

第二期

Euro 7: The new emission standard for light- and heavy-duty vehicles in the European Union


欧7：欧盟轻型车和重型车最新排放标准

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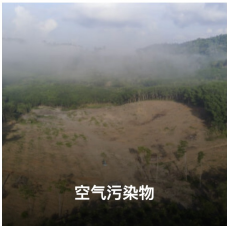
政策与策略



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新能源/电动汽车



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Work on Euro 7 started in early 2018

欧7标准的制定工作始于2018年

In 2019, we published two reports with ICCT's recommendations across three areas:

- Pollutants and their limits
- Testing procedures
- Enforcement

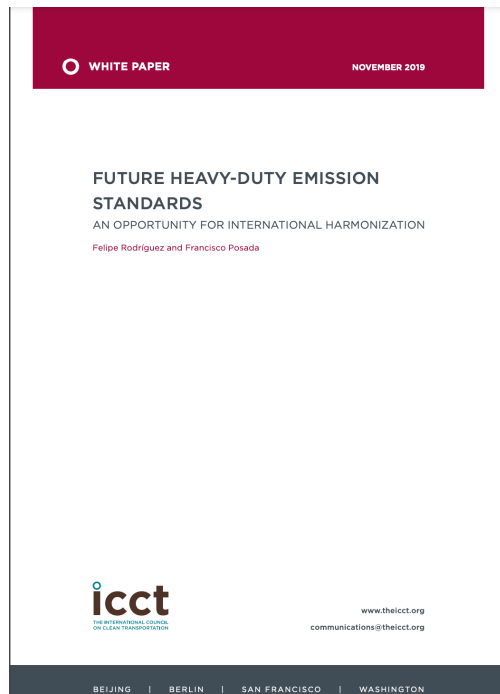
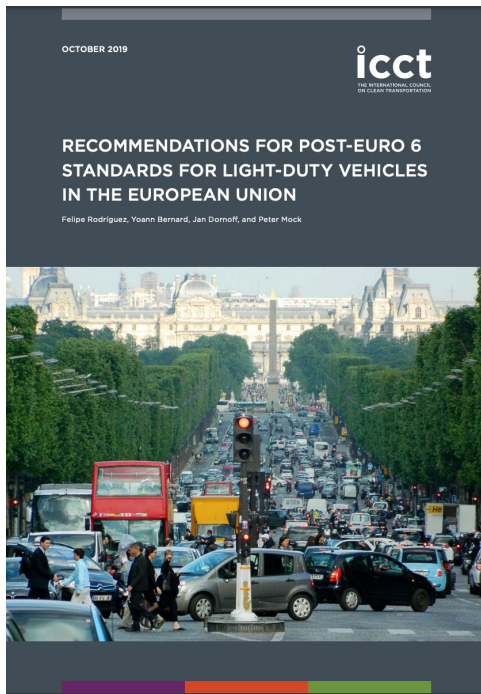
2019年，ICCT发布了两篇研究报告，从以下3个方面为欧7标准提出了建议：

- 管理污染物和限值
- 测试规程
- 实施监管

<https://theicct.org/publication/recommendations-for-post-euro-6-standards-for-light-duty-vehicles-in-the-european-union/>

<https://theicct.org/publication/future-heavy-duty-emission-standards-an-opportunity-for-international-harmonization/>

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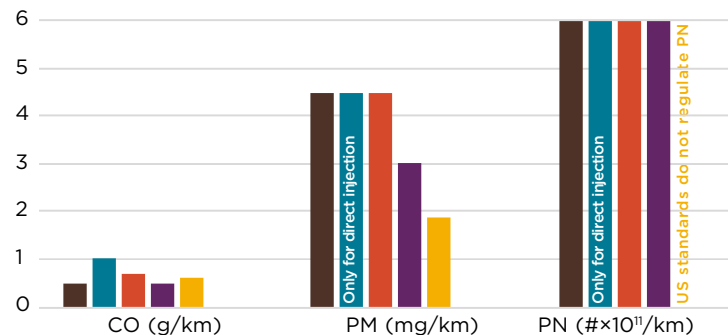
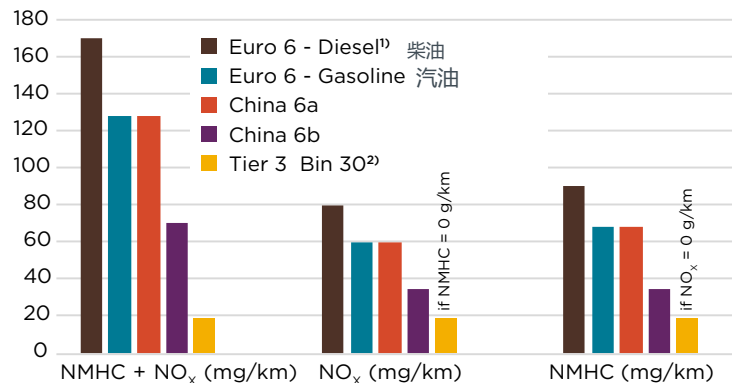


Why Euro 7?

为什么要制定欧7标准?



Emission limits 排放限值



EU limits are not fuel neutral. Diesel engines get a less stringent limit.

Euro 6 sets more lenient limits for CO (gasoline), NMHC and NO_x compared to Tier 3 Bin 30, and China 6b.

The US regulates NMOG. NMOG covers NMHC and also include other oxygenated hydrocarbons.

China 6b has been implemented in 2023. Tier 3 fully phased-in by 2025.

