



# **Update from RDE IWG**

**GRPE May 2019**

**From the sponsors:  
European Union  
Japan  
Korea**

## Background

- *During GRPE meeting in June 2018, EU, Japan and Korea requested the creation of an RDE IWG and the proposal was accepted.*
- *Creation of RDE IWG accepted by AC.3 in its June 2018 meeting*

# Meetings

*The group met already on:*

- 1. 11-12 September 2018 in Brussels**
- 2. 27-28 November 2018 in Brussels**
- 3. 9 January 2019 in Geneva**
- 4. 1-2 April 2019 in Tokyo**
- 5. 22 May 2019 in Geneva**

**And planned next meeting for 9-10 July 2019 in Vienna and in 30-31 October in Seoul.**

## 4th Meeting

- *Presentation by JRC on key factors, key parameters and set of boundary conditions that characterize the European RDE package 4, RDE monitoring exercise conducted by the JRC and EMROAD basic principles.*
- *OICA presentation on Cumulative Positive Altitude Gain*
- *JRC presentation on Data collection*

## 4th Meeting

- *US EPA presentation on principles to develop Light-Duty RDE for US*
- *India presentation on on-going RDE activities in India*
- *RDE GTR draft review*

## 5th Meeting

- *Presentation by China on RDE legislation in China and future activities*
- *Presentation by US EPA on Comparison between test cycles*
- *JRC presentation on Data collection*
- *Review of definitions*
- *Review of Korea proposal on city driving*

## Detailed task list-1

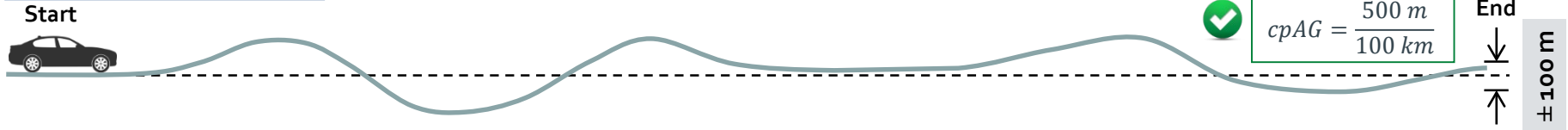
- *Driving and emission data collection: 1 June 2019*
- *Evaluation of Temperature and Altitude boundaries using regional needs: first delivery by 1 April 2019 meeting in Tokyo **Ongoing***
- *Evaluation of cumulative altitude gain: 1 April 2019 **DONE***
- *Introduction of certification lab cycles other than WLTP (FTP, MIDC,...): first delivery on 1 October 2019, final delivery end 2019 **FIRST PRESENTATION by US on 5<sup>th</sup> meeting***

