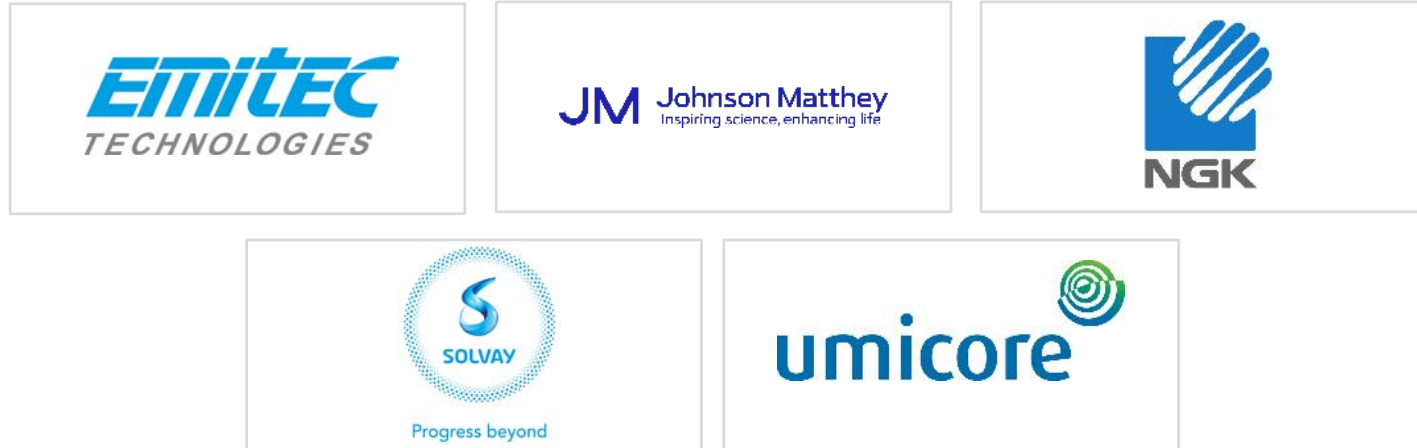


Development of the New Euro 7 Emission Legislation in Europe

ECMA 14th International Conference Leaping to Cleaner Air for Tomorrow •
2-3 November 2023 • New Delhi • India

Association for Emissions Control by Catalyst (AECC AISBL)

AECC members : European Emissions Control companies



- Exhaust emissions control technologies for original equipment, retrofit and aftermarket for all new cars, commercial vehicles, motorcycles, and non-road mobile machinery
- AECC is listed in EU Transparency Register (# 78711786419-61) and has consultative status with the UN Economic and Social Council (ECOSOC)

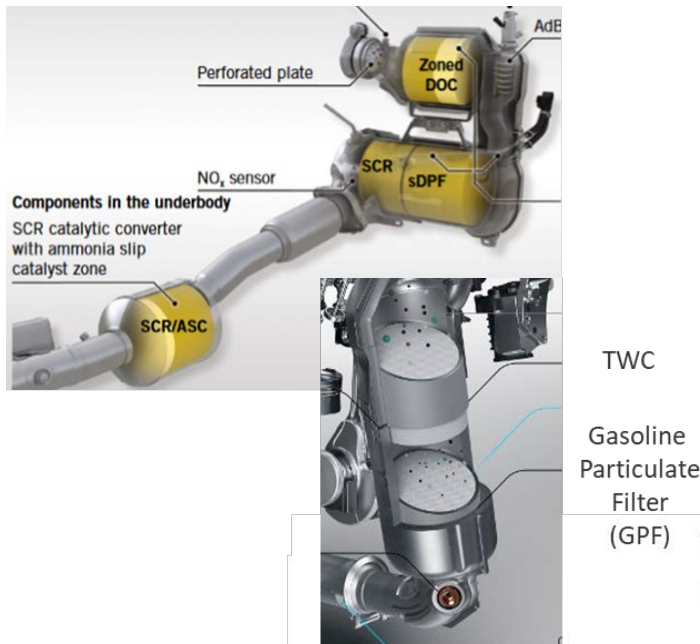
Euro 6/VI significantly reduced impact on air quality