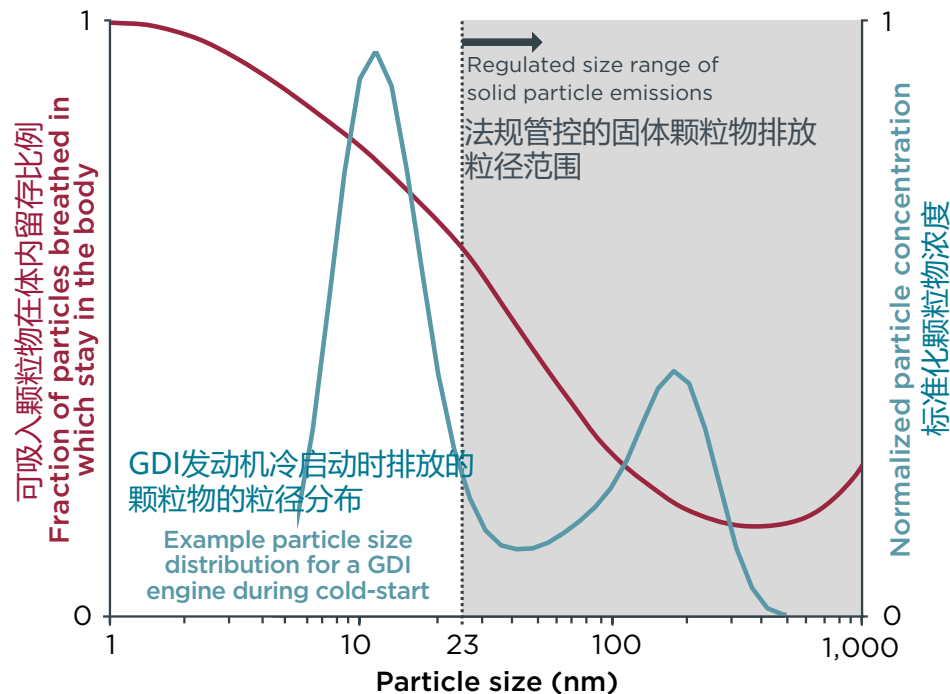
欧盟标准中的排放限值并不是燃料中立的，对柴油机的限值要求相对宽松。

与美国Tier 3 Bin30和中国的国6b标准相比，欧6标准下的CO（汽油车），非甲烷碳氢（NMHC）和NO_x限值较为宽松。

美国标准的管理污染物为非甲烷有机气体（NMOG），即同时包含了NMHC和其他碳氢氧化物。

中国的国6b标准已于2023年实施，美国Tier3标准将会在2025年全面实施。

Ultrafine particles 超细颗粒



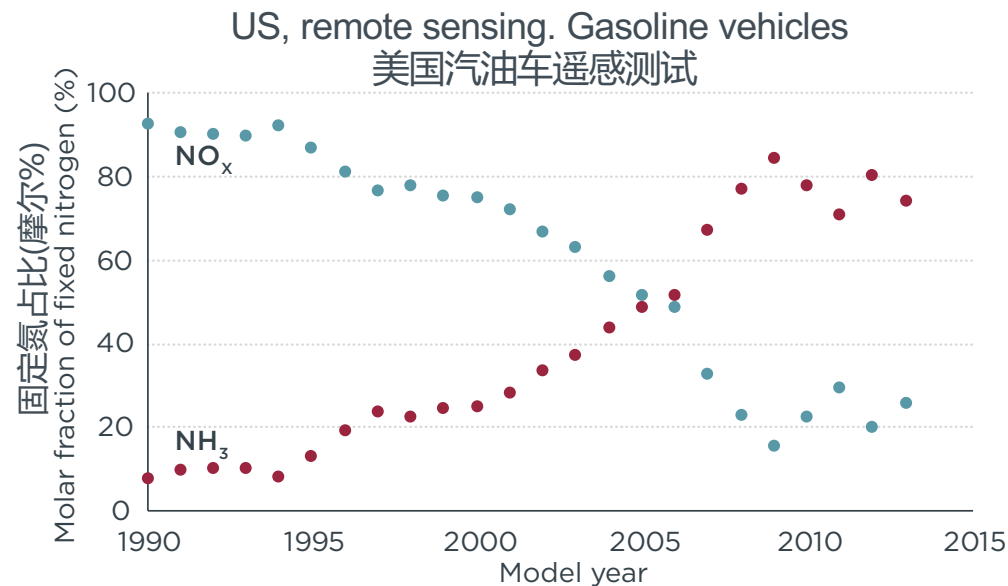
PN is measured as solid particles larger than 23 nm. SPN in the 10-23 nm range are abundant in DI engines, but also in PFI and gas engines.

Lowering the size threshold for solid particle counting from 23 nm down to 10 nm is achievable without major measurement challenges.

颗粒物数量 (PN) 的计入范围为粒径大于23nm的固体颗粒物。直喷、进气道喷油和燃气发动机都会排放大量粒径在10-23nm间的颗粒物。

把PN限值的计入阈值从23nm加严至10nm是可行的，并没有什么技术方面的壁垒。

Ammonia (NH₃) 氨



1 mg ammonia goes into 1 mg of PM_{2.5}.

Vehicles can surpass agriculture as the main source of NH₃ in cities.

NH₃ limits exist for HDVs. The 10 ppm limit was intended to limit NH₃ slip diesel SCR's.

Brazil set NH₃ limits for LDVs (diesel, 10 ppm) PROCONVE L8.

Gasoline's better NO_x puts the light on NH₃ as source of fixed nitrogen

1mg的氨会形成1mg的PM_{2.5}。

机动车或将超过农业源，成为城市首要氨排放源。

重型车标准中设有10ppm的氨排放限值，主要是为了限制柴油SCR的氨逸散。

巴西在其PROCONVE 8标准中设定了轻型柴油车氨逸散限值，也是10ppm。

汽油车的NO_x排放较低，其氨排放可被视为固定氮排放。

Non-regulated GHGs

法规外GHG排放

Methane (CH_4) and nitrous oxide (N_2O) are both powerful greenhouse gases (GHGs) that can be found in the exhaust of vehicles. CH_4 traps 84/28 times and N_2O traps 264/265 times more heat than CO_2 (20/100-year).

The formulation of TWC, SCR, and ammonia slip catalysts have direct impact on N_2O emissions.

