

Development of World-wide Light-duty Test Cycle

Proposed by Japan
(Reviewed by JRC, Ms. Ericsson, Mr. Steven)

DHC group
under GRPE/WLTP informal group
7 June 2011
Palais des Nations, Geneva

1. Current status
2. Open issue list
3. Regional weighting
4. Mode construction
5. Validation Plan
6. Next action

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1. Current Status

(1) In-use Data Collection

(by 3 June 2011)

Region	In-use Data	Traffic Statistical Information
EU	Completed	Completed
India	Completed	Completed
Japan	Completed	Completed
Korea	Completed	Completed
USA	Completed	Completed
China	-	-

(2) Methodology → It was agreed by DHC group
(refer to WLTP-DHC-06-03e.rev1)

(3) Threshold speed → It was agreed by DHC group
(refer to WLTP-DHC-07-02e)

Phase	Threshold vehicle speed
Low	$V_{max}^* \leq 60$
Middle	$60 \text{ km/h} < V_{max}^* \leq 80$
High	$80 \text{ km/h} < V_{max}^* \leq 110 \text{ km/h}$
Extra-High	$110 \text{ km/h} < V_{max}^*$

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2.1. Open Issues -1

	Issues	Discussion points	Status / Proposed Actions
1	Deadline for submission of driving data	a) India and China requested deadline be extended to May	Cycle development should be started just after 8th DHC meeting. Later data submission is still open for analysis.
2	Regional Weighting when developing the WLTC	a)traffic volume b)same weighting c)compromised weighting	Expect to get agreement during the 8th DHC meeting
3	Threshold Speed for L/M/H	a)according to DHC-06-03 b)CP's requirement	Threshold speeds of 60, 80 and 110km/h were agreed for the cycle phases during 7 th DHC meeting
4	High Phase Cycle Construction (US&EU versus other regions)	a)only ONE unified cycle b)possess TWO types of High phase cycle	It was agreed to possess two (2) types of HIGH phase cycle during 7 th meeting.
5	Mode Construction	a) cold start test only b) cold start & hot soak start	Possible mode constructions are introduced during 8 th DHC meeting. Further analysis is necessary during the validation 1.

CLOSED

2.2. Open Issues -2

	Issues	Discussion points	Proposed Actions
6	Unique Weighting Factor for L/M/H Phase	<ul style="list-style-type: none"> a) harmonized weighting factors b) permit regional weighting factors 	<ul style="list-style-type: none"> a) Is target of Informal Group Consider the possibility to accept b) for only CO2/Fuel consumption
7	Gear Shift Points	<ul style="list-style-type: none"> a) fixed points b) based on vehicle specification c) others 	Ms. Ericsson, Mr. Steven, JRC and JARI work together to finalize the method before developing the 1 st WLTC.
8	How to treat the vehicles which are not able to follow the prescribed cycle	<ul style="list-style-type: none"> a) continue to drive with wide-open-throttle b) exempt the H (or M&H) phase(s) c) others 	Develop the proposal during validation 1 tests.
9	Check the driving profile based on the vehicle characteristic		Analyze the in-use data based on vehicle characteristic (i.e. power to mass ratio)

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3.1. Possible options for regional weighting

Possible options for regional weighting when developing the unified driving characteristic of Low/Middle phases

Options	EU	US	India **	Japan	Korea	China	Justification
1	1	1	1	1	1	-	A
2	1		1			-	B
3 * Traffic volume ratio	L : 0.36 M : 0.26	L : 0.24 M : 0.46	L : 0.16 M : 0.12	L : 0.17 M : 0.13	L : 0.06 M : 0.04	L : - M : -	C

*) expect to change after obtaining the traffic statistical data from China

***) Total traffic volume of India is estimated based on WORLD ROAD STTISTICS 2009 DATA 2002-2007 using an average speed of 27 km/h and an increase of traffic volume of 51% between 2002 and 2006.(<http://www.irfnet.org/statistics.php>)