➤ Evolution in emission control systems

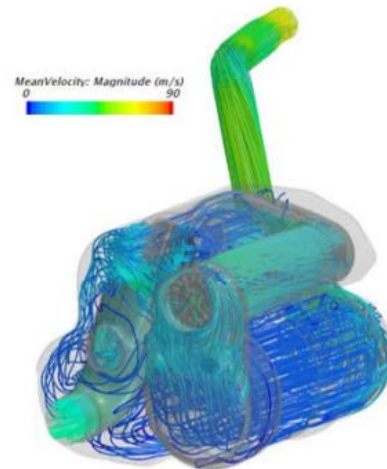
- LD diesel - combination of deNOx technologies
- LD gasoline - introduction of particulate filter
- HD diesel - compact design of SCR and filter

➤ Several reports about improved air quality

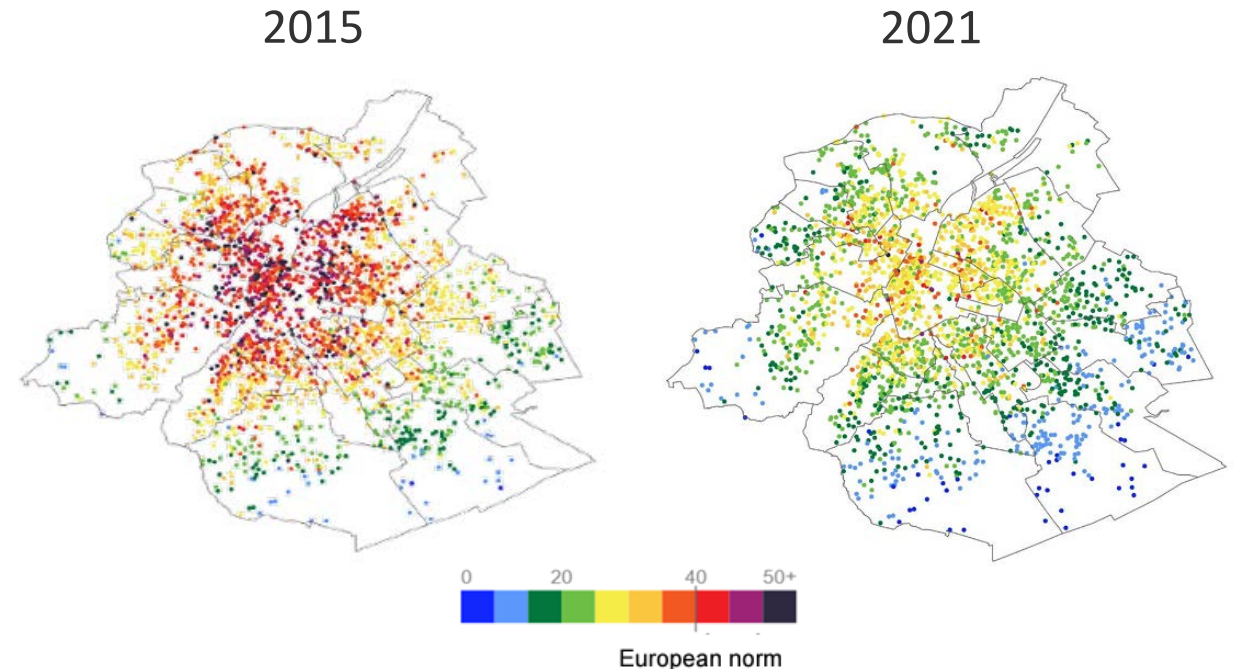
➤ Example of NO₂ in Brussels



Source: PSA



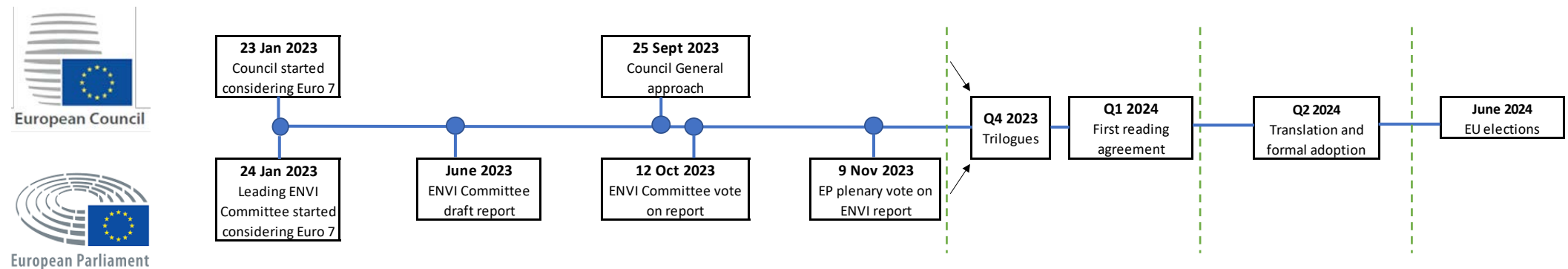
Source: Daimler 2022



Source: CurieuzenAir report air quality in Brussels, 2022

Further evolution expected towards Euro 7

- The European Commission published the Euro 7 proposal on 10 November 2022
- Two parallel processes are now ongoing
 - The ordinary legislative process by European Parliament and Council to discuss and decided Euro 7



- Development of implementing legislation by the European Commission with

- AGVES expert working group
- CLOVE consortium
- Currently focussing on OBM and anti-tampering



Euro 7 Implementing Regulations	
1. LDV Vehicle Types	6. Replacement pollution control systems types and their parts
2. HDV Vehicle Types	7. Brake system types and their replacement parts;
3. HDV Engines	8. Tyre types in respect to tyre abrasion
4. OBM/OBD systems	9. CO ₂ + range determination for LDV
5. Anti-tampering, security and cybersecurity systems	10. CO ₂ + range determination for HDV

Euro 7 proposal by the European Commission



	Cars and vans	Trucks and buses
Implementation timing	1/7/2025	1/7/2027
Normal driving conditions (RDE)	0 to 35 °C 0 to 700 m ...	-7 to 35 °C 0 to 1600 m ...
Extended driving conditions (RDE)	-10 to 0 °C or 35 to 45 °C 700 to 1800 m ...	-10 to -7 °C or 35 to 45 °C 1600 to 1800 m ...