In the United States, N_2O and CH_4 limits exist for LDVs since 2012 (limits are 6.3 mg/km and 18.8 mg/km respectively). China 6 limits N_2O emissions to 20 mg/km for LDVs.

甲烷 (CH_4) 和氧化亚氮 (N_2O) 都是汽车尾气中的强效温室气体，其20年和100年全球温室效应潜能值分别为84/28和264/265。

三元催化器，选择催化还原 (SCR) 以及氨逃逸催化器中的催化剂配比都会对 N_2O 排放产生直接影响。

美国于2012年出台了轻型车 N_2O 和 CH_4 排放限值，分别为6.3mg/km和18.8mg/km。中国在中国6标准中针对轻型车设定了20mg/km的 N_2O 排放限值。

Other unregulated pollutants 其他法规外污染物

Going from NMHC to NMOG. Organic compounds are underestimated by FIDs. This underestimation has been shown to be as high as 74% when high ethanol blends are used (E85).

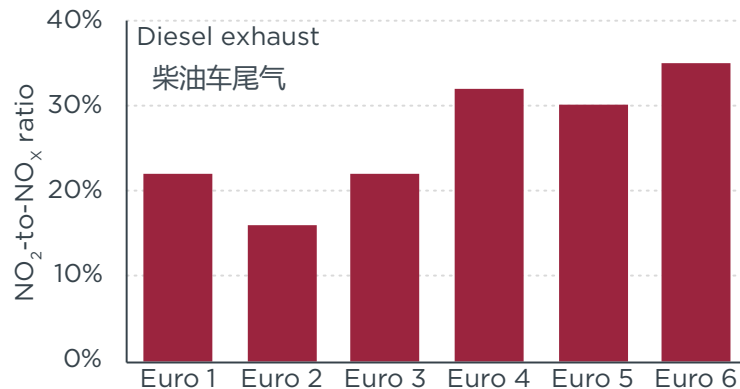
管理污染物从非甲烷碳氢 (NMHC) 改为非甲烷有机气体 (NMOG)。有机物在FID检测下会被低估，在使用高比例掺混乙醇燃料时 (E85)，低估幅度可高达74%。

Aldehydes: Probable carcinogens. Linked to high ethanol blends / flex fuel vehicles. Regulated in the US, South Korea and Brazil.

醛类属于潜在致癌物，E85/灵活燃料车会产生相关排放，美国、韩国和巴西已对醛类排放提出了监管要求。

Brake and tire wear particulate emissions.
制动和轮胎颗粒物排放。

Primary NO_2 emission limits
一次 NO_2 排放限值。



Evaporative emissions 蒸发排放

China 6 EVAP limit is 0.7 g/test over the 2-day test and has a refueling emission limit of 0.05 g/L. Brazil's PROCONVE L7 sets an EVAP limit of 0.5 g/test over the 2-day test and introduces a refueling emission limit of 0.05 g/L.

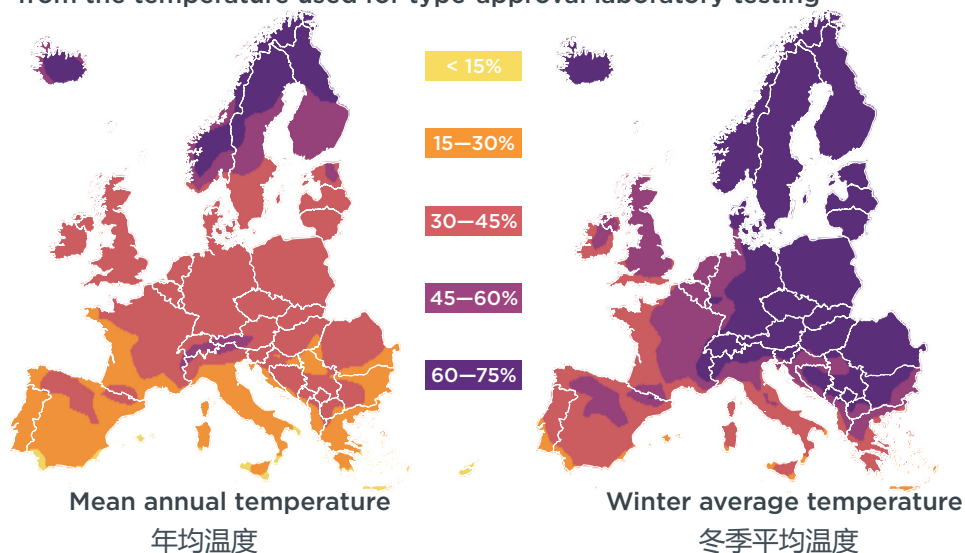
国6标准中的蒸发排放限值为2昼夜测试0.7g/次，以及0.05g/L的加油排放限值。巴西的PROCONVE L7标准中的2昼夜测试排放限值为0.5g/次，同样设有0.05g/L的加油排放限值。

US test procedures 美国测试规程	US tests / limits 美国测试/限值
High temperature hot soak + 3-day diurnal test 高温热浸+3昼夜测试	0.3 g/test (每次测试)
Hot soak + 2-day diurnal test 热浸+2昼夜测试	0.3 g/test (每次测试)
Canister bleed test 碳罐放气测试	0.020 g/test (每次测试)
Running losses test 运动损耗测试	0.031 g/km
Refueling test 加油测试	0.053 g/liter (升)
Spit back test 后喷测试	1 g/test (每次测试)
Leak test / OBD EVAP monitors 泄漏测试 / OBD 蒸发监测	0.5 mm eq. diameter (直径)

Low temperature test 低温测试

由于实际环境温度和实验室测试温度不同而造成的氮氧化物排放增加

Increase in diesel NO_x emissions due to deviations in ambient temperature from the temperature used for type-approval laboratory testing



All pollutant emissions from spark ignition and diesel vehicles are strongly and negatively affected by cold ambient temperatures.