# RDE Boundary Conditions

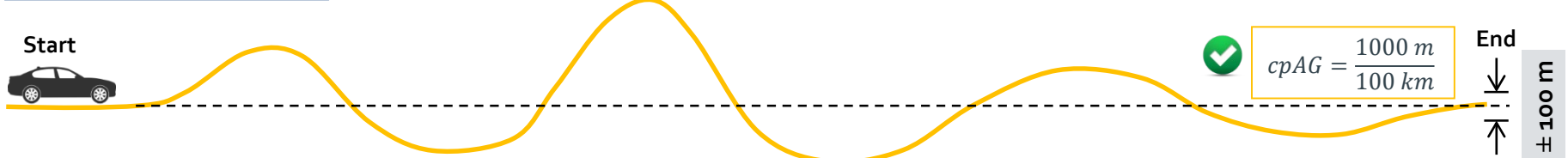
## Cumulative Positive Altitude Gain

$cpAG = \text{cumulative positive altitude gain}$

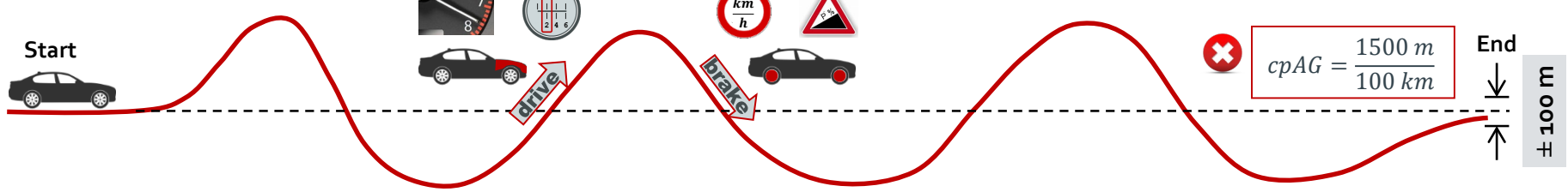
Moderate road gradients



Occasionally high gradients



Repeated high gradients

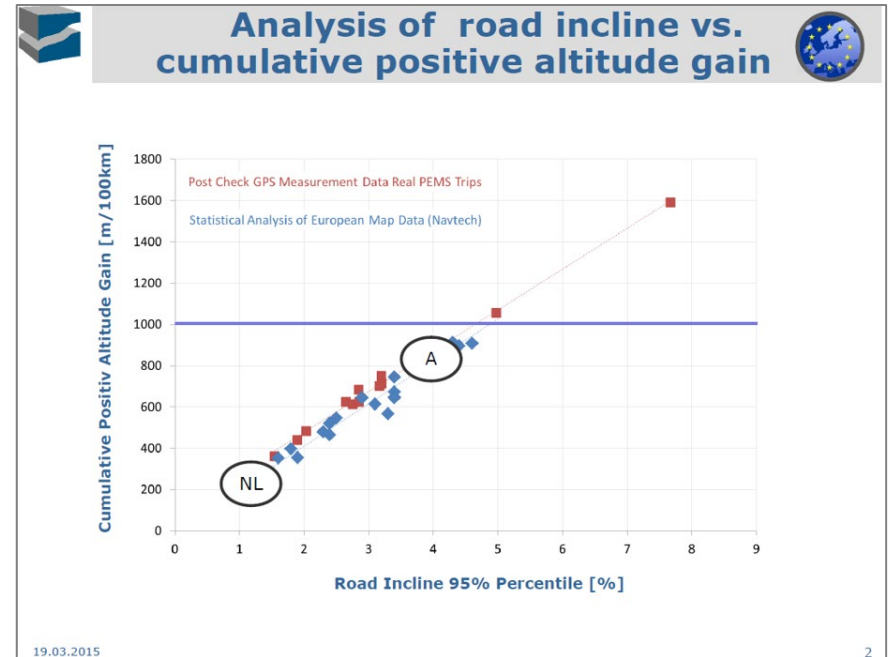
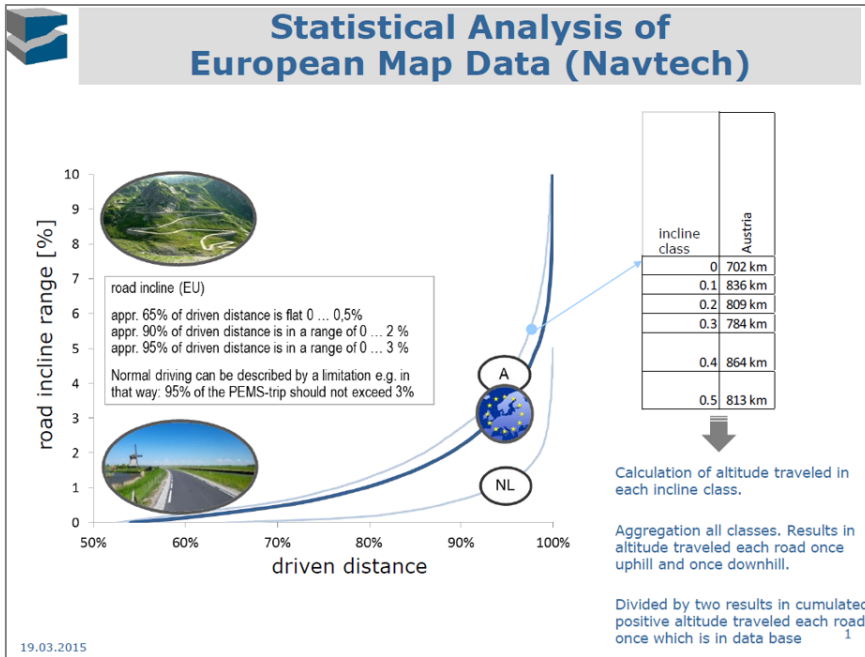




# RDE Boundary Conditions

## Cumulative Positive Altitude Gain

**Note:** Vehicle km by altitude data was provided by Emisia in 2012 and resulted in cumulative positive altitude gain being added in the second RDE package, Regulation (EU) 2016/646.

