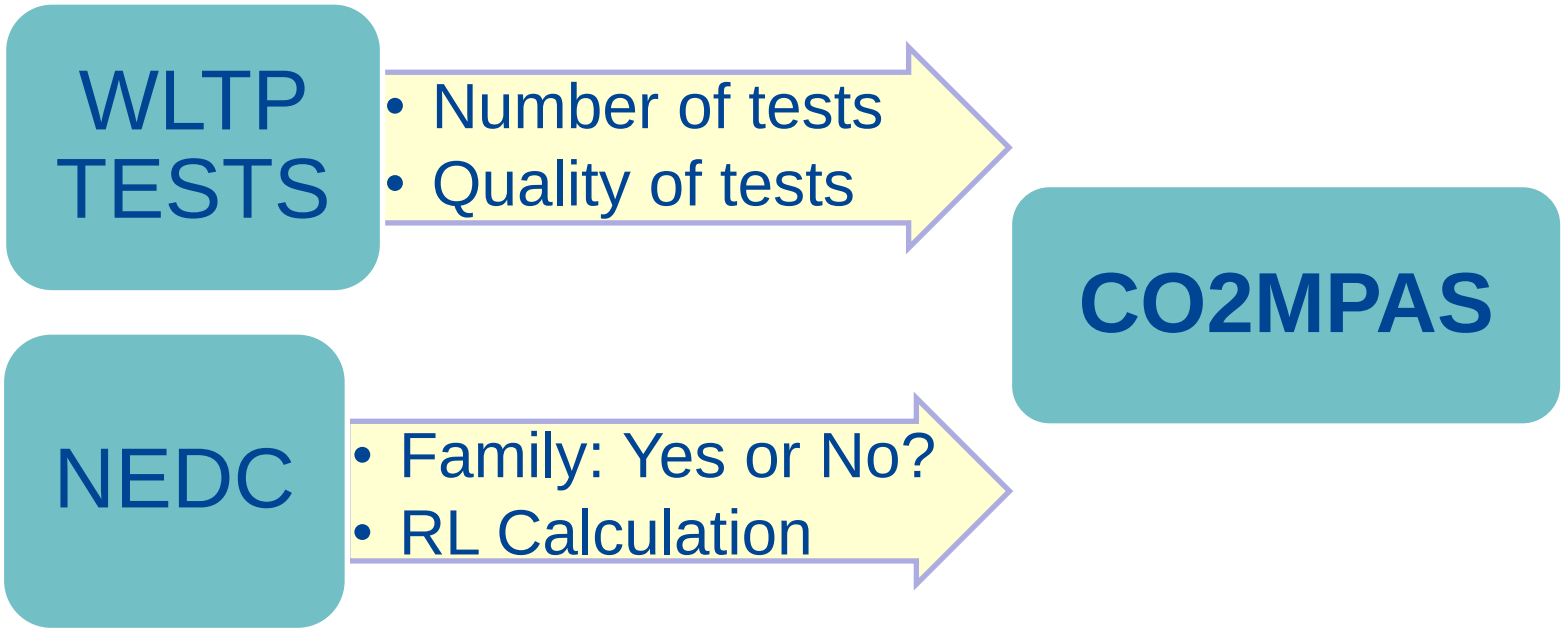
European Commission

STEPS BEFORE RUNNING CO2MPAS

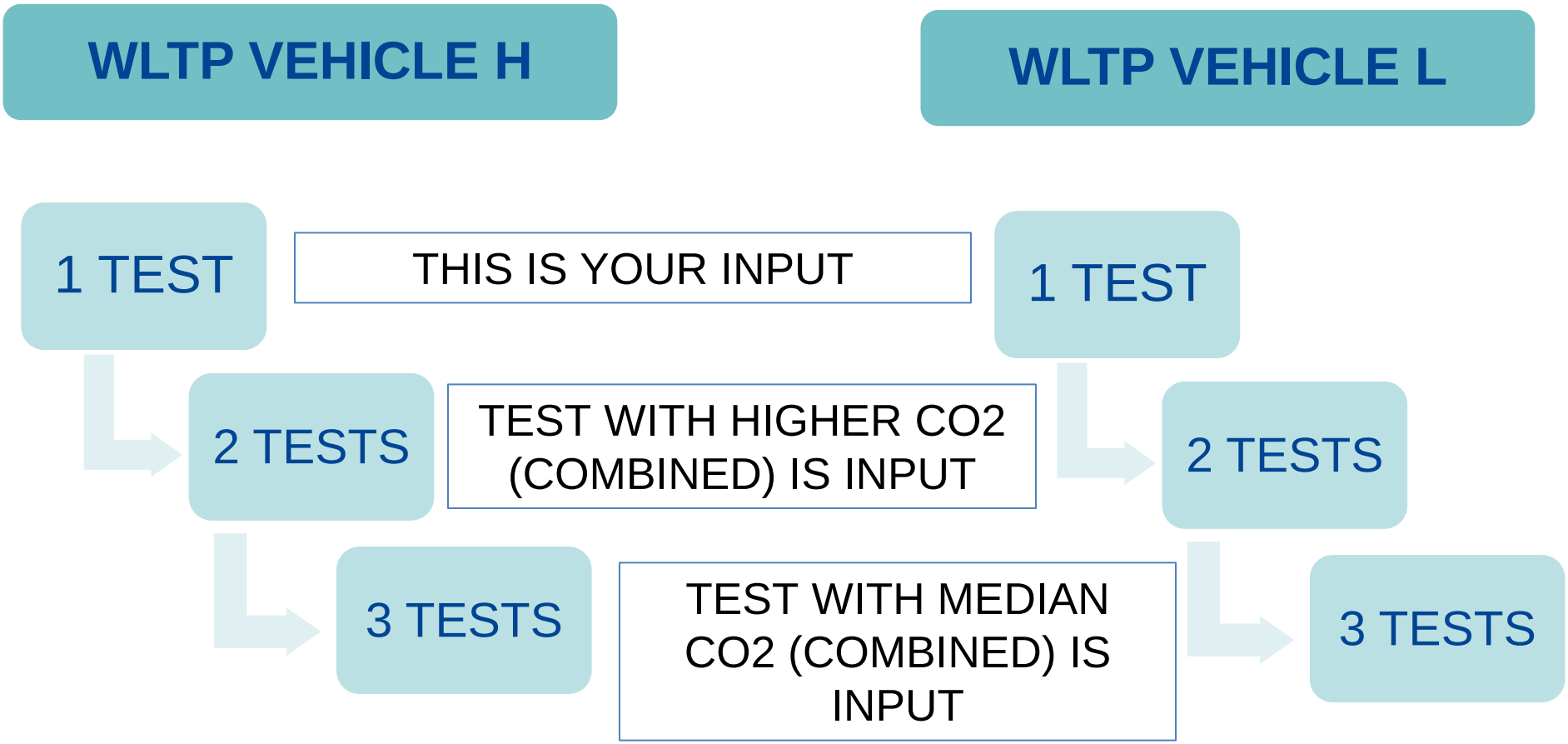
2nd workshop with OEMs
Ispra, December 12-13, 2016