低温环境对所有汽油车和柴油车的污染物排放都会产生很大的负面影响。

Currently, low T test applies only to gasoline vehicles

目前低温排放测试仅针对汽油车。

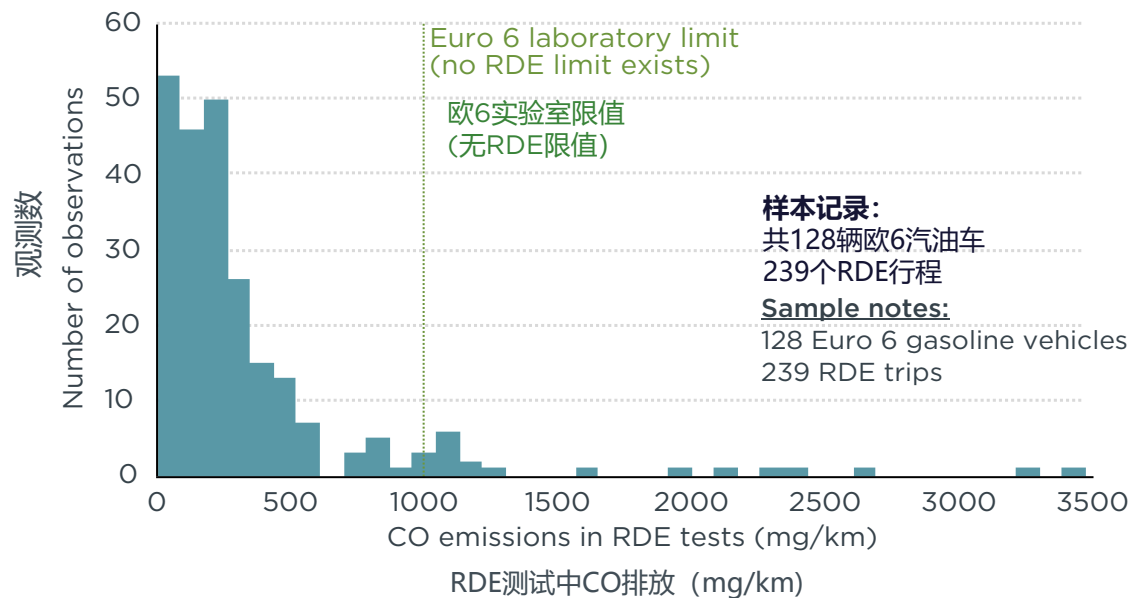
The low T limits for CO and HC, are 15 and 18 times the Euro 6 limit.

低温工况下的CO和HC排放限值分别是欧6限值的15和18倍

Low T limits for NO_x, or PN are warranted. RDE testing is not a replacement of low temperature chassis dyno testing for type approval.

低温NO_x和PN测试限值是必要的。 RDE测试并不能作为低温工况型式核准台架测试的替代。

In-use CO emissions 在用车CO排放

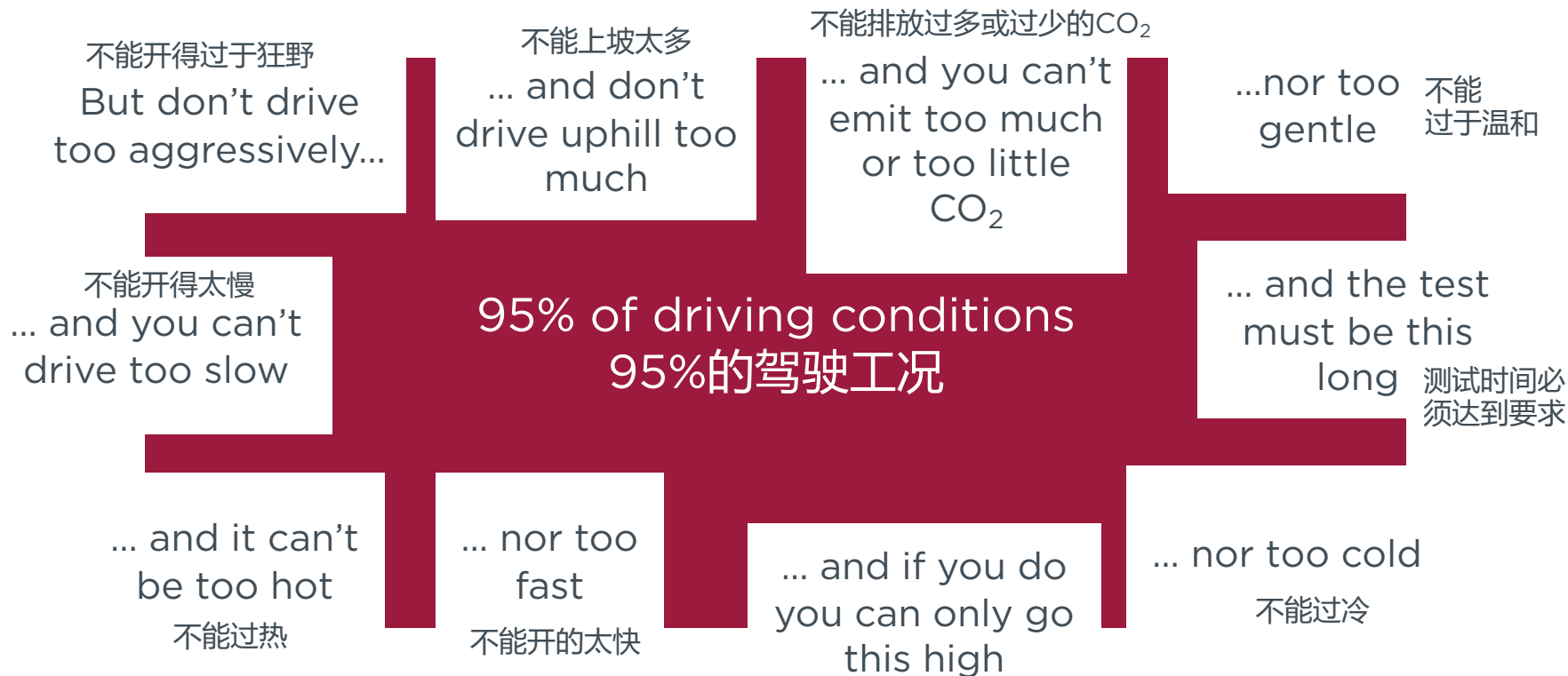


The US Tier 3 standards* attempt to reduce emissions from AES that command over-fueling, by setting limits on enrichment.

