# $CO_2$/FC correction for (N)OVC-HEV/(N)OVC-FCHV

Proposed update by ACEA EV for WLTP SG EV to give the option to avoid unnecessary testing without additional value (updated proposal)

Status: 26.02.2020

# NOVC-HEV/NOVC-FCHV: $CO_2$/FC correction

## Proposal ACEA EV for SG EV (example here based on NOVC-HEV)

- ACEA EV is supporting the approach of a generic worst case correction as for pure ICE vehicle due to
  - the high measurement effort nowadays without any additional value (as factor are similar/identical)
  - the procedure is not reproducible due to measurement inaccuracies caused by small REESS compared to absolute $CO_2$ values; therefore massively different corrections could be the consequence)
- It should be at the option of the manufacturer to use a generic worst case correction or to use a physically determined $K_{CO2}$ factor
- Proposal: Use of the pure ICE vehicle approach but apply different generator efficiency depending in the case of REESS charging

  ➔ Generator efficiency "$n_{alternator}$ = 1" is "Worst case approach"

| | **Willans Factor** | **Generator efficiency with neg. REESS Balance (Discharging)** | **Generator efficiency with pos. REESS Balance (Charging)** |
|---|---|---|---|
| Diesel (B7) | 161 (unchanged) | 0,67 | 1 |
| Petrol (E10) | 184 (unchanged) | 0,67 | 1 |

Calculation of $CO_2$-Delta which need to be corrected:

$$\Delta M_{CO2,j} = 0{,}0036 \times \Delta E_{REESS,j} \times \frac{1}{\eta_{alternator}} \times Willans_{factor} \times \frac{1}{d_j}$$

➔ With $n_{alternator}$ = 1 → smallest $\Delta M_{CO2,j}$

Calculation of corrected $CO_2$ value:

$$M_{CO2,c,3} = M_{CO2,c,2} - \Delta M_{CO2,j}$$

➔ With smallest $\Delta M_{CO2,j}$ → highest $M_{CO2,c,3}$

# (N)OVC-HEV: $K_{CO2}$ correction factor family

## Updated proposal ACEA EV for SG EV (status: February 26th)

$K_{CO2}$ family for NOVC-HEVs and OVC-HEVs

Only OVC-HEVs and NOVC-HEVs that are identical with respect to the following characteristics may be part of the same $K_{CO2}$ family at which $K_{CO2}$ shall be determined with vehicle H of one of the included interpolation families:

a. Type of internal combustion engine: fuel type (or types in the case of flex-fuel or bi-fuel vehicles), combustion process, engine capacity, ~~full-load characteristics~~, engine technology, and charging system, and also other engine subsystems or characteristics that have a non-negligible influence on ~~CO2 mass emission~~ $K_{CO2}$ under WLTP conditions;

b. Operation strategy of all ~~CO2 mass emission~~ $K_{CO2}$ influencing components within the powertrain;

c. Transmission type (e.g. manual, automatic, CVT) and transmission model (e.g. torque rating, number of gears, number of clutches, etc.);

d. Type and number of electric machines: construction type (asynchronous/ synchronous, etc.), type of coolant (air, liquid) and any other characteristics having have a non-negligible influence on ~~CO2 mass emission and electric energy consumption~~ $K_{CO2}$ under WLTP conditions;

e. Type of traction REESS (model, capacity, nominal voltage, nominal power, type of coolant (air, liquid));

f. Type of electric energy converter between the electric machine and traction REESS and between the traction REESS and low voltage power supply ~~and between the recharge-plug-in and traction REESS~~, and any other characteristics a non-negligible influence on ~~CO2 mass emission and electric energy consumption~~ $K_{CO2}$ under WLTP conditions. ~~At the request of the manufacturer and with the approval of the approval authority, electric energy converters between recharge-plug-in and traction REESS with lower recharge losses may be included in the family;~~