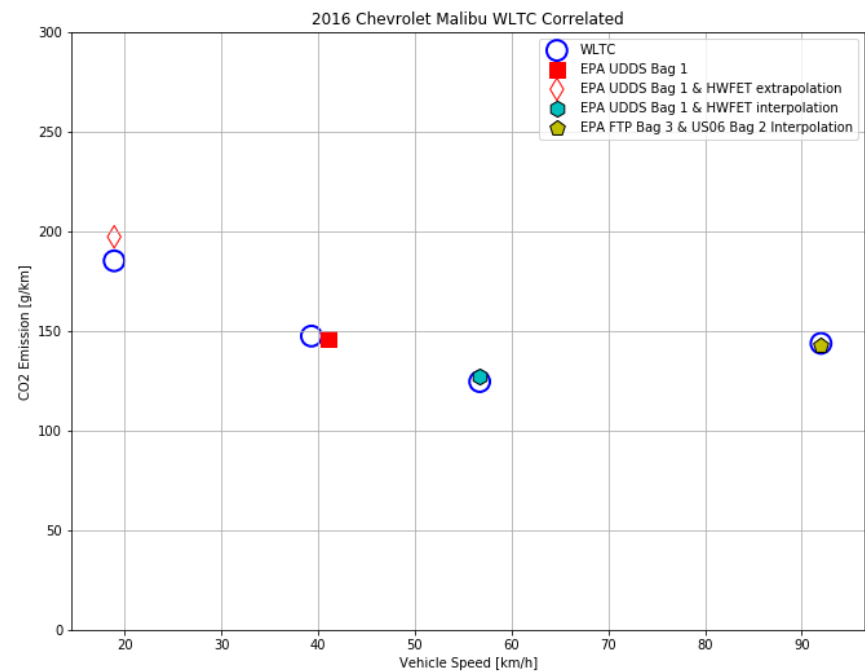


Limit derivation for the cumulative positive altitude gain.

# Linear Interpolation and Extrapolation of U.S. Cycles Compared to WLTC

*US EPA and JRC started conducting comparison tests, between WLTC and US cycles.*

*JRC will also test Indian cycle.*



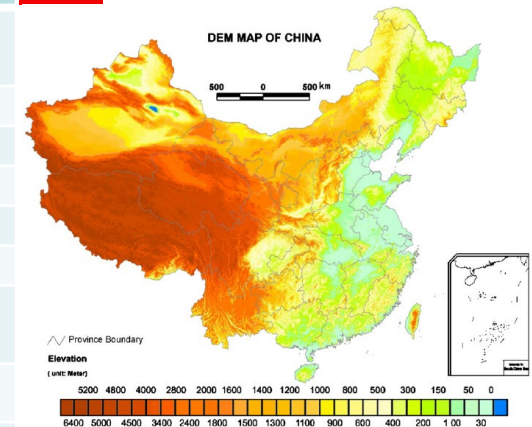
## Detailed task list-2

- *Evaluation of trip composition: first delivery April meeting, final for June 2019 **ONGOING***
- *Annex on uncertainty of measurements: October 2019*
- *Evaluation of trip severity/trip dynamics: **First delivery for June 2019***
- *Evaluation of emissions corrections and moderate/extended conditions: October 2019*
- *Drafting of GTR: already started, informal for January 2020 **GRPE ONGOING***

## Example of divergences in Regional Legislation

China RDE reference to EU RDE ,but make some changes according to own conditions.

