EUROPEAN LIGHT-DUTY EURO 6 AND HEAVY-DUTY EURO VI EMISSIONS LEGISLATIONS

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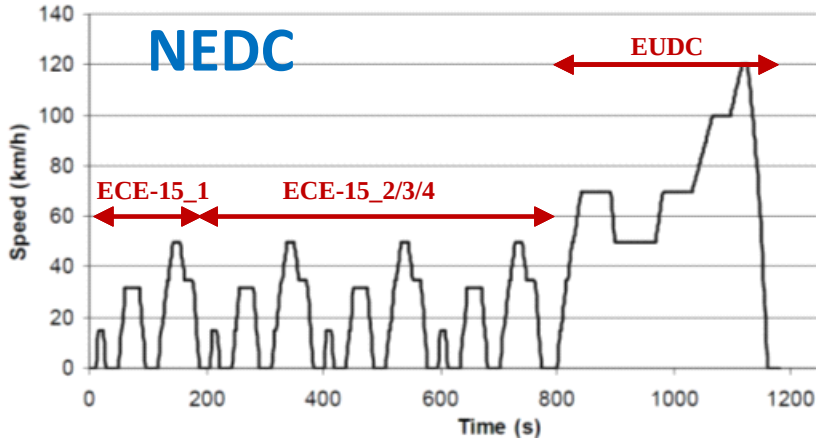
AECC
ASSOCIATION FOR EMISSIONS CONTROL BY CATALYST

AECC MEMBERS

European Emissions Control companies

Euro 6 legislation (EC) No 715/2007

Euro 6b: for all new vehicles since 1/9/2015

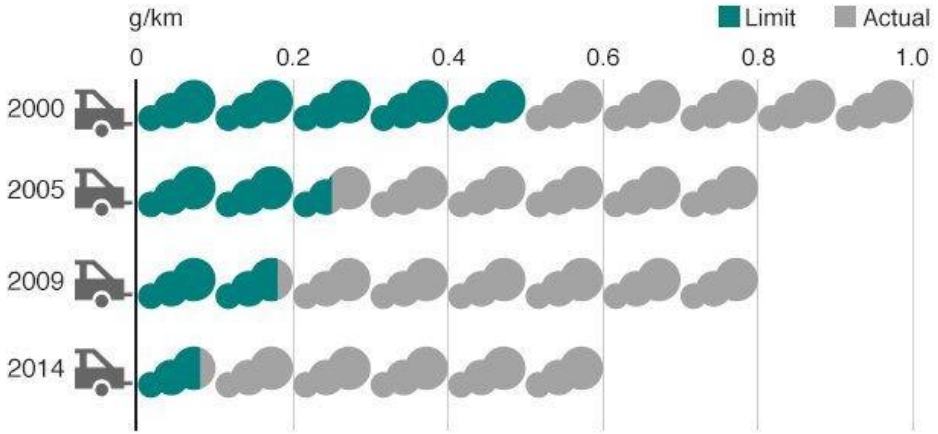


limits	THC mg/km	NMHC mg/km	NOx mg/km	NOx+HC mg/km	CO mg/km	PM mg/km	PN #/km
CI	-	-	80	170	500	4.5	$6*10^{11}$
PI	100	68	60	-	1000	$4.5^{(1)}$	$6*10^{11(1,2)}$

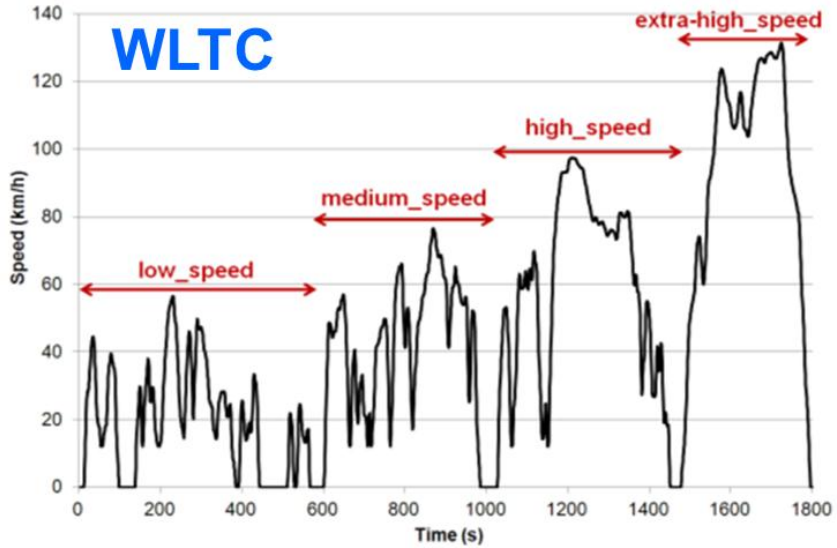
(1) GDI only (2) $6*10^{12}$ can be requested until 1/9/2017

