Submitted by the European Commission

Informal document **GRPE-87-27**
87th GRPE, 10-12 January 2023
agenda item 3(a)

Proposal for a new Supplement to the 02 series of amendments to UN Regulation No. 154 (Worldwide harmonized Light vehicles Test Procedures (WLTP))

Submitted by the European Commission

The text reproduced below was prepared by the experts from the European Commission to propose a new Supplement to the 02 series of amendments to UN Regulation No. 154.

This proposal introduces the new Utility Factor (UF) approach proposed in the Euro 6e emissions type-approval legislation. In addition, as a result of the application of the new tyre labelling Regulation (EU) 2020/740[1], this proposal introduces a revised format of the table with tyre energy efficiency classes according to rolling resistance coefficients (RRC), in-line with the format proposed in the Euro 6e emissions type-approval legislation. The proposal also includes a series of editorial corrections and clarifications.

[1] Regulation (EU) 2020/740 of the European Parliament and of the Council of 25 May 2020 on the labelling of tyres with respect to fuel efficiency and other parameters OJ L 177, 5.6..2020, p. 1

I. Proposal

Paragraph 4.2., amend to read:

"4.2. A model of the information document relating to exhaust emissions, emissions of carbon dioxide and fuel consumption and/or the measurement of electric energy consumption and electric range, evaporative emissions, durability and OBD, is given in Annex A1 to this Regulation. ~~The information mentioned under item 3.2.12.2.7.6. of Annex A1 to this Regulation is to be included in Appendix 1 "OBD - Related information" to the type approval communication given in Annex A2 to this Regulation.~~"

Appendix 6, paragraph 8.2., amend to read:

"8.2. The inducement system shall activate at the latest when the level of reagent in the tank reaches:

(a) In the case that the warning system was activated at least 2,400 km before the reagent tank was expected to become empty, a level expected to be sufficient for driving the average driving range of the vehicle with a complete tank of fuel;

(b) In the case that the warning system was activated at the level described in paragraph 3.5.(a), a level expected to be sufficient for driving 75 per cent of the average driving range of the vehicle with a complete tank of fuel; ~~or~~

(c) In the case that the warning system was activated at the level described in paragraph 3.5.(b), 5 per cent of the capacity of the reagent tank;

(d) In the case that the warning system was activated ahead of the levels described in both paragraph 3.5.(a) and 3.5.(b) but less than 2,400 km in advance of the reagent tank becoming empty, whichever level described in (b) or (c) of this paragraph occurs earlier.

Where the alternative described in paragraph 6.1. is utilised, the system shall activate when the irregularities described in paragraphs 4. or 5. or the NOx levels described in paragraph 6.2. have occurred.

The detection of an empty reagent tank and the irregularities mentioned in paragraphs 4., 5., or 6. shall result in the failure information storage requirements of paragraph 7. taking effect. "

Annexes Part A, front page, amend to read:

"**Annexes Part A**

The Type Approval requirements and documentation included in Annexes Part A are common to the series of amendments which includes Levels 1A / 1B and the series of amendments which includes Level 2 of this Regulation. This means that certain elements may not be required, or be required twice, for the level of approval being sought. In such an instance the element may be omitted or repeated, respectively."

Annex A1, Appendix 1, paragraph 1.4.1., amend to read:

"**1.4.1. Mass**

Test mass of ~~VL~~ **VM**(kg)	**:**	

"

Annex A1, Appendix 1, paragraph 2.1.1.1.3., amend to read:

"**2.1.1.1.3. ~~U-weighted~~ UF-weighted pollutant emissions of OVC-HEVs**

Pollutants	*CO* *(mg/km)*	*THC (a)* *(mg/km)*	*NMHC (a)* *(mg/km)*	*NO_x* *(mg/km)*	*THC+NOx (b)* *(mg/km)*	*Particulate Matter* *(mg/km)*	*Particle Number* *(#.10^{11}/km)*
Calculated values							

"

