

EXPERT PANEL FOR POLLUTING EMISSIONS REDUCTION EXPAPER

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Sessione 2: Sperimentazioni con veicoli verdi e normativa Sul nuovo standard Euro 7

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Nuova norma Euro 7 proposta dalla Commissione

La **Commissione Europea** ha presentato lo scorso 10 novembre 2022 la proposta per la definizione degli **standard Euro 7** per la riduzione delle emissioni inquinanti generate dai veicoli e in generale dal trasporto su strada.

I nuovi parametri di emissione fissati dalla norma Euro 7 faranno in modo che autovetture, furgoni, autocarri e autobus siano molto più puliti in condizioni di guida reali che meglio riflettono la situazione nelle città, dove i problemi di inquinamento atmosferico sono più gravi, e per un periodo molto più lungo rispetto alle norme vigenti.

La proposta contempla sia le emissioni prodotte dagli scarichi sia quelle generate da freni e pneumatici (NEE - Non-Exhaust Emissions), e contribuisce inoltre al rispetto delle nuove e più rigorose norme in materia di qualità dell'aria proposte dalla Commissione il 26 ottobre 2022.

La proposta della Commissione deve passare ora al Parlamento Europeo ed al Consiglio per l'approvazione finale e la successiva adozione da parte dei Paesi membri.

[Nuova norma Euro 7 proposta dalla Commissione \(europa.eu\)](https://ec.europa.eu/commission/presscorner/detail/it/ip_22_6495)

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Le nuove prescrizioni basate sulla norma Euro 7

La proposta sostituisce e semplifica le norme in materia di emissioni nelle quali era in precedenza operata una distinzione tra autovetture e furgoni (Euro 6) e autocarri e autobus (Euro VI).

Le disposizioni della norma Euro 7 prevedono limiti di emissione per tutti i veicoli a motore, vale a dire autovetture, furgoni, autobus e autocarri, riuniti in un unico contesto normativo.

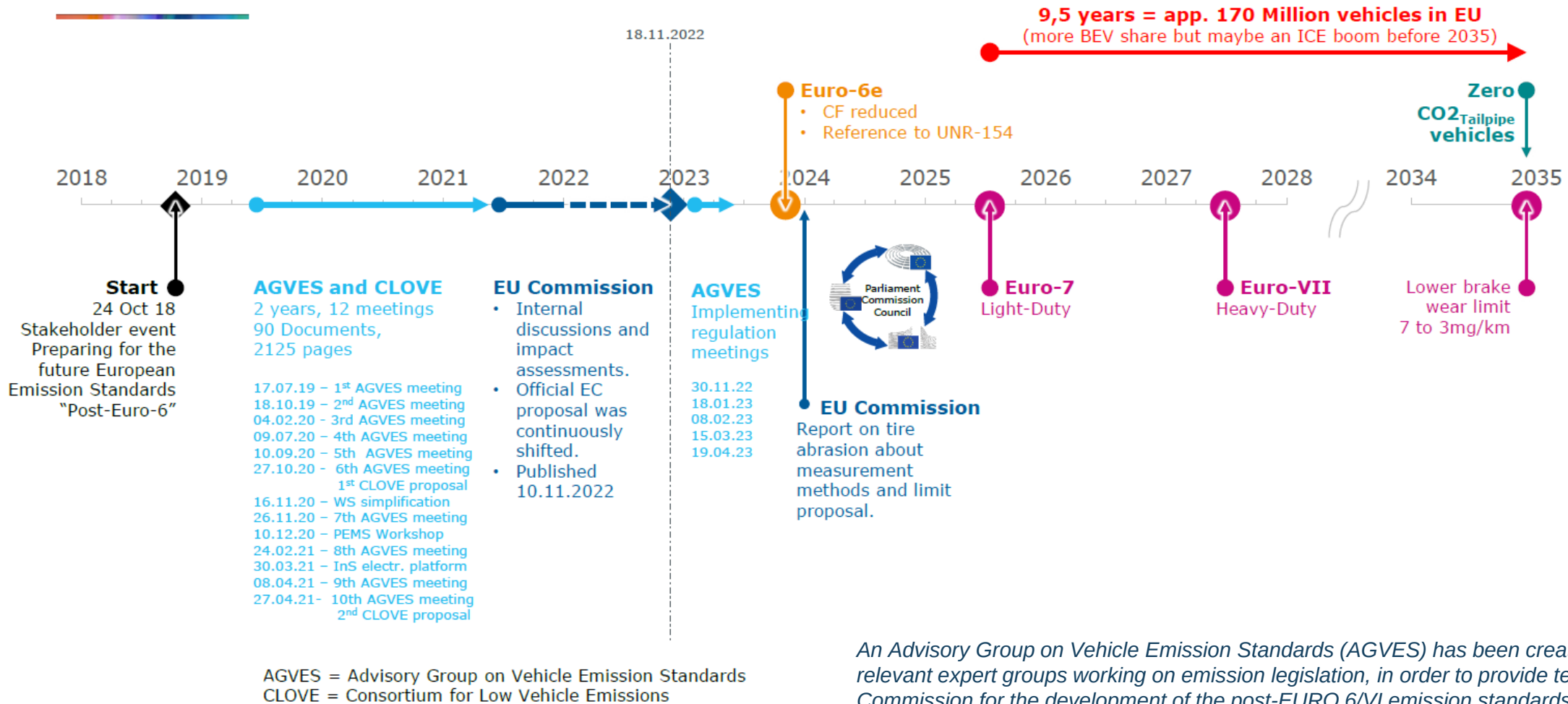
Le disposizioni della nuova norma, che sono neutre dal punto di vista dei carburanti e della tecnologia e fissano gli stessi limiti indipendentemente dal fatto che il veicolo utilizzi benzina, diesel, propulsione elettrica o combustibili alternativi.