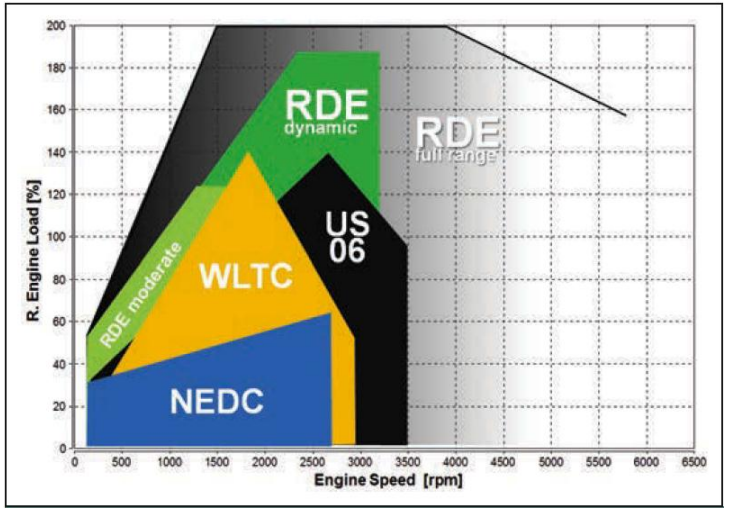
CI: Compression Ignition PI: Positive Ignition GDI: Gasoline Direct Injection

RDE & WLTP legislation to close the gap between lab and real world emissions



Source: the ICCT





Source: AVL

Euro 6 implementation dates

EURO 6C

- final PN limit for GDI and WLTC
- Apply for M1 & N1 Class I from 1 September 2017 (New Types) and 1 September 2018 for all vehicles.
- Apply to N1 Classes II & III and N2 from 1 September 2018 (New Types) and 1 September 2019 (all new vehicles)

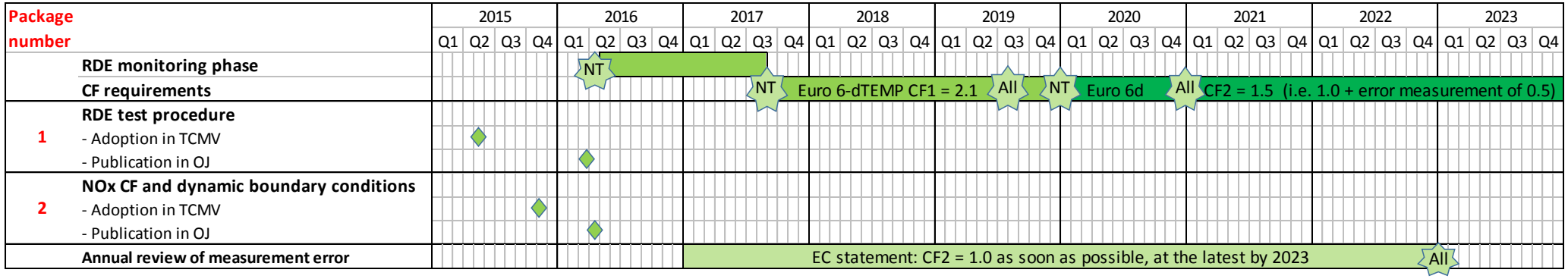
EURO 6D-TEMP

- RDE (NOx CF step 1, PN TBC)
- Apply for M1 & N1 Class I from 1 September 2017 (New Types) and 1 September 2019 for all vehicles.
- Apply to N1 Classes II & III and N2 from 1 September 2018 (New Types) and 1 September 2020 (all new vehicles)