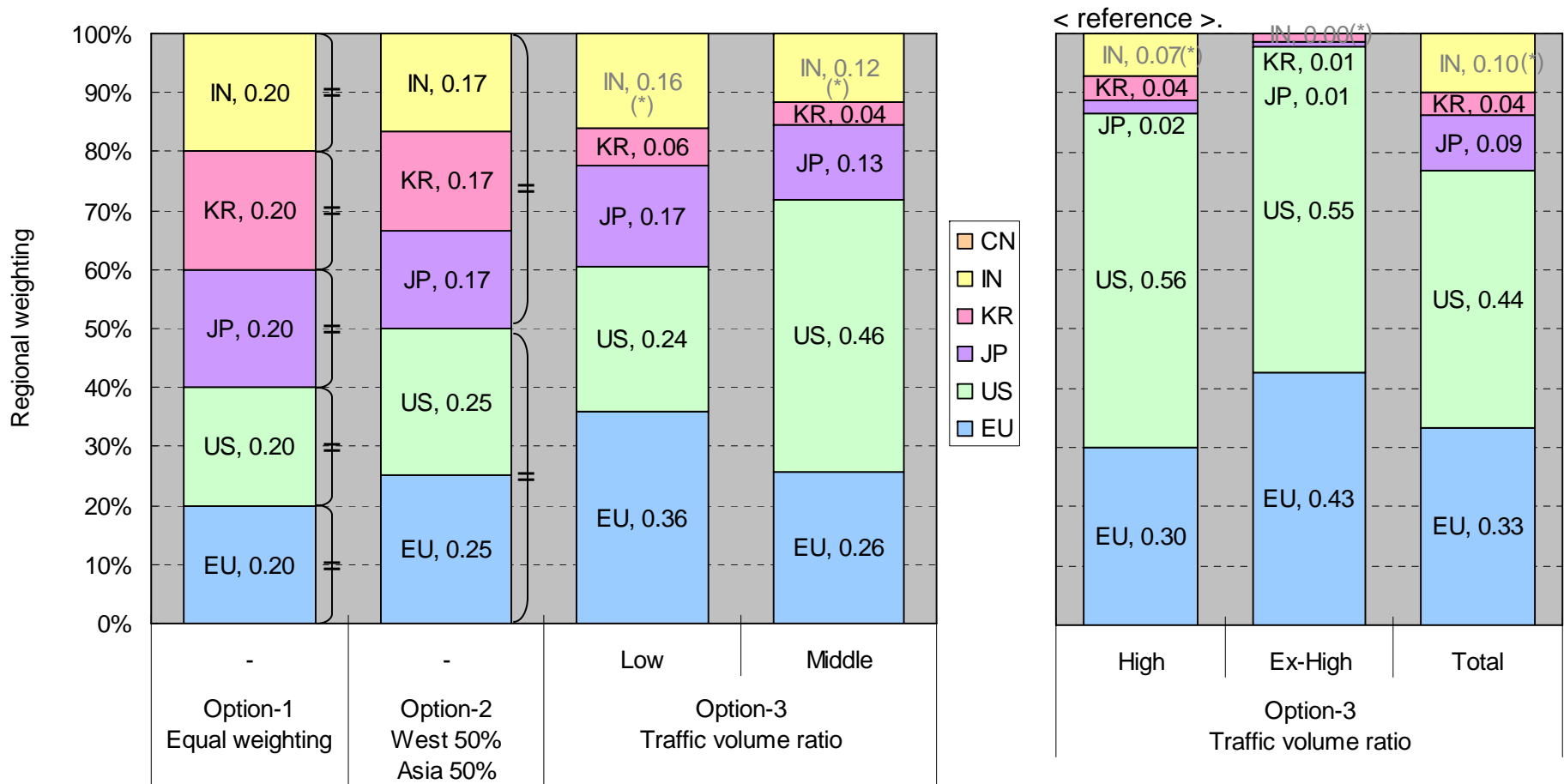
A : equal weighting for contracting parties submit in-use driving data (consider Switzerland as part of EU region)

B : based on population, vehicle density and increasing rate

C : based on traffic volume, same logic as High/extra-High phases weighting

3.2. Possible options for regional weighting

The impact study was conducted without Chinese data.