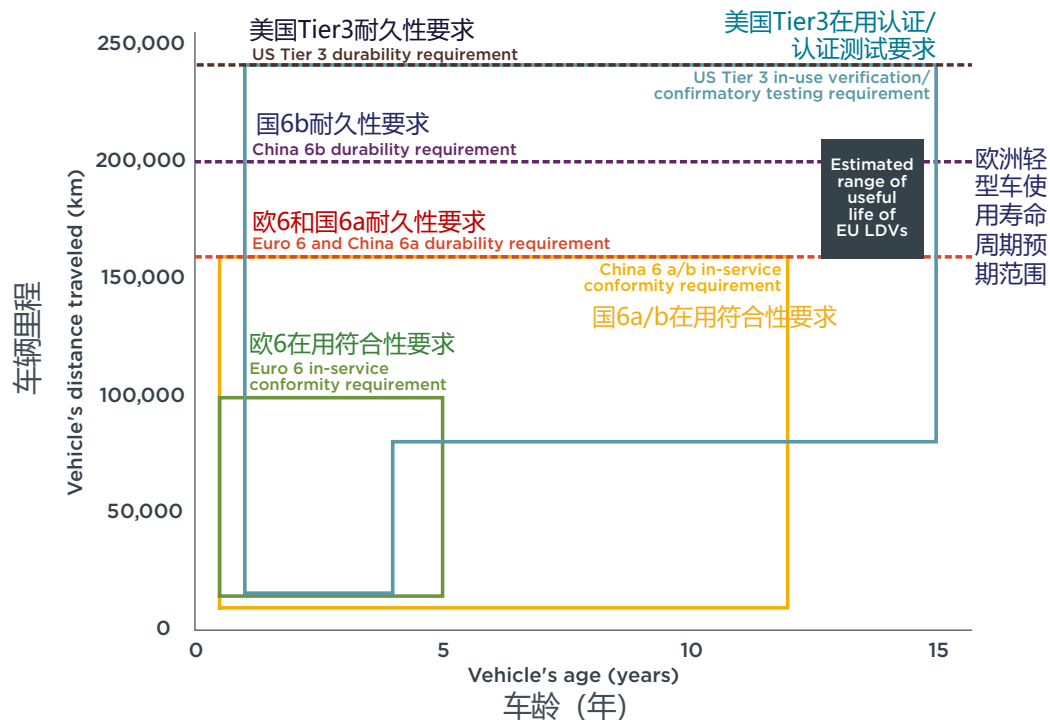
美国Tier3标准试图通过设定富燃限值来减少启动辅助排放控制策略（AES）导致的富燃排放。

Real-driving emissions tests aimed to cover 95% of driving

RDE实际驾驶排放测试的目标是覆盖95%的驾驶工况



Durability and warranty requirements 耐久性和保修要求



Extending the definition useful life for durability demonstration from the current 160k km for LDVs. **US useful life is 240k km for LDVs.**

Aligning the **age** and mileage requirements for vehicle selection for ISC testing with the useful life.

Setting a minimum emission warranty program with emissions defect reporting.

延长当前轻型车16万公里的耐久性要求。**美国规定的使用寿命周期为24万公里。**

在用符合性测试的车龄和里程要求应与车辆使用寿命周期规定保持一致。

制定最低排放质保期要求，并提供排放缺陷报告。

Euro 7

欧7标准

Euro 7: The new emission standard for light- and heavy-duty vehicles in the European Union

Authors: Jan Dornoff, Felipe Rodríguez

On December 18, 2023, the European Parliament and the Council of the European Union (EU) reached an agreement on new emission standards for light- and heavy-duty vehicles.¹ Pending formal adoption by both Parliament and Council, the new regulation will supersede the current Euro 6 regulation for passenger cars and vans, (EC) 715/2007,² and the Euro VI regulation for trucks and buses, (EC) 595/2009.³

The Euro 7 regulation sets requirements for the type-approval of vehicles, brake systems, and tires intended for sale in the European Union regarding their emissions behavior. It stipulates emission limits, sets emission-relevant minimum durability requirements, and defines requirements for on- and off-board compliance verification methods.

This policy update summarizes the key elements of the Euro 7 regulation and highlights the changes compared to the current emission standards.

下载链接: <https://theicct.org/publication/euro-7-emission-standard-ldv-hdv-eu-mar24/>



