



Economic Commission for Europe**Inland Transport Committee****World Forum for Harmonization of Vehicle Regulations****Working Party on Pollution and Energy****Ninety-first session**

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Item 3 (c) of the provisional agenda

Light vehicles:**Worldwide harmonized Real Driving Emissions test procedure and
UN Regulations No. 168 (Global Real Driving Emissions (Global RDE))****Proposal for a new Supplement to UN Regulation No. 168
(Global Real Driving Emissions (Global RDE))****Submitted by the experts from the International Organization of Motor
Vehicle Manufacturers***

This document proposes to clarify the need for 3-phase and 4-phase analysis of test data depending on the fuel type of the engine (petrol or diesel). The modifications to the current text of the Regulation are marked in bold for new or strikethrough for deleted characters.

* In accordance with the programme of work of the Inland Transport Committee for 2024 as outlined in proposed programme budget for 2024 (A/78/6 (Sect. 20), table 20.5), the World Forum will develop, harmonize and update UN Regulations in order to enhance the performance of vehicles. The present document is submitted in conformity with that mandate.

I. Proposal

Paragraph 6.1., amend to read:

"6.1. Compliance requirements

For vehicle types approved according to this Regulation, the final emissions at any possible RDE test performed in accordance with the requirements of this Regulation, shall be calculated for evaluation with a ~~3-phase~~ and a 4-phase WLTC **and for vehicles with a diesel engine additionally with a 3-phase WLTC.**

Requirements for evaluation with 4 Phase WLTC

Requirements for evaluation with 3 Phase WLTC

The final emissions for the 4-phase analysis shall not be higher than any of the limits for the relevant criteria emissions (i.e. NO_x and PN) found in Table 1A of paragraph 6.3.10. of the 03 series of Amendments to UN Regulation No. 154 on WLTP.

~~For vehicles with a diesel engine~~ The final emissions for the 3-phase analysis shall not be higher than the NO_x limits found in Table 1B of paragraph 6.3.10. of the 03 series of Amendments to UN Regulation No. 154 on WLTP.

The requirements of emission limits shall be fulfilled for the urban operation and the complete PEMS trip.

The RDE tests required by this Regulation provide a presumption of conformity. The presumed conformity may be reassessed by additional RDE tests.

The manufacturer shall ensure that all vehicles within the PEMS test family are compliant with UN Regulation No. 154 on WLTP, including conformity of production requirements.

The RDE performance shall be demonstrated by performing the necessary tests in the PEMS test family on the road operated over their normal driving patterns, conditions and payloads. The necessary tests shall be representative for vehicles operated on their real driving routes, with their normal load."

Paragraph 6.4.1.2., amend to read:

"6.4.1.2. The authority shall select additional vehicles according to the requirements of paragraph 6.4.3. for PEMS testing carried out by a Technical Service to demonstrate compliance of the selected vehicles with the requirements of this Regulation. The technical criteria for selection of an additional vehicle according to paragraph 6.4.23. shall be recorded with the test results."

Paragraph 6.4.1.3., amend to read:

"6.4.1.3. With agreement of the authority, a PEMS test can also be driven by a different operator witnessed by a Technical Service, provided that at least the tests of the vehicles required by paragraphs 6.4.23.2. and 6.4.23.6. and in total at least 50 per cent of the PEMS tests required by paragraph 6.4.3.7. for validating the PEMS test family are driven by a Technical Service. In such case the Technical Service remains responsible for the proper execution of all PEMS tests pursuant to the requirements of this Regulation."

Paragraph 9.2., amend to read:

"9.2. Required distance shares of trip speed bins

The following is the distribution of the speed bins in an RDE trip that are required for respecting the needs of evaluation for both the 4-phase WLTC and **where applicable the 3-phase WLTC:**

<i>Requirements for evaluation with 4-Phase WLTC</i>	<i>Requirements for evaluation with 3-Phase WLTC</i>
<p>The trip shall consist of approximately 34 per cent urban, 33 per cent rural and 33 per cent motorway speed bins. ‘Approximately’ shall mean the interval of ± 10 per cent points around the stated percentages. The urban speed bin shall however never be less than 29 per cent of the total trip distance.</p>	<p>The trip shall consist of approximately 55 per cent urban and 45 per cent expressway speed bins. ‘Approximately’ shall mean the interval of ± 10 per cent points around the stated percentages. The urban speed bin however can be lower than 45 per cent but never be less than 40 per cent of the total trip distance.</p>

The shares of urban, rural and motorway speed bins shall be expressed as a percentage of the total trip distance for analysis with 4-Phase WLTC.