[Nuova norma Euro 7 proposta dalla Commissione \(europa.eu\)](https://ec.europa.eu/commission/presscorner/detail/it/ip_22_6495)

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Le nuove prescrizioni basate sulla norma Euro 7

Euro-7/VII - Timeline



An Advisory Group on Vehicle Emission Standards (AGVES) has been created by joining all the relevant expert groups working on emission legislation, in order to provide technical advice to the Commission for the development of the post-EURO 6/VI emission standards for motor vehicles.

Le nuove prescrizioni basate sulla norma Euro 7

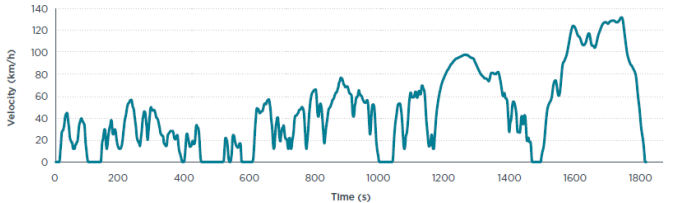
La attuale norma Euro 6 (o VI per Heavy-Duty) prevede:

- una prova in laboratorio con veicolo (ciclo WLTP) o motore con limiti fissati e diversi per tipologia (accensione comandata o per compressione).

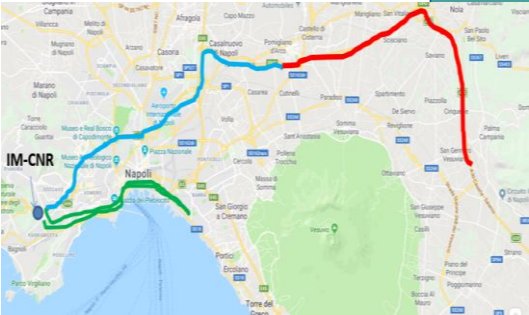
- test **RDE**, Real Driving Emission, una prova su strada con limiti calcolati tramite dei Fattori di Conformità rispetto a quelli previsti da Euro 6 (o VI) nella prova in laboratorio

$$NTE_{pollutant} = CF_{pollutant} \times EURO-6$$

Table 1Summary of RDE conformity factors			
	NOx CF	PN CF	CO
Euro 6d-TEMP	2.1	1.5	CO is to be measured and recorded
Euro 6d	1.43 = 1 + margin, margin = 0.43	= 1 + margin PN, margin PN = 0.5	
Euro 6e	1.10 = 1 + error margin of 0.10	1.34 = 1 + error margin of 0.34	