在欧6/VI标准基础上
进行更新的内容

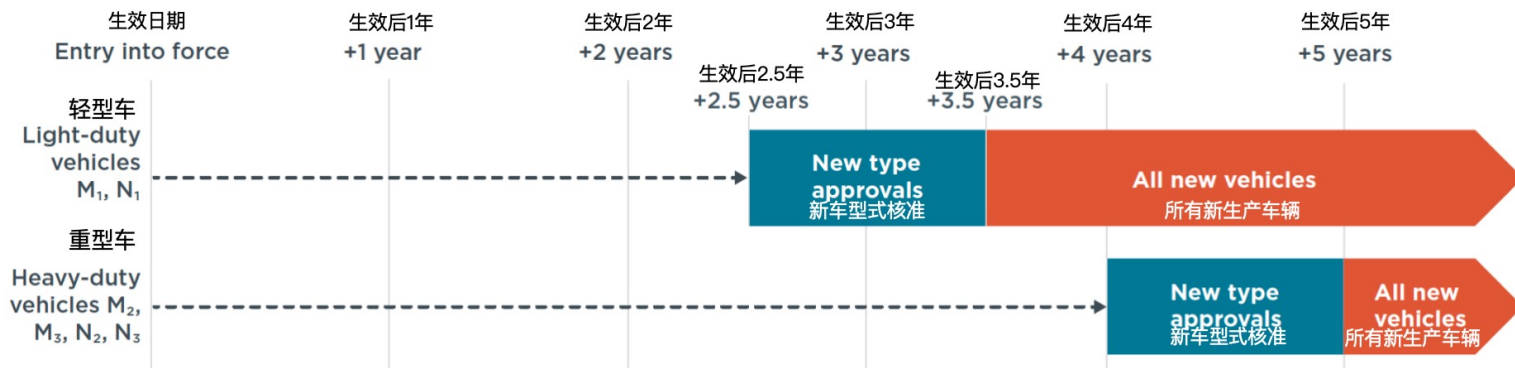
Revised elements of Euro 6/VI regulation	New elements in Euro 7
<ul style="list-style-type: none"> • Extension of scope of regulated tailpipe emission species and revision of limits • Revision of expected useful vehicle life • Real driving emissions test conditions • Extension of low temperature test scope • Extension of on-board fuel and energy consumption monitoring (OBFCM) scope 	<ul style="list-style-type: none"> • Battery durability requirements • Brake particle emission limits • Evaporative and refueling emissions • On-board emission monitoring requirements • Anti-tampering and cybersecurity requirements • Environmental vehicle passport (EVP)
<ul style="list-style-type: none"> • 增加了尾气污染物管控种类并修订了排放限值 • 修订了车辆使用寿命周期年限 • 修订了RDE测试工况要求 • 扩展了低温测试范围 • 扩展了车载能耗监测 (OBFCM) 的范围 	<ul style="list-style-type: none"> • 电池耐久性要求 • 制动颗粒物排放限值 • 蒸发和加油排放 • 车载排放监测要求 • 防篡改和网络安全要求 • 车辆环保护照 (EVP)

欧7标准中的新内容

Implementation timeline 实施时间

Euro 7 also relies on complementary pieces of legislation, called implementing acts, which establish detailed testing procedures and methodologies. Those implementing acts will be adopted 12 months after the standards are entered into force for M₁ and N₁ vehicles, and 30 months after for M₂, M₃, N₂, and N₃ vehicles.

要确保欧7标准有效实施，还需要出台各项配套法规，即实施法案。在实施法案中会制定具体的测试规程和方法学，其中，针对M₁和N₁车辆的法案将于欧7标准生效12个月后实施，针对M₂、M₃、N₂和N₃车辆的法案将于标准生效30个月后实施。



Emission limits LDV 轻型车排放限值

Euro 7 tailpipe emission limits for LDV are identical to the Euro 6

Euro 7 requires that all petrol vehicles comply with PN limits whereas under Euro 6, indirect injection engines were exempt.

Under Euro 7, particles with a diameter as small as 10nm count towards the PN limit while the Euro 6 limit only comprised particles as small as 23nm.

欧7标准下的M1类乘用车和N1类轻型厢式货车的排放限值

Euro 7 tailpipe emission limits for passenger cars of category M₁ and light-duty vans of category N₁

Category and class	CO		THC		NMHC		NO _x		THC + NO _x		PM	PN ₁₀
	SI	CI	SI	CI	SI	SI	SI	CI	CI	CI	SI & CI	SI & CI
M ₁ & N ₁ class I	1000	500	100	—	68	—	60	80	—	170	4.5	6×10 ¹¹
N ₁ class II	1810	630	130	—	90	—	75	105	—	195	4.5	6×10 ¹¹
N ₁ class III	2270	740	160	—	108	—	82	125	—	215	4.5	6×10 ¹¹

Notes: SI: Spark ignition; CI: Compression ignition; CO: Carbon monoxide; THC: Total hydrocarbons; NMHC: Non-methane hydrocarbons; NO_x: Nitrogen oxides; PM: Particulate matter; PN₁₀: Number of particles larger than 10 nm

注: SI: 点燃式; CI: 压燃式; CO: 一氧化碳; THC: 总碳氢化合物; NMHC: 非甲烷碳氢; NO_x: 氮氧化物; PM: 颗粒物质量; PN10: 直径大于10纳米的颗粒物数量

欧7标准中的轻型车尾气排放限值与欧6标准相同。

欧7标准要求所有汽油车辆必须满足颗粒物数量（PN）限值，而在欧6标准中对非直喷发动机豁免此项要求。

欧7标准将PN计入阈值加严到了直径10纳米，欧6标准下的计入阈值为23纳米。

Emission limits HDV 重型车排放限值

欧7标准下的M2、M3、N2和N3类重型车的排放限值

Euro 7 tailpipe emission limits for heavy-duty vehicles of categories M₂, M₃, N₂ and N₃

	WHSC (only CI engines)			WHTC (CI and SI engines)			On-road emissions limit		
	Euro VI (mg/kWh)	Euro 7 (mg/kWh)	Change compared to Euro VI	Euro VI (mg/kWh)	Euro 7 (mg/kWh)	Change compared to Euro VI	Euro VI (mg/kWh)	Euro 7 (mg/kWh)	Change compared to Euro VI
NO_x	400	200	-50%	460	200	-56%	690	260	-62%
PM	10	8	-20%	10	8	-20%	—	—	—
PN₁₀^a	8x10 ¹¹	6x10 ¹¹	-25%	6x10 ¹¹	6x10 ¹¹	No change	9.8x10 ¹¹	9x10 ¹¹	-8%
CO	1500	1500	No change	4,000	1,500	-62%	6,000	1,950	-68%
NMOG	—	80	-38% ^c	160 ^b	80	-50%	240	105	-56%
THC	130	—	—	160 ^c	—	—	—	—	—
NH₃	—	60	New	—	60	New	—	85	—
CH₄	—	500	New	500 ^b	500	No change	750	650	-13%
N₂O	—	200	New	—	200	New	—	260	—