EURO 6D

- RDE (NOx CF step 2, PN TBC)
- Apply for M1 & N1 Class I from 1 January 2020 (New Types) and 1 January 2021 for all vehicles.
- Apply to N1 Classes II & III and N2 from 1 January 2021 (New Types) and 1 January 2022 (all new vehicles)

Published Euro 6 RDE packages 1&2



- NTE limit = Euro 6 limit x CF
  - Conformity Factor (CF) defined for NOx
  - Error margin to be reviewed annually
- CF applies to urban and total RDE
- Portable Emissions Measurement Systems (PEMS) used; results post-processed with normalisation tools

NTE: Not To Exceed
CF: Conformity Factor
NT: New Type Approval
All: All new vehicles
TCMV: Technical Committee – Motor Vehicles
OJ: Official Journal
EC: European Commission

Expected Euro 6 RDE packages 3&4

Package number		2015				2016				2017				2018				2019				2020				2021				2022				2023			
		Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
	PN CF requirements TBC																																				
3	**Definition on PN procedure and CF + cold-start + vans + hybrids** - Adoption in TCMV - Publication in OJ								◆	◆																											
4	**Definition of In-Service Conformity testing** - Adoption in TCMV - Publication in OJ											◆	◆																								

Agreed
Expected

NT New types

All All new vehicles

- RDE package 3
  - Procedure and CF for Particulate Number (PN)
  - Cold-start RDE
  - Light commercial vehicles (LCVs) and hybrids
- RDE package 4: Definition of In-Service Conformity testing

NTE: Not To Exceed
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All: All new vehicles
TCMV: Technical Committee – Motor Vehicles
OJ: Official Journal
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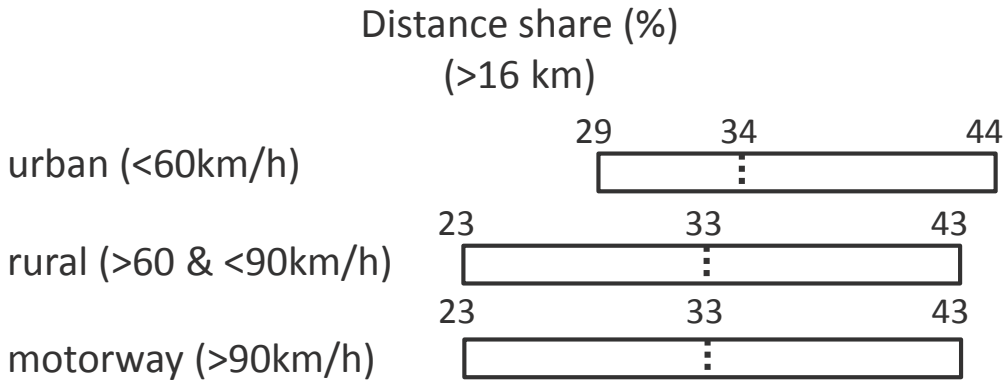
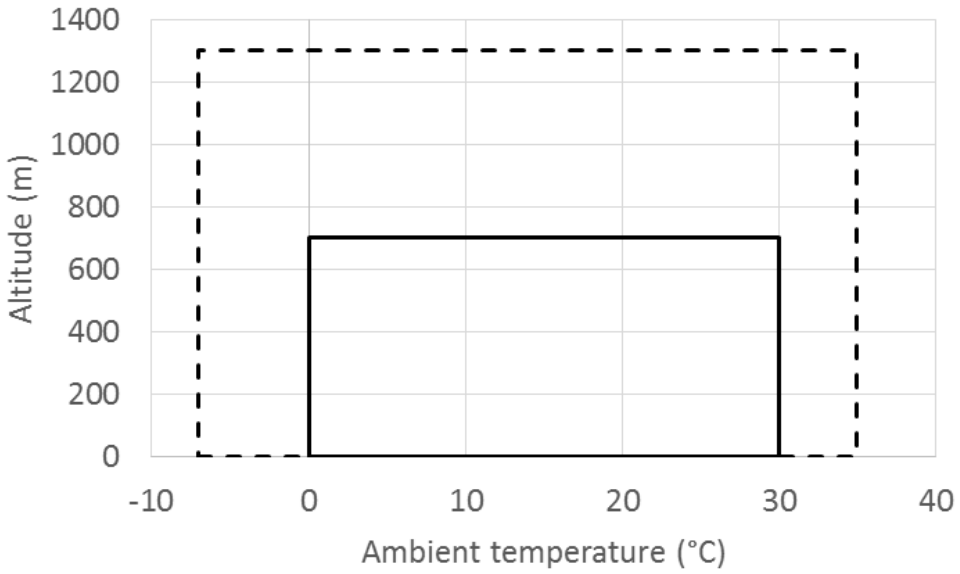
LCVs: Light Commercial Vehicles