DURATA TOT PERCORSO		Tra 90 e 120 minuti
DISTANZA	Guida urbana	Più di 16 km
	Guida extraurbana	Più di 16 km
	Guida in autostrada	Più di 16 km
COMPOSIZIONE PERCORSO	Guida urbana	29-44% della distanza
	Guida extraurbana	29-49% della distanza
	Guida in autostrada	29-49% della distanza
VELOCITÀ MEDIE	Guida urbana	16-40 km/h
	Guida extraurbana	60-90 km/h
	Guida in autostrada	Più di 90 km/h (più di 100 km/h per almeno 5 minuti)
CARICO		≤ 90% del peso massimo del veicolo
ALTITUDINE	Moderata	0-700 m sul livello del mare
	Estesa	700-1300 m sul livello del mare
DIFFERENZA DI ALTITUDINE		Non più di 100 m di differenza di altitudine tra il punto di partenza ed il punto di arrivo del percorso di prova
AUMENTO DI ALTITUDINE CUMULATIVO		1200 m / 100 km
TEMPERATURA AMBIENTE	Moderata	0-30° C
	Estesa	Da - 7 a 0° C, da 30 a 35° C
PERCENTUALE SOSTE VELOCITÀ MASSIMA		8-30% della durata della guida urbana. 145 km/h (160 km/h per il 8% della guida in autostrada)
UTILIZZO DI SISTEMI AUSILIARI		Liberamente utilizzabili, così come su strada (compresi ad esempio sistemi start&stop)



- percorso urbano
- percorso extra-urbano
- percorso autostradale

Le nuove prescrizioni basate sulla norma Euro 7

TEST SU AUTO

ANNEX V APPLICATION OF TEST REQUIREMENTS AND DECLARATIONS		
Table 1: Application of test requirements and declarations for M ₁ , N ₁ vehicles for vehicle type approval		
Test requirements	Tests and requirements at initial emission type approval	Tests and requirements at production
	Gaseous pollutants and PN in road testing (RDE)	Required demonstration test for all fuels for which the type approval is granted and declaration of compliance for all fuels, all payloads and all applicable vehicle types
	Gaseous pollutants, PM and PN in RDE cycles in the laboratory and CO ₂ emissions, fuel consumption (OBFCM), electric energy consumption and electric range (Battery Durability) (WLTP at 23 °C)	Required where all pollutants cannot be measured on the road
	CO ₂ ambient temperature correction (WLTP at 14°C)	Declaration ⁶
	Crankcase emissions	Declaration that a closed crankcase system or routing to the tailpipe is installed ⁶