Notes: WHSC: World Harmonized Stationary Cycle; WHTC: World Harmonized Transient Cycle; CI: Compression ignition; SI: Spark ignition;

^a Particle number limit in #/kWh; ^b Only for gas engines; ^c Only for diesel engines; ^d compared to Euro VI THC

注: WHSC: 全球统一稳态工况; WHTC: 全球统一瞬态工况; CI: 压燃式; SI: 点燃式; a.颗粒物数量限值, 单位: #/kWh; b.仅适用于汽油发动机; c.仅适用于柴油发动机; d.与欧六标准总碳氢限值对比

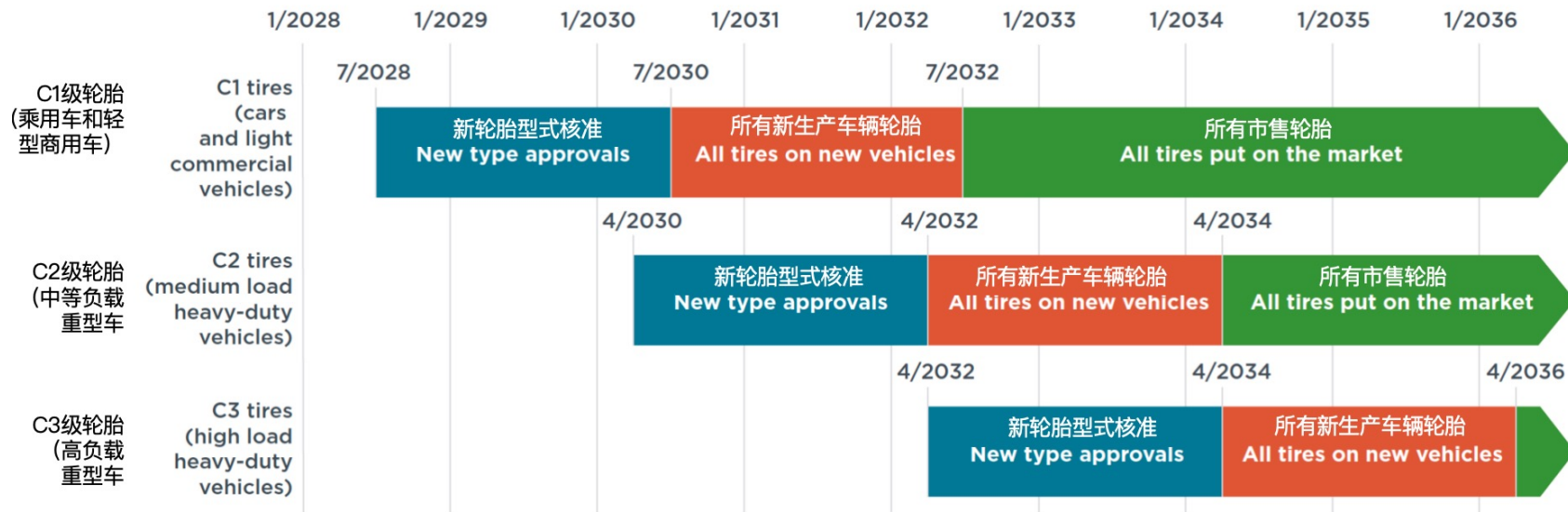
Brake and tire particles 制动和轮胎颗粒物排放

欧7标准中的制动系统颗粒物排放限值

Euro 7 brake particle emission limits for particulate matter

Date	Powertrain type	Vehicle categories		
		M ₁ / N ₁ class I & II	N ₁ class III	M ₂ / N ₂ and M ₃ / N ₃
Until December 2029	Battery electric vehicles	3 mg/km	5 mg/km	none
	Other powertrain types	7 mg/km	11 mg/km	none
January 2030 - December 2034	Battery electric vehicles	tbd	tbd	tbd
	Other powertrain types	tbd	tbd	tbd
From January 2035	All powertrain types	3 mg/km	tbd	tbd
自标准生效之日起至2029年12月	电动汽车	3 mg/km	5 mg/km	无管理要求
	其他传动系统汽车	7 mg/km	11 mg/km	无管理要求
2030年1月至2034年12月	电动汽车	待定	待定	待定
	其他传动系统汽车	待定	待定	待定
2035年1月以后	所有传动系统汽车	3 mg/km	待定	待定