Joint Research Centre

STEPS THAT WILL BE DISCUSSED



WLTP – NUMBER OF TESTS



WLTP – QUALITY OF DATA

WLTP VEHICLE H

1 TEST

2 TESTS

3

WLTP VEHICLE L

ST

2 TESTS

3 TESTS

NEVER MIX BAG RESULTS OF ONE WLTP TEST WITH TIME-SERIES SIGNALS FROM ANOTHER WLTP TEST

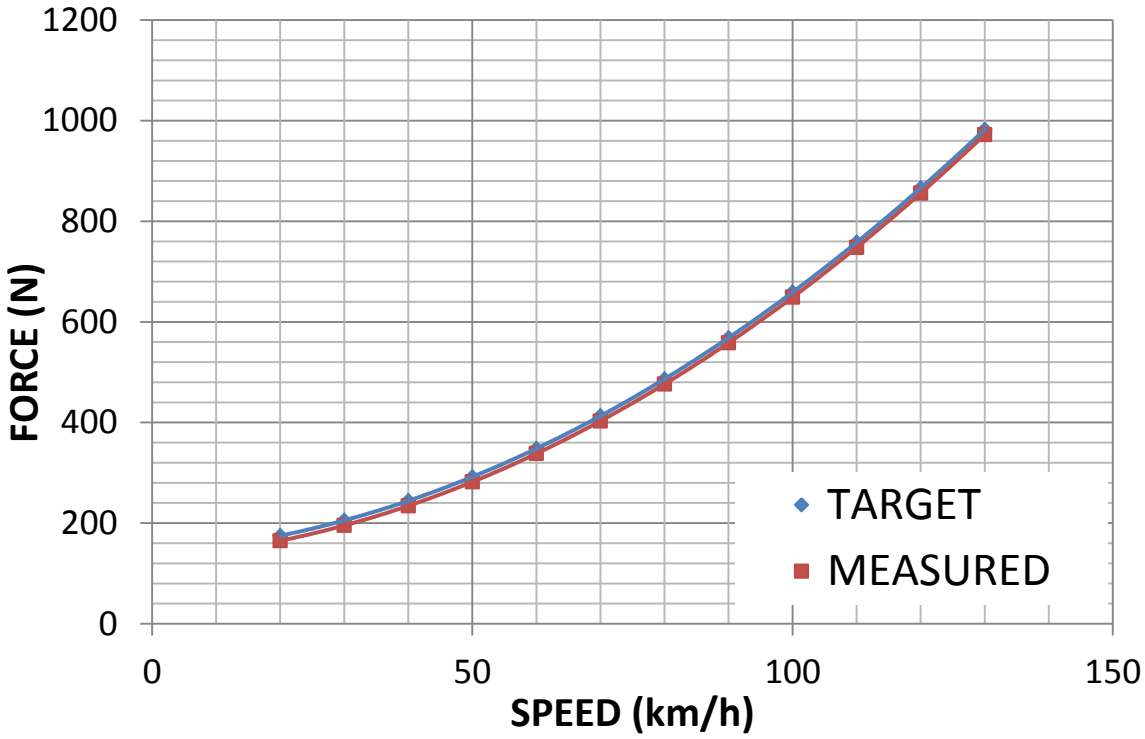
WLTP – QUALITY OF TESTS

- Make sure that WLTP tests are carried out fully compliant with WLTP requirements, for example:
  - Preconditioning is performed day before and battery is not charged overnight;
  - WLTP Road Loads are transferred to dyno with accuracy prescribed with new regulation (±10N)
  - Vehicle is soaked minimum 6 hours at 23ºC±3ºC and engine oil and coolant temperature shall be 23ºC±2ºC at the start of the test;
  - Rotational mass is correctly applied to the road load and for inertia setting

WLTP - DYNO RL SETTING ACCURACY

WLTP	TARGET	MEASURED
F0 (N)	139.88	129.88
F1 (N/km/h)	0.892	0.892
F2 (N/(km/h)^2)	0.04298	0.04298