Items		Requirements
Test procedure & PEMS requirements		Package 1,2
Boundary Condition	Altitude	Moderate: [0m, 700m] Extended: (700m, 1300m) <b>Enhance extended: (1300m~2400m)</b>
	Temperature	Moderate: [0°C, 30°C] Extended: [-7°C, 0°C] or (30°C, 35°C]
Data post-process	ICE, NOVC-HEV	Package 2 Moving Average Window Method
	OVC-HEV	Package 3
Conformity Factors	NOx, PN	2.1



\* Extended factor: 1.6 **Enhanced extended factor: 1.8**

# EU-RDE Trip Parameters (1)

Parameter	EU Settings	Reason
Total trip duration	[90-120 min]	Minimum size of the data set required to achieve statistical significance and coverage of the operating conditions (urban/rural/motorway or speed bins)
Cold start duration	[max 5 min]	Defines the maximum cold start duration
Cold start operational requirements		Ensures that the vehicle is conditioned properly and driven "normally" during the cold start phase to avoid excessively low or high emissions
Minimum distances Distance shares for the U/R/M conditions	[min 16 km] [34/33/33% ±5%]	Minimum coverage of the operating conditions (urban/rural/motorway or speed bins). Each operating condition is likely to cover various areas of the engine map, thermal conditions of the engine system and driving dynamics (e.g. more dynamics in the city)
Cumulative altitude gain	[max 1200 m]	Ensures that the whole trip is not uphill or downhill and that the energy consumption used for "climbing" remains within EU normal values
Difference between start and end points	[<=100 m]	Ensures "Energy consumption neutrality" and (almost) forces a round trip.

# EU-RDE Trip Parameters (2)

Parameter	EU Settings	Reason
Urban average speed	[15-40 km/h]	<p><i>Operating conditions which could cause (for some technologies) emissions levels which are not comparable to the average RDE emissions:</i></p> <p>Very low urban average speeds may include non-representative shares of vehicle idling – High urban average speeds are not representative for EU urban driving.</p>
Motorway speed above 145 km/h	[<=3% of motorway time]	Most EU member states have motorway speed limits between 100 and 130 km/h (except Germany). Emissions driving at high speeds is possible up to 145 km/h without invalidating the tests. Emissions control at higher speeds is also ensured through provisions on emissions control strategies.
Motorway speed above 100 km/h	[>=5 min]	Minimum coverage of “real” motorway driving (See above)
Urban stop time	[6-30 %]	Limit the idling time during the test (potential effects on distance specific emissions, possible effects on cold start, etc...)

# EU-RDE Trip Parameters (2)

Parameter	EU Settings	Reason
Overall driving dynamics	50% of U/R/M windows within the tolerances	<p>The vehicle CO2 emissions encompass the effects of the driver's behavior, the vehicle payload, the wind, the road grade</p> <p>The severity of the driving conditions is assessed using the vehicle RDE CO2 emissions in comparison with the ones from the reference cycle (WLTP)</p> <ul style="list-style-type: none"> <li>- First at an intermediate scale using the MAW method;</li> <li>- Second at the trip scale for the final emissions calculation.</li> </ul>
Excess of absence of driving dynamics	Below or above the limit curves	<p>Additional kinematic indicators were introduced to assess:</p> <ul style="list-style-type: none"> <li>- The presence of excessive driving dynamics (e.g. a few strong accelerations) using the statistics of instantaneous Speed*Acceleration (VxA) product.</li> <li>- The absence of driving of driving dynamics (e.g. constant speed driving using a cruise control in an excessive manner) using the Relative Positive Acceleration (RPA).</li> </ul> <p>NB: To assess such effects, the MAW CO2 was not found sensitive enough.</p>



# Upcoming Meetings

- *6<sup>th</sup> meeting 9-10 July 2019, Austria*
- *7<sup>th</sup> meeting in 30-31 October 2019, Korea*
- *8<sup>th</sup> meeting and Informal document in time for January 2020 GRPE meeting*
- *9<sup>th</sup> meeting in February 2020 to prepare working document*
- *10<sup>th</sup> meeting with Working document in June 2020 GRPE meeting*



## Summary:

- *Work progresses well although there is still a lot to be done to ensure that regional aspects are covered adequately*
- *Very ambitious deadline but engagement of participants is good*
- *We create a database on RDE measurements that will be widely available*
- *Already working on a draft GTR*



# **Thank you for your attention!**

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European Union  
Japan  
Korea