Original Document of EU Commission proposal for Euro-7, 10.11

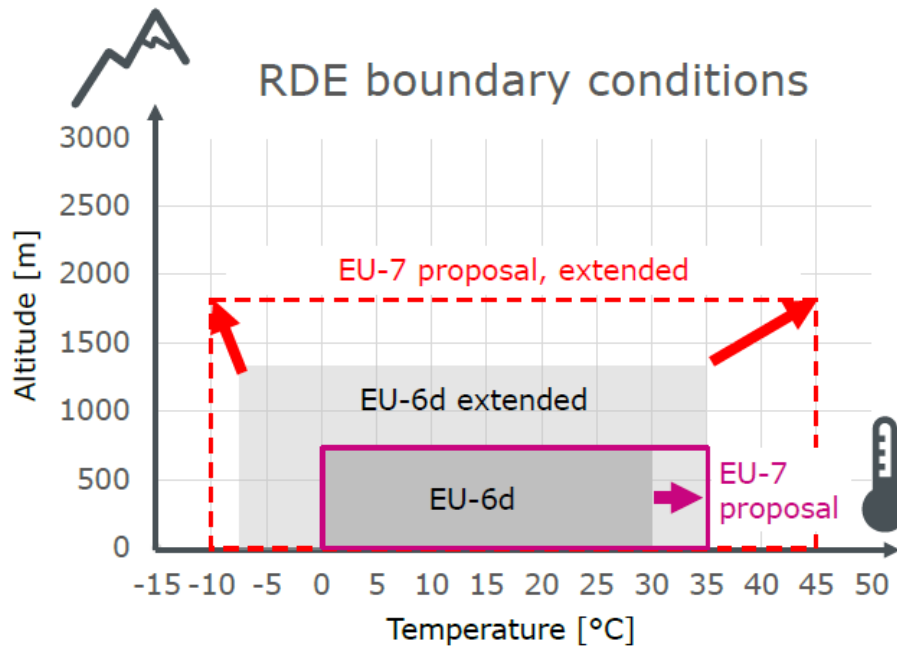
TEST SU MEZZI PESANTI

Table 6: Application of test requirements and declarations for type-approval and production conformity for Member States and recognised third parties/Commission		
Test requirements for each fuel	Tests and requirements at initial emission type approval	Tests at conformity production
	Relevant actor	Type approval authority for issuing the type approval
Gaseous pollutants, PM and PN and CO ₂ emissions, fuel consumption on transient cycle (WHTC Cold and Hot)	Required on the parent engine and a declaration for all family members**	Audit or optional tests

Table 3: Application of tests, declarations and other requirements for type-approval and production conformity for manufacturers		
Test requirements	Tests and requirements at initial emission type approval	Tests at conformity production
	Gaseous pollutants, PM and PN in road testing (RDE) for each fuel and for the applicable vehicle categories (M ₂ , M ₃ , N ₂ and N ₃) and low load test (if applicable)	Required demonstration tests for all fuels for which the type approval is granted per vehicle type and a declaration of compliance for all fuels, all payloads and all applicable vehicle types
CO ₂ and fuel/energy consumption, emission/electric zero range determination of a vehicle	VECTO licence	For conformity production

Le nuove prescrizioni basate sulla norma Euro 7

Criteria Emissions: RDE testing Euro-7/VII proposals



EU-6d	EU-7 EC proposal	EU-VII EC proposal
CF $CF_{NOx} = 1,43$ $CF_{PN23nm} = 1,5$	CF=1	
CO ₂ , CO, NO _x , PN _{23nm}	CO ₂ , CO, NO _x , THC, NMHC (CH ₄), NH ₃ , PN _{10nm}	CO ₂ , NO _x , CO, THC, NMOG, CH ₄ , N ₂ O, NH ₃ , HCHO, PN _{10nm} , PM
Max. Speed ≤145km/h ≤160km/h extended	Max. Speed ≤145km/h ≤160km/h extended	
Duration, min distance 20.8	any	
34% 33% 33%	as per normal use	
Avg, max accel., ...	as per normal use	
	 Towing is extended RDE	

For all extended RDE driving conditions an "Extended Driving Divider" of 1,6.

 Payload ≥ 10%
<10% is extended

I nuovi limiti della norma Euro 7: per auto (M1)