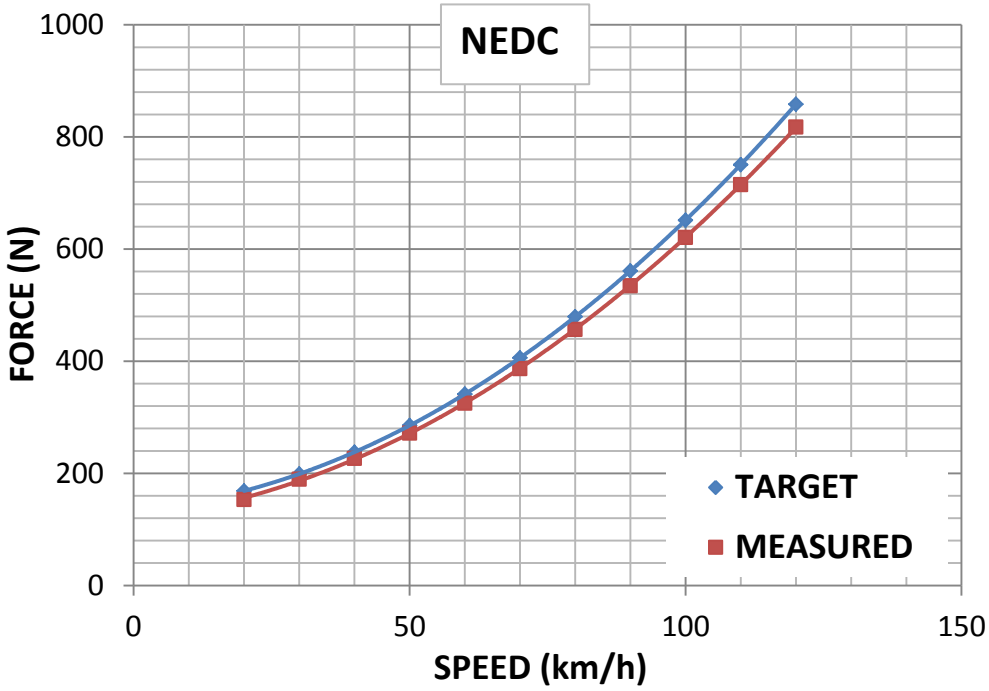
WLTP allows ±10N tolerance in setting dyno RLs = APPLIED RLs can be lower by 10N compared to TARGET



NEDC - DYNO RL SETTING ACCURACY

NEDC	TARGET	MEASURED
F0 (N)	133.88	119.54
F1 (N/km/h)	0.879	1.049
F2 (N/(km/h)^2)	0.04298	0.03966

NEDC allows ±5%* time tolerance in setting dyno RLs
=> APPLIED time can be higher by 5% compared to TARGET time
=> APPLIED forces lower than TARGET forces



*±10% for the lowest reference speed (20km/h)

DYNO RL SETTING ACCURACY – FINAL EFFECT

NEDC	TARGET	MEASURED	
F0 (N)	133.88	119.54	
F1 (N/km/h)	0.879	1.049	
F2 (N/(km/h)^2)	0.04298	0.03966	
WLTP	TARGET	MEASURED	
F0 (N)	139.88	129.88	
F1 (N/km/h)	0.892	0.892	
F2 (N/(km/h)^2)	0.04298	0.04298	
	TARGET	**MEASURED**	**DECLARED**
CO2MPAS RESULT	122.12	119.42	117
CO2MPAS DEVIATION (%)	**4.38**	**2.07**	

The effect can be even higher and we saw also some tests where it can be more than 5%

NEDC FAMILY – YES OR NO?