** Total traffic volume of India is estimated based on WORLD ROAD STATISTICS 2009 DATA 2002-2007 (<http://www.irfnet.org/statistics.php>) using an average speed of 27 km/h and an increase of traffic volume of 51% between 2002 and 2006.

3.3. Priority

Priority order for data weighting when developing the unified reference database for Low/Middle phase.

Options	Regional weighting						Priority					Total
	EU	US	India**	Japan	Korea	China	EU	US	Japan	Korea	India	
1	1	1	1	1	1	-			1			
2	1		1			-			3			
3*	L : 0.36 M : 0.26	L : 0.24 M : 0.46	L : 0.16 M : 0.12	L : 0.17 M : 0.13	L : 0.06 M : 0.04	L : - M : -			2			

*) expect to change after obtaining the traffic statistical data from China

***) Total traffic volume of India is estimated based on WORLD ROAD STSTATISTICS 2009 DATA 2002-2007 using an average speed of 27 km/h and an increase of traffic volume of 51% between 2002 and 2006. (<http://www.irfnet.org/statistics.php>)

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4.1. Background

During the 7th DHC meeting held on 16 May 2011, the possible six(6) options of mode construction were proposed.

Need to study on each option to consider the following views.

- a) Testing burden
- b) Investment (hard and/or soft)
- c) Required measurement items
- d) Low concentration pollutants
- e) Regional weighting factor
- f) others, if necessary

4.2. Possible mode constructions

option	Mode construction		Brief description
	Series test	independent	
1			
2			MIDDLE&HIGH 1 sampling
3			similar to US procedure
4			1 HIGH phase
5			LOW&MIDDLE 1 sampling
6			All phases test as a series

*) phase duration subject to change after obtaining the statistical information from China
 **) middle phase test after intermediate soak may be required for HEV vehicles