Annex 2, Addendum title page, amend to read*:*

"**Addendum to type approval communication No … concerning the type approval of a vehicle with regard to exhaust emissions pursuant to the ~~original version of~~ 02 series of amendments to UN Regulation No. 154**

…"

Annexes Part B, front page, amend to read:

"**Annexes Part B**

The annexes in Annexes Part B describe the procedures for determining the levels of emissions of gaseous compounds, particulate matter, particle number, CO_2 emissions, fuel consumption, **fuel efficiency**, electric energy consumption and electric range from light-duty vehicles. "

Annex B4, paragraph 4.2.1.8.2., amend to read:

"4.2.1.8.2. Manufacturer's specifications

In order to avoid unrepresentative parasitic drag, the ~~The~~ vehicle shall conform to the manufacturer's intended production vehicle specifications regarding tyre pressures described in paragraph 4.2.2.3. of this annex, wheel alignment described in paragraph 4.2.1.8.3. of this annex, ground clearance, vehicle height, drivetrain and wheel bearing lubricants, and brake adjustment ~~to avoid unrepresentative parasitic drag~~."

Annex B4, paragraph 4.2.1.8.5., amend to read:

"4.2.1.8.5. Vehicle coastdown mode

If the ~~determination of~~ **determined** dynamometer settings cannot meet the criteria described in paragraphs 8.1.3. or 8.2.3. of this annex due to non-reproducible forces, the vehicle shall be equipped with a vehicle coastdown mode. The vehicle coastdown mode shall be approved and its use shall be recorded by the responsible authority.

If a vehicle is equipped with a vehicle coastdown mode, it shall be engaged both during road load determination and on the chassis dynamometer. "

Commented [A1]: Editorial note: proposed new text is highlighted in yellow given that the text in this section is already in bold.

Commented [A2]: Editorial note: proposed new text is highlighted in yellow given that the text in this section is already in bold.

Annex B4, paragraph 4.2.2.1., Table A4/2, replace as follows:

"Table A4/2

Energy efficiency classes according to rolling resistance coefficients (RRC) for C1, C2 and C3 tyres and the RRC values to be used for those energy efficiency classes in the interpolation, kg/tonne

Energy efficiency class	*Range of RRC for C1 tyres*	*Range of RRC for C2 tyres*	*Range of RRC for C3 tyres*
1	RRC ≤ 6.5	RRC ≤ 5.5	RRC ≤ 4.0
2	6.6 ≤ RRC ≤ 7.7	5.6 ≤ RRC ≤ 6.7	4.1 ≤ RRC ≤ 5.0
3	7.8 ≤ RRC ≤ 9.0	6.8 ≤ RRC ≤ 8.0	5.1 ≤ RRC ≤ 6.0
4	9.1 ≤ RRC ≤ 10.5	8.1 ≤ RRC ≤ 9.0	6.1 ≤ RRC ≤ 7.0
5	RRC ≥10.6	RRC ≥ 9.1	RRC ≥ 7.1
Energy efficiency class	*Value of RRC to be used for interpolation for C1 tyres*	*Value of RRC to be used for interpolation for C2 tyres*	*Value of RRC to be used for interpolation for C3 tyres*
1	RRC = 5.9*	RRC = 4.9*	RRC = 3.5*
2	RRC = 7.1	RRC = 6.1	RRC = 4.5
3	RRC = 8.4	RRC = 7.4	RRC = 5.5
4	RRC = 9.8	RRC = 8.6	RRC = 6.5
5	RRC = 11.3	RRC = 9.9	RRC = 7.5

*For Level 1A only: In case the actual RRC value is lower than this value, the actual rolling resistance value of the tyre or any higher value up to the RRC value indicated here shall be used for interpolation.