Limits	Lowest Euro 6 level + NH ₃ Emission budget <10 km Extended area: emissions / 1.6 Additional lifetime: limit x 1.2	Moving Window 90 th and 100 th percentile Emission budget < 3x WHTC Extended driving divider: emissions / 2 Multiplier for additional lifetime tbd
Main lifetime	160k km or 8 years	300k km or 8 years (cat. 1) 700k km or 15 years (cat. 2)
Additional lifetime	200k km or 10 years	375k km (cat. 1) 875k km (cat. 2)

Euro 7 status in Council



➤ Rotating EU Presidency leads the discussions

Jan – Jun 2023

Swedish EU Presidency



Jul – Dec 2023

Spanish EU Presidency



Jan – Jun 2024

Belgian EU Presidency



➤ Council General Approach agreement reached on 25 September 2023

➤ Lead time for implementation after entry into force

- LDVs: +30 months (New Types) and +42 months (All Types)
- HDVs: +48 months (New Types) and +60 months (All Types)

➤ LDV limits and test conditions from Euro 6e have been kept

➤ HDV limits and test conditions

- Separate limits for laboratory and RDE tests
- Keeping PN₂₃ procedure
- Euro VI test conditions kept including Moving Average Window methodology

Table 2: Euro 7 exhaust emission limits for M2, M3, N2 and N3 vehicles

Pollutant emissions	<u>WHSC (CI) and WHTC (CI and PI)</u>	<u>Real Driving Emissions (RDE)</u>
	<u>per kWh</u>	<u>per kWh</u>
NO _x in mg	<u>230</u>	<u>300</u>
PM in mg	<u>8</u>	<u>–</u>
PN ₁₀₋₂₃ in #	<u>6×10^{11}</u>	<u>9×10^{11}</u>
CO in mg	<u>1500</u>	<u>1950</u>
NMOG in mg	<u>80</u>	<u>105</u>
NH ₃ in mg	<u>65</u>	<u>85</u>
CH ₄ in mg	<u>500</u>	<u>650</u>
N ₂ O in mg	<u>200</u>	<u>260</u>
HCHO in mg	<u>30</u>	<u>40</u>