4.3. Case Study

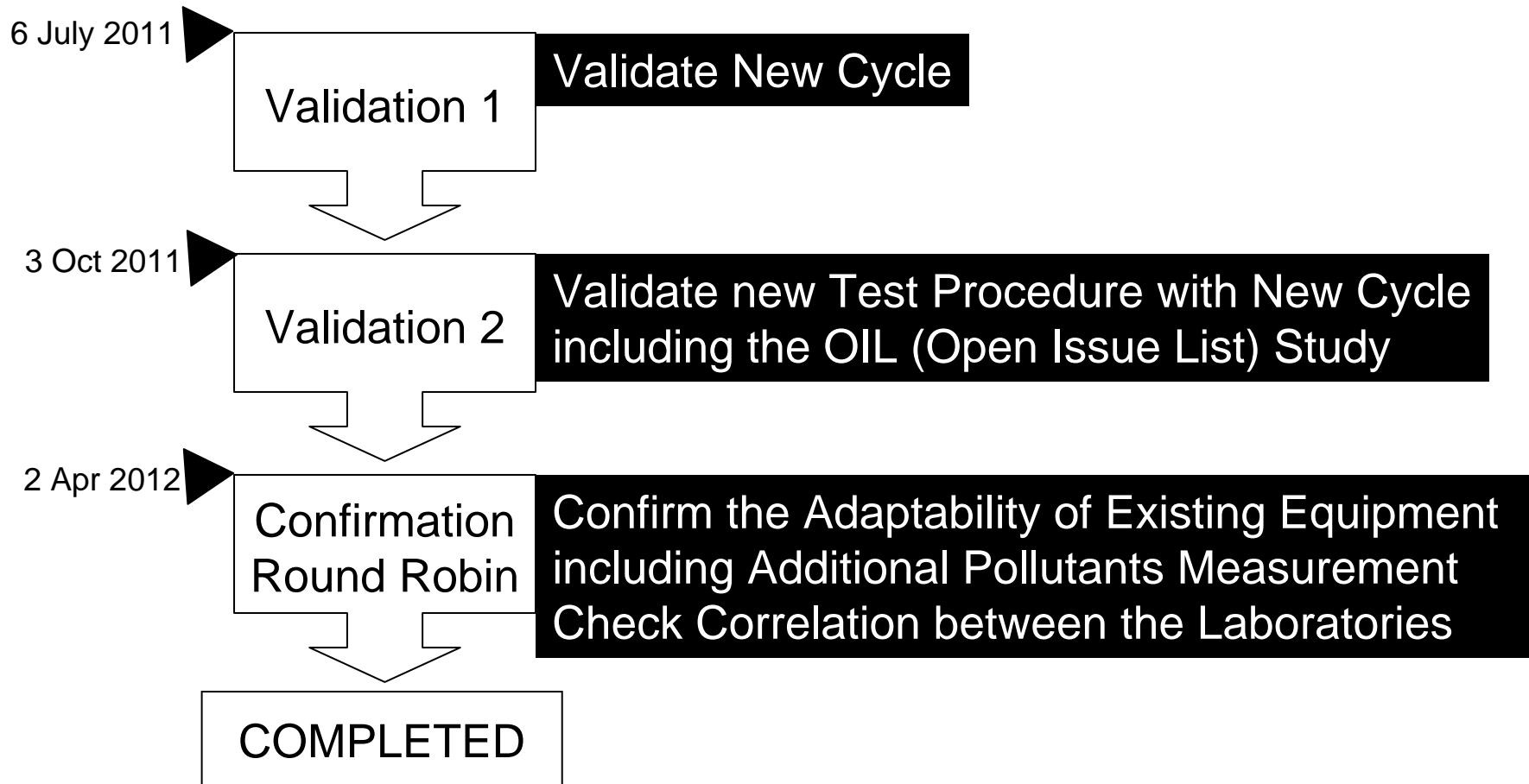
B : BAD, W : WORSE, C : CRITICAL

Option	Testing burden	Investment (hard and/or soft)	measurement item	Low concentration pollutants	Regional WF (weighting factor)	Others (if necessary)
1						
2						
3						
4						
5						
6						

Need to study on each option.
Expect to get agreement before starting validation test 2

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5.1. Validation - Over View -



Before start each test,

preparation phase is necessary taking into account of the followings

- 1) Test plan,
- 2) Participant CPs, Laboratories,
- 3) Vehicle Procurement
- 4) Measurement Items,
- 5) Test Criteria,
- 6) others.

5.2. Test Plan for Validation 1 (1)

(1) Participant CP and/or Laboratories

Contracting Parties	Laboratories
Japan	NTSEL, JARI, JAMA
Korea	
Europe	JRC, UTAC
OICA	ACEA, JAMA
others	

(2) Test Vehicles (in Japan) and Test Conditions

Fuel	power to mass ratio	Sales volume	Transmission
Petrol	Low end (20~40 kW/t) : Passenger & Truck	within Top 5 sales	at least 1 vehicle
Diesel	High end (100 kW/t or more) : Passenger		
HEV/EV	Not must during validation 1 phase		

Test Conditions

Cold Start Test : LOW and MIDDLE phases

Hot Start Test : ALL phases

5.2. Test Plan for Validation 1 (2)

(3) Measurement Items and Test Criteria

of tests : at least 3 times

Measurement Items	Methods	Criteria
Driving Trace (each mount)	Driving index by SAE J2951 Driven roller counter(10Hz or more) Acceleration ratio	+/- 3%
Tire Speed	Difference between roller speed and tire speed	No slip
Gear Shift Points	Appropriate shift point Clutch off point	+/- 3kph within +/-1sec
Accel Pedal Angle	Positional Sensor	TBD
Difference of Test Drivers	Drive Trace Questionnaire	TBD
* Pollutants - CO2 - (each phase)	Bag (& continuous) sampling	NA
* Pollutants - others - (each phase)	Bag (& continuous) sampling	NA

*) NOT MUST

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7. Next Actions

