Electric Energy



# Energy Storage Systems (on board)

- Fuel Tank
  - Liquid
  - Compressed Gaseous
  - Cryo Tank
  - (Hybrid Storage System)
- Rechargeable Storage System



# Energy Storage Systems (on board)

Open question about REESS definition

- Rechargeable (Electric) Energy Storage System  
-- *Battery, Capacitor* --
- Rechargeable (Mechanical/Pressure) Energy Storage System  
-- *Flywheel,  
Pressure Storage System (gas, hydraulic)* --





# Fuel Supply Types

- Mono-Fuel  
*--purely one type of fuel --*
- Bi-Fuel  
*-- two seperated tanks with two different Fuel types, fuel supply either/or --*
- Flex Fuel  
*-- flexible mixture of Fuels in the tank --*
- Dual-Fuel  
*-- two seperated tanks with two different fuel types, mixture in the fuel supply chain or during compression or combustion --*



# Energy Converter

- Internal Combustion Engine (ICE – Pi or CI)  
– powered by fuel  
<< chemical energy into mechanical energy >>
- Fuel Cell (FC) - powered by Fuel  
<< chemical energy into electric energy >>
- Electric Motor - powered by electric energy  
<< electric energy into mechanical energy, or vice versa as a generator >>



# Vehicle Definitions

## (Mono/Pure) Powertrain

Propulsion Systems which contains only one type of Energy Converters or only one type of Energy Storage System

- Conventional Vehicle (only ICE)
- PEV: Pure Electric Vehicle (only Electric Motor)
- FCV: Fuel Cell Vehicle (Fuel Cell, H2-Tank)  
*-- no REESS --*



# Vehicle Definitions

## Hybrid Powertrains

The Propulsion System consist (at minimum) of two different types of Energy Converters and (at minimum) of two different types of Energy Storage Systems.

- Conventional HV: ICE + Electric motor /  
Fuel tank + REESS
- FCHV: FC + Electric Motor /  
H2-tank + REESS



# Characteristics of Powertrains

- External chargeable (Plug In - Electric En.) yes/no
- Mode Switch yes/no
- Recuperation yes/no
- Electric Energy Consumption
- Fuel Consumption
- CO2 Emissions
- Pollutant Emissions
- Electric Range
- Low voltage / high voltage



# Next Steps

- WLTP GTR proposal (definitions) – to be taken into account
- First draft document (discussion paper or first draft annex to S.R.1 & R.E.3) by email to GRPE members and chairs of other GR`s
- Comments – to be taken into account
- Second draft document to GRPE for consideration at January or June 2013 session