"

Annex B4, paragraph 6.4.3., amend to read:

"6.4.3. Wind speeds for wind tunnel measurement

The aerodynamic force shall be measured at two wind speeds under the following speed conditions:

(a) Class 1 vehicles
Lower wind speed v_{low} to measure aerodynamic force shall be v_{low} < 80 km/h;
Higher wind speed v_{high} shall be (v_{low} + 40 km/h ≤ v_{high} ≤ 150 km/h).

(b) Class 2 and 3 vehicles
Lower wind speed v_{low} to measure aerodynamic force shall be 80 km/h ≤ v_{low} ≤ 100 km/h;
Higher wind speed shall be (v_{low} + 40 km/h ≤ v_{high} ≤ 150 ~~km~~ **km/h**). "

Annex B5, paragraph 2.3.1.3., amend to read:

"2.3.1.3. The usage of twin roller dynamometers with 4WD configuration ~~should~~ **shall** be accepted if the following conditions are met:

…"

Annex B6, paragraph 2.3.2.4., amend to read:

"2.3.2.4. …

For Level 1B

An additional averaging of tests using the CO_2-output of step 4a is necessary (not described in Table A7/1). The linearity of the corrected measured and averaged CO_2 emission for vehicle M, $M_{CO2,c,4a,M}$ according to step 4a of Table A7/1 of Annex B7, shall be verified against the linearly interpolated CO_2 emission between vehicles L and H over the applicable cycle by using the corrected measured and averaged CO_2 emission $M_{CO2,c,4a,H}$ values of vehicle H and $M_{CO2,c,4a,L}$ of vehicle L, according to step 4a ~~used in~~ of Table A7/1 of Annex B7, for the linear CO_2 emission interpolation.

…"

Annex B6, Appendix 1, paragraph 3.3., amend to read:

"3.3. ~~Ki~~ $\mathbf{K_i}$ factors and ~~Ki~~ $\mathbf{K_i}$ offsets shall be rounded to four places of decimal. For ~~Ki~~ $\mathbf{K_i}$ offsets, the rounding shall be based on the physical unit of the emission standard value."

Annex B6a, paragraph 1.2., amend to read:

"1.2. In order to ensure statistical representativity, at the request of the manufacturer, all tests from which results are used in the calculations described in this ~~Annex B6A~~ **Annex B6a** can be repeated up to a maximum of 3 times and the arithmetic average of results used in the context of this ~~Annex B6A~~ **Annex B6a**. Where the tests have been performed only for the purpose of determining the FCF and without prejudice to paragraph 3.7.3. of this ~~Annex B6A~~ **Annex B6a**, the results of the additional tests shall not be taken into account for any other purposes."

Annex B6a, paragraph 3., amend to read:

"3. ATCT Procedure

The Type 1 test specified in Annex B6 shall be carried out with the exception of the requirements specified in paragraphs 3.1. to 3.9. of this Annex B6a. That ~~requires also~~ **also requires** a new calculation and application of gearshift points in accordance with Annex B2 taking into account the different road load as specified in paragraph 3.4. of this Annex B6a.

3.1. …"

Annex B8, paragraph.4.2.1.2.1., Table A8/7, Step 5 amend to read:

"

5 …	…	…	… FE shall be ~~perform final rounding~~ **rounded**	…

			to the nearest whole number. …	

"

Annex B8, paragraph.4.5.1.1.5., amend to read:

"4.5.1.1.5. …

For Level 1B

An additional averaging of tests using the charge-sustaining CO_2-output of step 4a is necessary (not described in Table A8/5). The linearity of the corrected measured and averaged charge-sustaining CO_2 emission for vehicle M, $M_{CO2,c,4a,M}$ according to step 4a of Table A8/5 of Annex B8, shall be verified against the linearly interpolated CO_2 emission between vehicles L and H over the applicable cycle by using the corrected measured and averaged charge-sustaining CO_2 emission $M_{CO2,c,4a,H}$ of vehicle H and $M_{CO2,c,4a,L}$ of vehicle L, according to step 4a ~~used in~~ of Table A8/5 of Annex B8, for the linear CO_2 emission interpolation.