1. WLTP ONLY VEHICLE H	→ NEDC ONLY VEHICLE H	• All vehicles will have one NEDC H value
2. WLTP VEHICLE H AND L	→ NEDC ONLY VEHICLE H	• Situation with one body shape and one option for tire
3. WLTP VEHICLE H AND L	→ NEDC VEHICLE H AND L	• NEDC will have interpolation family

NEDC Calculation of RLs and Inertia

INPUTS	
MRO-L (kg)	1000
MRO-H (kg)	1100

WLTP-L	
Test Mass -L (kg)	1200
F0* -L (N)	110
F1* -L (N/km/h)	0.400
F2* -L (N/(km/h)2)	0.03000
F2a* -L (N/(km/h)2)	0.03200

WLTP-H	
Test Mass -H (kg)	1400
F0 -H (N)	130
F1 -H (N/km/h)	0.400
F2 -H (N/(km/h)2)	0.03400
F2a* -H (N/(km/h)2)	0.03300
TIRE PRESSURE	
Pmin-H	2
Pmax-H	3
Pmin-L	2
Pmax-L	3

$$RM_{n,L} = (MRO_L - 75 + 100)[kg]$$

$$RM_{n,H} = (MRO_H - 75 + 100)[kg]$$

$RM_{N,L}$ = 1000 – 75 + 100 = 1025 kg
and from Regulation 83 it corresponds to inertia of **1020 kg**

Joint Research Centre

NEDC Calculation of F_0

CO2MPAS

$$F_{0n,L} = F_{0w,L} \cdot \left(\frac{RM_{n,L}}{TM_{w,L}}\right) \cdot \left(\frac{P_{avg,L}}{P_{min,L}}\right)^{-0,4} \cdot \frac{1.015}{1.03} - \left(2 \cdot \frac{0.1 \cdot RM_{n,L} \cdot 9.81}{1000}\right) - 6\,N$$

PHYSICAL TESTS

$$F_{0n,L} = F_{0w,L} \cdot \left(\frac{RM_{n,L}}{TM_{w,L}}\right) \cdot \left(\frac{P_{avg,L}}{P_{min,L}}\right)^{-0,4} \cdot \frac{1}{1.03} - \left(2 \cdot \frac{0.1 \cdot RM_{n,L} \cdot 9.81}{1000}\right)$$

Inertia

Tire pressure

Rotational mass

Tire tread

Precond

NEDC Calculation of F_1 and F_2

CO2MPAS

$$F_{1n,L} = F_{1w,L} \cdot \frac{1.015}{1.03}$$

$$F_{2n,L} = F_{2w,L} \cdot \frac{1.015}{1.03}$$

PHYSICAL TESTS

$$F_{1n,L} = F_{1w,L} \cdot \frac{1}{1.03}$$

$$F_{2n,L} = F_{2w,L} \cdot \frac{1}{1.03}$$

When WLTP RLs are measured with coast down or wind tunnel methods these formulas for NEDC RL calculations apply.

NEDC Calculation of default RLs

CO2MPAS

$$F_{o\,n,L} = T_{o\,n,L} + (F_{o\,w,L} - A_{w,L})$$

$$F_{1\,n,L} = F_{1\,w,L} - B_{w,L}$$

$$F_{2\,n,L} = T_{2\,n,L} + (F_{2\,w,L} - C_{w,L})$$

Dyno coefficients for WLTP tests

Tabulated NEDC dyno values

Target WLTP RLs

When for WLTP RLs are used default values (or RLMF) the following procedure for NEDC shall apply.

NEDC Calculation of default RLs

PHYSICAL TESTS

$T_{o\ n,L}$

$T_{2\ n,L}$

Tabulated NEDC dyno values

When for WLTP RLs are used default values (or RLMF) the following procedure for NEDC shall apply.

NEDC Physical Tests

- Make sure that NEDC tests are carried out fully compliant with correlation regulation, and especially:
  - That NEDC RLs are calculated as explained;
  - Set temperature for the tests is at 25ºC;
  - Battery is fully charged before the tests

Questions ?