Different RDE boundary conditions define normal driving

- Route criteria



- Ambient conditions



moderate boundary

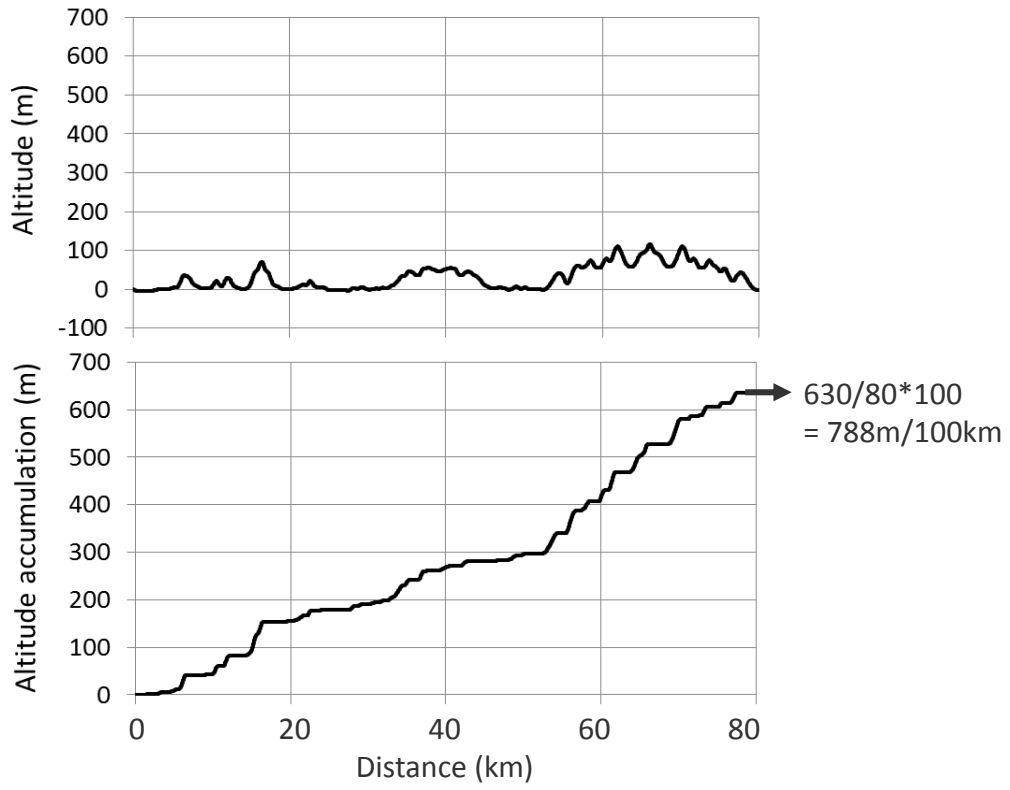
extended boundary

Higher emissions allowed (measured values divided by 1.6)