…"

Annex B8, Appendix 2, introductory paragraph, amend to read:

"This ~~Appendix~~ **appendix** describes the procedure to correct the charge-sustaining Type 1 test CO_2 emission for NOVC-HEVs and OVC-HEVs, and the **charge-sustaining Type 1 test** fuel consumption for NOVC-FCHVs and OVC-FCHVs (if applicable) as a function of the electric energy change of all REESSs. "

Annex B8, Appendix 2, paragraph 1.1.2., amend to read:

"1.1.2. The application of the correction over the total cycle on the fuel consumption for NOVC-FCHVs and OVC-FCHVs, on the CO_2 emission for NOVC-HEVs and OVC-HEVs is based on the ~~charge-sustaining~~ REESS energy change $\Delta E_{REESS,CS}$ of the charge-sustaining Type 1 test and the correction criterion c.

For the calculation of $\Delta E_{REESS,CS}$, paragraph 4.3. of this annex shall be used. The considered period j used in paragraph 4.3. of this annex is defined by the charge-sustaining Type 1 test. The correction criterion c shall be determined according to paragraph 1.2. of this Appendix."

Annex B8, Appendix 2, paragraph 1.1.4., amend to read:

"1.1.4. …

(c) The manufacturer can prove to the responsible authority by measurement that there is no relation between $\Delta E_{REESS,CS}$ and charge-sustaining CO_2 emission and $\Delta E_{REESS,CS}$ and **charge-sustaining** fuel consumption respectively."

Annex B8, Appendix 2, paragraph 3.1.1.3.4., amend to read:

"3.1.1.3.4. ~~To obtain a set of applicable WLTP test cycles required for the determination of the correction coefficients according to paragraph 2.2. of this appendix, the test may be followed by a number of consecutive sequences in accordance with the requirements of paragraph 3.1.1.1. to paragraph 3.1.1.3.3. inclusive of this appendix~~. **To obtain a set of applicable WLTP test cycles that are required for the determination of the correction coefficients, the test may be followed by a number of consecutive sequences required according to**

Commented [A3]: Editorial note: for consistency with paragraph 3.1.2.3.4.

paragraph 2.2. of this appendix consisting of paragraphs 3.1.1.1. to paragraph 3.1.1.3.3. inclusive of this appendix."

Annex B8, Appendix 2, paragraph 3.1.2.3.4., amend to read:

"3.1.2.3.4. To obtain a set of applicable WLTP test cycles that are required for the determination of the correction coefficients, the test may be followed by a number of consecutive sequences required according to paragraph 2.2. of this appendix consisting of paragraphs 3.1.2.2. and ~~3.1.2.3.~~ **3.1.2.3.3.** of this appendix. "

Annex B8, Appendix 2, paragraph 3.2.1.3.4., amend to read:

"3.2.1.3.4. To obtain a set of applicable WLTP test cycles that are required for the determination of the correction coefficients, the test can be followed by a number of consecutive sequences required according to paragraph 2.2. of this appendix consisting of paragraph 3.2.1.1. to paragraph ~~3.2.1.3.~~ **3.2.1.3.3.** inclusive of this appendix."

Annex B8, Appendix 2, paragraph 3.2.2.3.4., amend to read:

"3.2.2.3.4. To obtain a set of applicable WLTP test cycles that are required for the determination of the correction coefficients, the test can be followed by a number of consecutive sequences required according to paragraph 2.2. of this appendix consisting of paragraphs 3.2.2.2. and ~~3.2.2.3.~~ **3.2.2.3.3.** of this appendix."