Component Candidates	Unit	EU-6d (M1)			Clove proposal 27.04.2021		EU Commission proposal 10.11.2022			Notes
		PI	CI	Testing	EU-7 (M1)		EU-7 (M1)		Testing	
CO2	mg/km	✓	✓	Lab + RDE	✓	-	✓		Lab	Needed for calculation, validation and for GHG legislation
CH4 + N2O	mg/km	-	-	-					-	
CO	mg/km	1000	500	Lab + RDE	400	-20%	500	0%	(Lab) + RDE	
NOx	mg/km	60	80	Lab + RDE	20...30	-50%	60	-30% (1)	(Lab) + RDE	CF 1,43 down to 1
THC	mg/km	100	-	Lab	25...45	-65%	100	0%	(Lab) + RDE	
NOx + THC		-	170	-					-	
CH4	mg/km	-	-	Lab	10	-	✓		-	No limit only needed for if there is a NMHC limit
NMHC	mg/km	68	-	-			68	0%	(Lab) + RDE	
Alcohols	mg/km	-	-	-					-	
NMOG	mg/km	-	-	-					-	
PM	mg/km	4,5	4,5	Lab	2	-55%	4,5	0%	Lab	
PN	#/km	6E+11	6E+11	Lab + RDE	1E+11	-89%	6E+11	-55% (1)	(Lab) + RDE	CF 1,43 to 1. PN _{23nm} → PN _{10nm} results in app. 50% higher results
N2O	mg/km	-	-	-	10	New			-	New pollutant - stratospheric ozone depletion
NH3	mg/km	-	-	-	10	New	20	New	(Lab) + RDE	New pollutant - secondary PM formation
HCHO	mg/km	-	-	-	5	New			-	No limit only needed if there is a NMOG limit
		EC 715/2007 as amended EC 692/2008			% lowest EU-6 to highest proposal					

Note ⁽¹⁾ (x%) represents the nominal limit number, (0%) -30% considers the also measurement modifications like Conformity Factor (CF) reduction and/or measuring more particle due to PN_{10nm}. A wider range of RDE test conditions is not considered, since it can hardly be quantified.

I nuovi limiti della norma Euro 7: per auto (M1)

ANNEX I EURO 7 EMISSION LIMITS

Table 1: Euro 7 exhaust emission limits for M₁, N₁ vehicles with internal combustion engine

Pollutant emissions	M ₁ , N ₁ vehicles	Only for N ₁ vehicles with power to mass ratio ¹ less than 35 kW/t	Emission budget for all trips less than 10 km for M ₁ , N ₁ vehicles	Emission budget for all trips less than 10 km only for N ₁ vehicles with power to mass ratio less than 35 kW/t
	<i>per km</i>	<i>per km</i>	<i>per trip</i>	<i>per trip</i>
NO _x in mg	60	75	600	750
PM in mg	4.5	4.5	45	45
PN ₁₀ in #	6×10 ¹¹	6×10 ¹¹	6×10 ¹²	6×10 ¹²
CO in mg	500	630	5000	6300
THC in mg	100	130	1000	1300
NMHC in mg	68	90	680	900
NH ₃ in mg	20	20	200	200

¹ Measured in accordance with paragraph 5.3.2. of UN/ECE Regulation No 85 in the case of ICEVs and PEVs, or, in all other cases, measured in accordance with one of the test procedures laid down in paragraph 6 of UN Global Technical Regulation 21

1

• Borderline between Light-Duty and Heavy-Duty for N₁/N₂ is a power to mass ratio of 35kW/t

2

• Emission Budget for the first 10km in mg/trip.
• Above 10km a limit in mg/km

I nuovi limiti della norma Euro 7: per veicoli pesanti (M2, M3, N2 e N3)

Component Candidates	Light-Duty	Unit	EU-VI Heavy-Duty M2, M3, N2 and N3			
			Cold emissions 100th percentile	Hot emissions 90th percentile	Emission Budget < 3xWHTC	Idle emission if no 5min automatic engine shut off
CO2	✓	mg/kWh	✓	✓		
CH4 + N2O		mg/kWh	-	-		
CO	✓	mg/kWh	3500	200	2700	
NOx	✓	mg/kWh	350	90	150	5000 mg/h
THC	✓	mg/kWh	-	-		
NOx + THC		mg/kWh	-	-		
CH4	✓	mg/kWh	500	350	500	
NMHC	✓	mg/kWh	-	-		
Alcohols		mg/kWh	Needed for NMOG	Needed for NMOG	Needed for NMOG	
NMOG		mg/kWh	200	50	75	
PM	✓	mg/kWh	12	8	10	
PN _{10nm}	✓	#/kWh	5E+11	2E+11	3E+11	
N2O		mg/kWh	160	100	140	
NH3	✓	mg/kWh	65	65	70	
HCHO		mg/kWh	30	30		