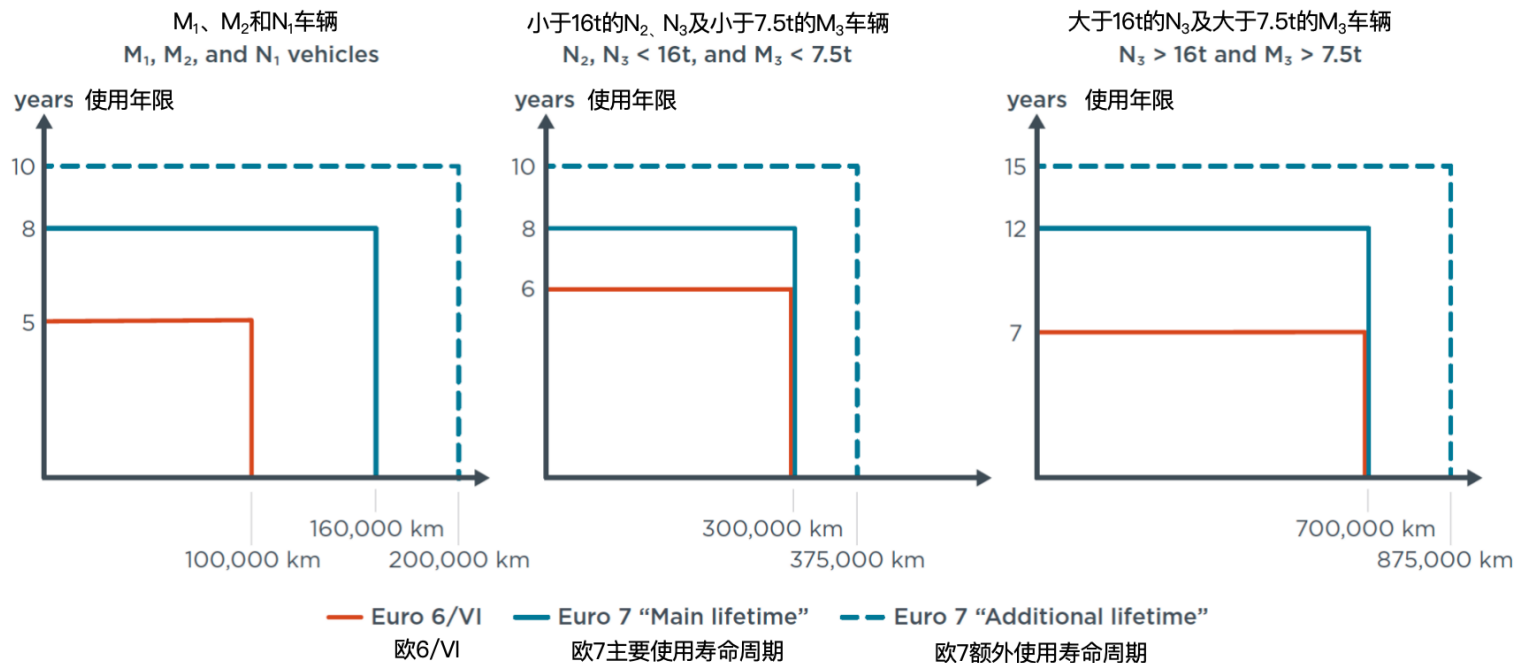
Brake and tire particles 制动和轮胎颗粒物排放



Durability requirements 耐久性要求

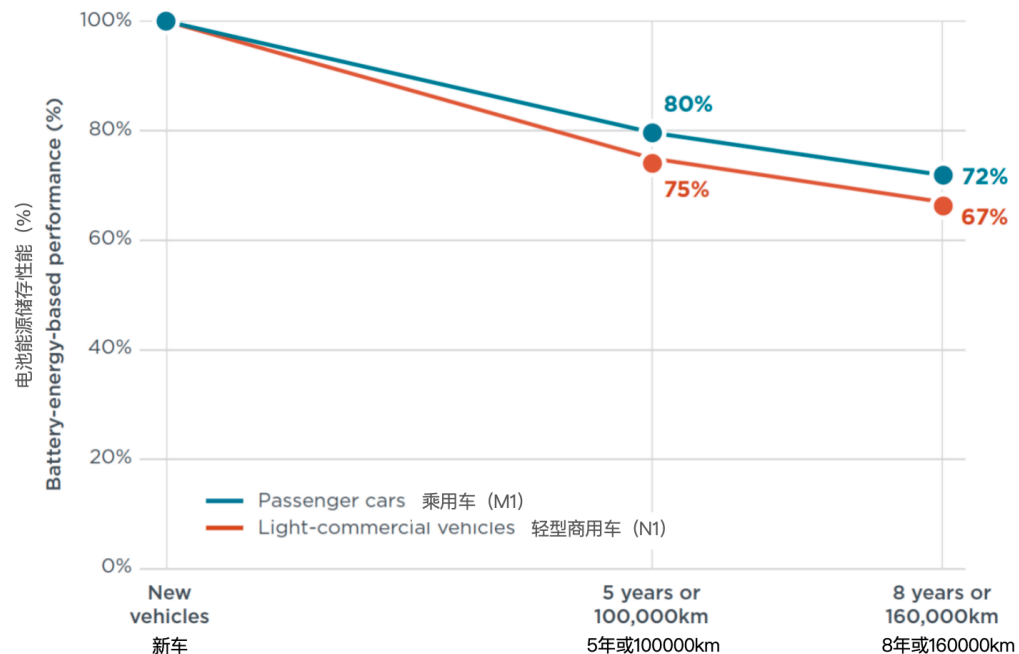
Euro 7 lifetime requirements compared to Euro 6/VI

欧7和欧6/VI标准使用寿命周期要求对比



Durability requirements 耐久性要求

Euro 7 battery durability requirements for battery electric vehicles and plug-in hybrid vehicles of categories M1 and N1
欧7标准下对M1类和N1类纯电动和插电式混合动力汽车的电池耐久性要求



Other elements 其他管理要求

Euro 7 extends the scope of on-board fuel and energy consumption monitoring (OBFCM) to all vehicle categories and all powertrain types, including electric vehicles.

On-board emissions monitoring (OBM) is a new compliance verification element introduced by Euro 7. Exceedances that are 2.5 times higher than the applicable emission limit are recorded. NO_x, PM and NH₃ are monitored.

Euro 7 allows manufacturers to type-approve hybrid vehicles with geofencing technologies, so that they can drive in zero-emission zones only when zero-emission mode is activated.

All Euro 7 vehicles will be equipped with an environmental vehicle passport (EVP), which will contain, in electronic format, information relevant to the environmental impact and performance of the new vehicle

欧7标准将车载能耗监测 (OBFCM) 装置的应用范围扩大至所有车辆类型和所有传动类型, 包括电动汽车。

车载排放监测 (OBM) 是欧7标准下新纳入的一项合规验证要求, 须通过OBM系统来监测NO_x、PM和NH₃排放水平, 任何排放超出限值2.5倍的情况必须予以记录。

欧7标准允许制造商将装配有地理围栏技术的混合动力汽车作为一个单独的类别来进行型式核准认证, 这类车辆在零排放区内以只能零排放模式行驶。

所有欧7车辆将配备车辆环保性能护照 (EVP), 其中将以电子格式包含新车环境影响和性能相关信息。

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