Annex B8, Appendix 5, replace as follows:

"Annex B8 - Appendix 5

Utility factors (UF) for OVC-HEVs and OVC-FCHVs (as applicable)

1. Reserved

2. For the approval of OVC-HEVs or OVC-FCHVs of category M1 or N1 with emission characters EA, EB or EC as referred to in Table A3/1 of Annex 3 to the 08 series of amendment to UN Regulation No. 83, the fractional utility factor UF_j for the weighting of period j, shall be calculated in accordance with the following equation:

$$UFj(dj) = 1 - \exp\left\{-\left(\sum_{i=1}^{k} C_i \times \left(\frac{d_j}{d_{nx}}\right)^i\right)\right\} - \sum_{l=1}^{j-1} UF_l$$

where:

UF_j	utility factor for period j;
d_j	measured distance driven at the end of period j, km;
C_i	i^{th} coefficient (see Table A8.App5/1);
d_{nx}	$d_{nea,}$ d_{neb}, $d_{nec,}$ normalized distance (see Table A8.App5/1);
k	number of terms and coefficients in the exponent;
j	number of period considered;

i number of considered term/coefficient;

$\sum_{l=1}^{j-1} UF_l$ sum of calculated utility factors up to period (j-1)

The normalized distance "d_{nx}" shall be set in accordance with Table A8.App5/1, where the values d_{neb} shall be applied from 1 January 2025, and d_{nec} from 1 January 2027.

Table A8.App5/1
Parameters for the determination of fractional UFs (as applicable)

Parameter	Value
d_{nea}*	800 km
d_{neb}*	2200 km
d_{nec}*	4260 km
C1	26.25
C2	-38.94
C3	-631.05
C4	5964.83
C5	-25095
C6	60380.2
C7	-87517
C8	75513.8
C9	-35749
C10	7154.94

*The value to be applied shall be that corresponding to the emission characters EA, EB and EC as specified in Table A3/1 of Annex 3 to the 08 series of amendment to UN Regulation No. 83. "

Annex B8, Appendix 6, paragraph 3.2., amend to read:

"3.2. …

(b) If several modes are capable of following the reference test cycle under charge-sustaining operating conditions and none of those modes is a configurable start mode, the vehicle shall be tested for criteria emissions~~,~~ **and** CO_2 emissions in the best case mode and worst case mode. Best and worst case modes shall be identified by the evidence provided on the CO_2 emissions in all modes. CO_2 emissions shall be the arithmetic average of the test results in both modes. Test results for both modes shall be recorded.

At the request of the manufacturer, the vehicle may alternatively be tested with the driver-selectable mode in the worst case position for CO_2 emissions;

(c) ..."

Annex B8, Appendix 8, paragraph 2.2., amend to read:

"2.2. …

For Level 1B

$$AF_{EC,AC,CD,i} = \frac{EC_{deci}}{EC_{ave,i}}$$

where

$EC_{dec,i}$ is the declared electric energy consumption of vehicle i of the charge-depleting Type 1 test according to Table A8/9 Step no. 8, Wh/km;

$EC_{ave,i}$ is the average of the measured electric energy consumption of vehicle i of the charge-depleting Type 1 test according to Table A8/9 Step no. 8**, Wh/km**."

Annex C5, paragraph 3.6.3., amend to read:

" 3.6.3. In the case of vehicles equipped with positive ignition engines, misfiring cylinders need not be uniquely identified if a distinct single or multiple cylinder misfire fault code is stored."

Annex C5, paragraph 3.9.4., amend to read:

"3.9.4. Regarding the status code (as described in paragraph 3.6. of this annex), one of the following two options has to be used, if one or more of the diagnostics reporting readiness is fuel type specific:

(a) The status code is fuel specific, i.e. use of two status codes, one for each fuel type;

(b) The status code shall indicate fully evaluated control systems for both fuel types (petrol and (NG/biomethane)/LPG)) when the control systems are fully evaluated for one of the fuel types.

If none of the diagnostics reporting readiness is fuel type specific, then only one status code has to be supported."

Commented [A4]: Editorial note: this paragraph has been identified as one which might benefit from clarification. To be considered during the development of the Working Document planned for 88th GRPE.

Commented [A5]: Editorial note: this paragraph has been identified as one which might benefit from clarification. To be considered during the development of the Working Document planned for 88th GRPE.