Le nuove prescrizioni basate sulla norma Euro 7

Evaporative Emission (EVAP) (Gasoline only)



Annex I, Table 3: **Euro 7 evaporative emission limits** for petrol fuelled M_1 , N_1 vehicles

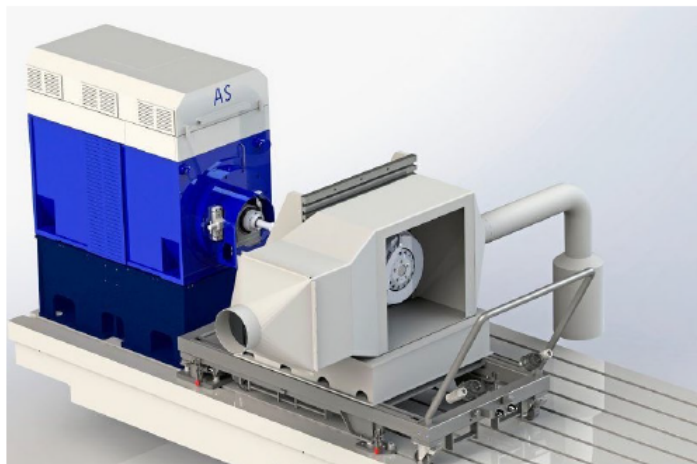
 Evaporative pollutant emissions (only gasoline)	M_1, N_1 with maximum mass up to 2650 kg	N_1 with maximum mass equal or more than 2650 kg
1. Hot soak + 2 day diurnal test	0.50 g at worst day + hot soak	0.70 g at worst day + hot soak
2. Refueling emissions	0.05 g/L of fuel	0.05 g/L of fuel

Challenges:

1. Reduced Hot-Soak and Diurnal limits might require app. 2 times larger canisters.
For conditioning drive cycle, a climatic chassis dyno for 38°C. Modified calculations
2. Refueling emission will require new test systems.

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Brake- and tire wear



Annex I, Table 4/5: Euro 7 brake Particle Emission limits in standard driving cycle

 Brake particle emissions	M ₁ , N ₁	M2, M3	N ₂ , N ₃
Brake particle (PM ₁₀) emissions per vehicle	7 mg/km 2035: 3 mg/km	-	
Brake particle (PN) emissions per vehicle	-	-	

Current vehicles are 2 to 3+ times above the limit (Round robin results)

AVL Test and measurement systems are already available

Annex I, Table 6: Euro 7 tyre Abrasion limits

Tyre Abrasion	M ₁ , N ₁	M2, M3	N ₂ , N ₃
Tyre Mass lost in g/1000km	-	-	-

Test procedure will be developed by UN-ECE, EU Commission to report on measurement method and limit proposal until end 2024

Le nuove prescrizioni basate sulla norma Euro 7

Battery durability and performance



Battery Durability of OVC-HEV and PEV		5 years or 100-000 km whichever comes first	Vehicles more than 5 years or 100 000 km, and up to whichever comes first of 8 years or 160 000 km	Vehicles up to additional lifetime
	Energy based battery capacity	80% (M1) / 75% (N1)	70% (M1) 65% (N1)	
	Electric Drive Range	?	-	

Le nuove prescrizioni basate sulla norma Euro 7

	Euro-7/VII Targets	EC proposals
1	• as clean as possible (Best Available Technology)	○
	• under "all EU" driving conditions	✓
2	• Significant reduction of limits	○
	• New emission components	✓
3	• Fuel and technology independent	✓
	• Harmonization between Light- and Heavy Duty	○
4	• New EVAP procedure	✓
	• Brake- and tire wear	✓
5	• On-Board Measurements (OBM)	✓
	• Simplification of type approval	✓

Based on the AVGES meetings and CLOVE proposal (2019 ... 2021).
EC Proposal Explanatory Memorandum (10.11.2022)

EC proposals
(10.11.2022)