Where applicable, the shares of urban and expressway speed bins shall be expressed as a percentage of the trip distance with speed not exceeding 100 km/h for analysis with 3-Phase WLTC.

The minimum distance of each, urban, rural and motorway or expressway speed bins shall be 16 km."

Paragraph 9.3., amend to read:

"9.3. RDE test to be performed

The RDE performance shall be demonstrated by testing vehicles on the road, operated over their normal driving patterns, conditions and payloads. RDE tests shall be conducted on paved roads (e.g. off-road operation is not permitted). ~~Either~~ **For vehicles with a diesel engine,** a single RDE trip or two dedicated RDE trips shall be driven in order to prove compliance with the emission requirements against both 3-Phase WLTC and 4-Phase WLTC."

Paragraph 10.7.1., amend to read:

"10.7.1. **For vehicles with a diesel engine,** ~~in~~ the case that a single RDE trip is not capable of complying with all validity requirements described in paragraphs 9.1.1., 9.2. and 9.3., paragraphs 4.5.1. and 4.5.2. of Annex 8 and paragraph 4. of Annex 9 simultaneously, then a second RDE trip shall be done. The second trip shall be designed to meet either the 3-phase or 4-phase WLTC trip requirements not yet satisfied, as well as all other relevant trip validity requirements, but it is not necessary to satisfy again the 4-phase or 3-phase WLTC trip requirements previously met by the first trip."

Paragraph 10.7.2., amend to read:

"10.7.2. ~~If~~ **For vehicles with a diesel engine,** in case the emission calculated for the 3-phase RDE trip exceed the emission limits for the total trip due to the exclusion of all data points with speed above 100 km/h even though the trip is compliant, then a second trip with the speed limited to less than or equal to 100 km/h shall be made and evaluated for compliance with the 3-phase requirements."

Annex 8, paragraph 1., amend to read:

"1. Introduction

The Moving Averaging Window method shall be used to assess the overall trip dynamics. The test is divided in sub-sections (windows) and the subsequent analysis aims at determining whether the trip is valid for RDE purposes. The ‘normality’ of the windows shall be assessed by comparing their CO₂ distance-specific emissions with a reference curve obtained from the vehicle CO₂ emissions measured in accordance with the WLTP test.

For compliance with this Regulation, the method shall be applied using the 4-phase and **where applicable** the 3-phase WLTC requirements."

Annex 10, paragraph 4.3.3., amend to read:

"4.3.3. Calculation of the final result

The positive cumulative elevation gain of a total trip shall be calculated by integrating all positive interpolated and smoothed road grades, i.e., $road_{grade,2}(d)$. The result should be normalized by the total test distance d_{tot} and expressed in meters of cumulative elevation gain per one hundred kilometres of distance.

The waypoint vehicle speed v_w shall then be calculated over each discrete way point of 1m:

$$v_w = \frac{1}{(t_{w,i} - t_{w,i-1})}$$

Where applicable for 3-phase WLTP evaluation all datasets with $v_w \leq 100$ km/h are used for the calculation of the cumulative positive altitude gain of the complete trip.

All of the positive "

Annex 11, paragraph 1., amend to read:

"1. Introduction

This annex describes the procedure to calculate the final criteria emissions for the complete and urban part of an RDE trip for the ~~3-phase~~ and 4-phase **and where applicable the 3-phase** WLTP."

Annex 11, paragraph 3., amend to read:

"3. Calculation of the Intermediate RDE emissions results

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$RF_{L1} = 1.30$ and $RF_{L2} = 1.50$;

The RDE result evaluation factors RF_k ($k=t$ =total, $k=u$ =urban) shall be obtained using the functions laid down in paragraph ~~2.2.3.1.~~ for vehicles with ICE and NOVC-HEV, and in paragraph ~~2.3.2.~~ for OVC-HEV. A graphical illustration of the method is provided in Figure A11/1 below, while the mathematical formulas are found in Table A11/1:

..... "

II. Justification

1. The 3-phase WLTP from UN Regulation No. 154 level 1B is applied for the CPs where they set lower vehicle speed limit like Japan.
2. Japan applies RDE requirements based on 3-phase WLTC exclusively to vehicles with diesel engines.
3. The original version of this Regulation was drafted to reflect this situation but some text can be interpreted as requiring fundamentally a 3-phase analysis of the test data despite limits for this analysis only being applied to vehicles with a diesel engine.
4. This proposal aims to remove this interpretation and clarify that only a 4-phase analysis is required for vehicles with a petrol engine.
5. Additionally, several incorrect references to paragraphs have been identified in the original version of the Regulation and corrections are proposed.