Euro 7 status in European Parliament



- Leading committee is ENVI, with rapporteur MEP Vondra (ECR, Czech)
 - ENVI report was voted on 12 October 2023
 - Plenary vote is expected in the session on 8-9 November 2023
- Rapporteur's Compromise Amendments were all adopted, except CA7 on CO₂-neutral fuels
 - Lead time for implementation after entry into force of all relevant secondary legislation (+12 months)
 - LDVs: +24 months (New Types) and +36 months (All Types)
 - HDVs: +48 months (New Types) and +60 months (All Types)
 - LDV
 - Fuel-neutral limits of EC proposal kept for cars (incl. 10 km budget and PN10); higher limits for N1 class II and III
 - Test conditions
 - At Euro 6 RDE boundaries for ambient temperature & altitude; allowing these to be combined in extended
 - Trip composition any, but 'as per normal use', referring to trip dynamics of UN Regulation No. 68 (Euro 6e)
 - Max. avg. wheel power: 20% normal, 20-30% extended (*potential contradiction with trip dynamics above tbc*)
 - HDV similar as Council position, with slightly lower limits (NO_x: 200-260 mg/kWh)

Euro 7 needed to further improve air quality

Works together with other legislative efforts which reduce CO₂ emissions



AECC calls for a **swift adoption of Euro 7**

- Finalise Euro 7 well before 2024 EU elections
- Key to realise a prompt implementation



Affordable emission control technologies are **available** today



AECC data indicates proposed Euro 7 limits are **technically feasible**



Light-duty vehicles

- Test conditions to represent real-world driving
- Development in substrate and coating technologies are ongoing beyond what is demonstrated



Heavy-duty vehicles

- Euro 7 proposal follows the outcome of the Impact Assessment
- The Moving Window methodology seems appropriate, without data exclusions

AECC position paper

aecc.eu/wp-content/uploads/2023/05/230509-AECC-position-on-Euro7-final.pdf

AECC fact sheet on Euro 7, September 2023

<https://www.aecc.eu/wp-content/uploads/2023/09/2023-08-31-AECC-Factsheet.pdf>

Myths and truths about Euro 7 pollutants limits for new vehicles in the EU



Every new vehicle sold in the next decades should play its part in reducing air pollution. The robust Euro 7 rules proposed by the European Commission put EU citizens' health first and will keep the automotive sector competitive globally.

Euro 7 is ~~unnecessary~~

All EU citizens will benefit: an upgrade to Euro 7 reduces health risks caused by vehicle traffic. Each € invested in Euro 7 results in a reduction of 5€ on healthcare and environment costs.

Keeping Euro 6/VI is not sufficient.
20% of distance driven in Europe is outside current test boundaries. Wider Euro 7 test methods will better capture emissions resulting from driving in different conditions.

Euro 7 limits are ~~not~~ feasible

The necessary emission control technology is already available and has been tested successfully with vehicles on the road.

Fitting the latest emission control technology can reduce truck NOx emissions by 75-96% compared to Euro VI-C and NOx from a gasoline car by 40-64% from Euro 6d.
Vehicle manufacturers are already developing new vehicles with more stringent limits than Euro 6/VI in mind.

Euro 7 will ~~not~~ make Europe competitive

China and the United States are moving ahead with more stringent standards than Euro 6/VI. Europe cannot stay behind if it wants to remain competitive.

Investing in Euro 7 comes at incremental cost of 0.6-5.7 billion euro compared to the 59 billion euro each manufacturer is expected to invest in electrification, connectivity and automation by 2050.

Euro 7 is ~~not~~ affordable

Cars and trucks will remain affordable as equipping them with new emission control technologies comes at a very small proportion of the cost of a new vehicle.