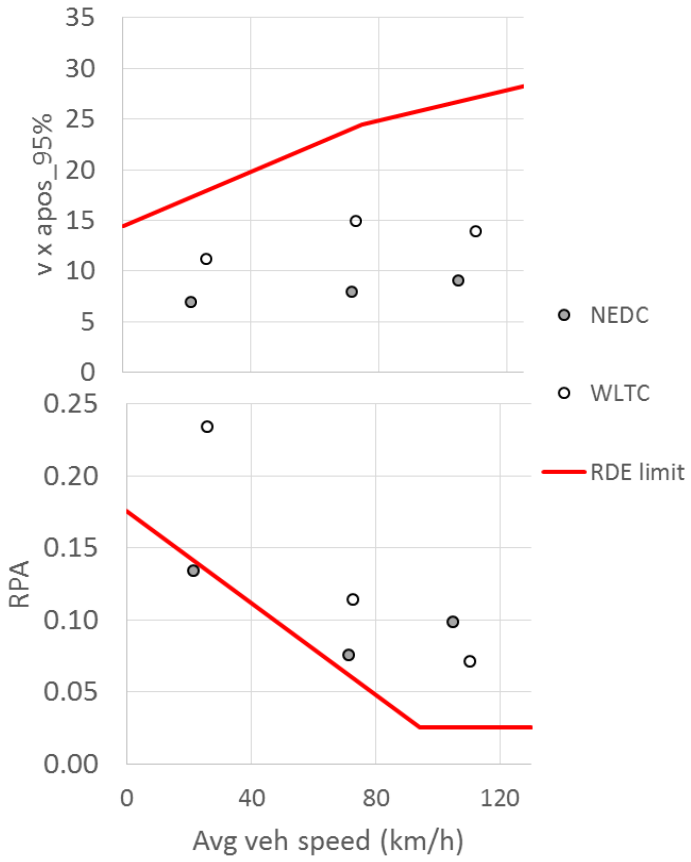
Different RDE boundary conditions define normal driving

- Dynamic conditions

Altitude accumulation (<1200m/100km)



excess or absence of driving dynamics



Heavy-duty Euro VI (EC) 595/2009

- Emission limits

	Limit values							
	CO (mg/kWh)	THC (mg/kWh)	NMHC (mg/kWh)	CH_4 (mg/kWh)	NO_X (1) (mg/kWh)	NH_3 (ppm)	PM mass (mg/kWh)	PM number (#/kWh)
WHSC (CI)	1 500	130			400	10	10	$8{,}0 \times 10^{11}$
WHTC (CI)	4 000	160			460	10	10	$6{,}0 \times 10^{11}$
WHTC (PI)	4 000		160	500	460	10	10	(2) $6{,}0 \times 10^{11}$

- HD Type Approval uses worldwide harmonised cycles
- Off-cycle emission testing is included (CI only)
- Gaseous PEMS testing (CF=1.5)
  - demonstration test at type approval
  - In-Service Conformity testing
- PEMS currently not for PM&PN but PEMS-PN pilot programme has started
- Procedure for accelerated ageing to be used for approval of replacement pollution control devices

THANK YOU!

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BACKUP

Real Driving Emissions (RDE)

- Additional test, initially at Type Approval, using Portable Emissions Measurement Systems (PEMS) in real driving.
- Data analysis using EMROAD and CLEAR ‘normalisation’ tools.
- Conformity Factors (CF) set for NOx and PN. CF = Not-To-Exceed emissions / Euro 6 limit.
- Covers NOx for all Euro 6 vehicles (passenger cars and light-commercial vehicles).
- PN for Diesel and Gasoline Direct Injection Euro 6 vehicles.
- CO to be measured and recorded but no CF set.
- Cold start (until coolant has reached 70°C, max. 5 minutes) emissions to be recorded but excluded from evaluation until specific requirements are introduced.
- Technical specification for PEMS PN not yet complete.

RDE dynamic conditions

- Trip duration: 90-120 minutes.
- Ambient conditions: 0-30ºC (-7 to +35ºC for ‘extended’ conditions).
- Altitude: 0-700 m (can be 1300 m for ‘extended’ conditions).
- A 60% allowance applies to emissions in ‘extended’ conditions.
- Urban (0-60 km/h), rural (60-90 km/h) and motorway (>90 km/h); driving in that order; at least 16 km each.
  - Motorway speed >100 km/h for at least 5 min.
  - Maximum vehicle speed 145 km/h (up to 160 km/h allowed for max. 3% of the motorway duration).
  - 15-40 km/h average speed in urban. Urban driving must include several stops > 10 s (but not as one long stop).

RDE dynamic conditions

- Auxiliary devices (such as air conditioning) shall be operated in a way compatible with real driving on the road.
- If regeneration occurs, the RDE test may be voided and repeated once regeneration is completed.