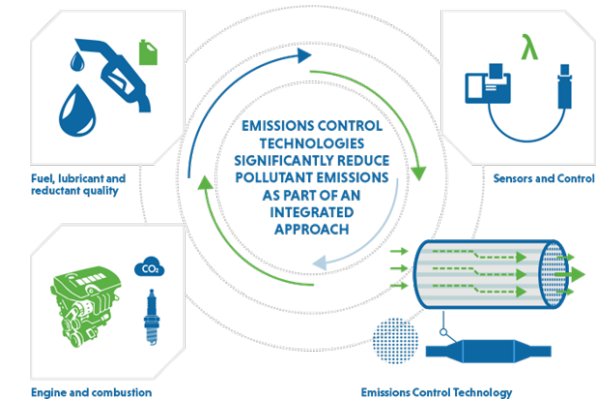
Studies on the impact of Euro 7 estimate the additional cost of new cars to be between 104-251€ compared to Euro 6d.
Contrary to some claims, Euro 7 vehicles will not need to comply with all possible driving situations, hence automatic gearboxes and hybridisation technologies should not be counted among the cost to adapt to the new standards.



www.aecc.eu www.ipa-news.com Discover the [full Euro 7 fact list](#) and what technology can deliver.

AECC demo data supports Euro 7 and CO₂ discussions

- Demonstrators show ultra-low pollutant emissions with emission control technologies in an integrated approach
- Tests show compatibility with drop-in sustainable renewable fuels, with substantial reduction in Well-to-Wheel CO₂ emissions

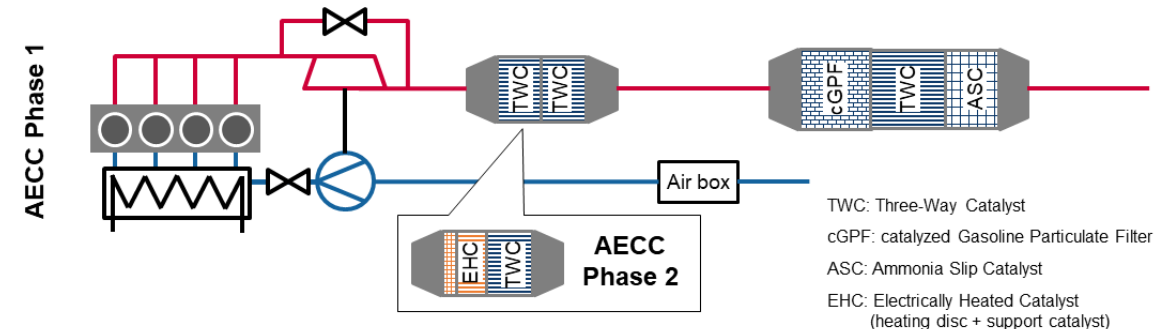


LD gasoline demonstrator concept

- Base vehicle description
 - C-segment vehicle
 - 1.5l engine with 4 cylinders
 - Variable valve train and cylinder deactivation
 - 48V mild-hybrid
 - Euro 6d type-approval baseline: cc cGPF + uf TWC



- AECC emission control system
 - Phase 1: cc TWC, uf cGPF+TWC+ASC
 - Phase 2: cc EHC|TWC, uf cGPF+TWC+ASC
 - Bench aged components targeting 160k km



J. Demuynck, et al.; [“Ultra-low Emissions of a 48V Mild-Hybrid Gasoline Vehicle with Advanced Emission Control Technologies”](#), 15th International Conference on Engines and Vehicles, 2021

J. Demuynck, et al.; [“Zero-Impact Emissions from a Gasoline Car with Advanced Emission Controls and E-Fuels”](#) 43rd International Vienna Motor Symposium, 2022



Ignition

Engine load: 23 %

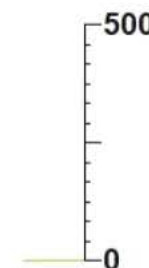
Vehicle speed: 26 km/h



NOx
1550 ppm



30 s or 150 m to near-zero emissions



NOx
0 ppm

Video available at <https://youtu.be/qoG0GxF8X-k>

More videos available on YouTube (AECC eu): https://www.youtube.com/channel/UCbPS9op5ztLqrv6zIMH_IcQ



Engine
catalyst
heating



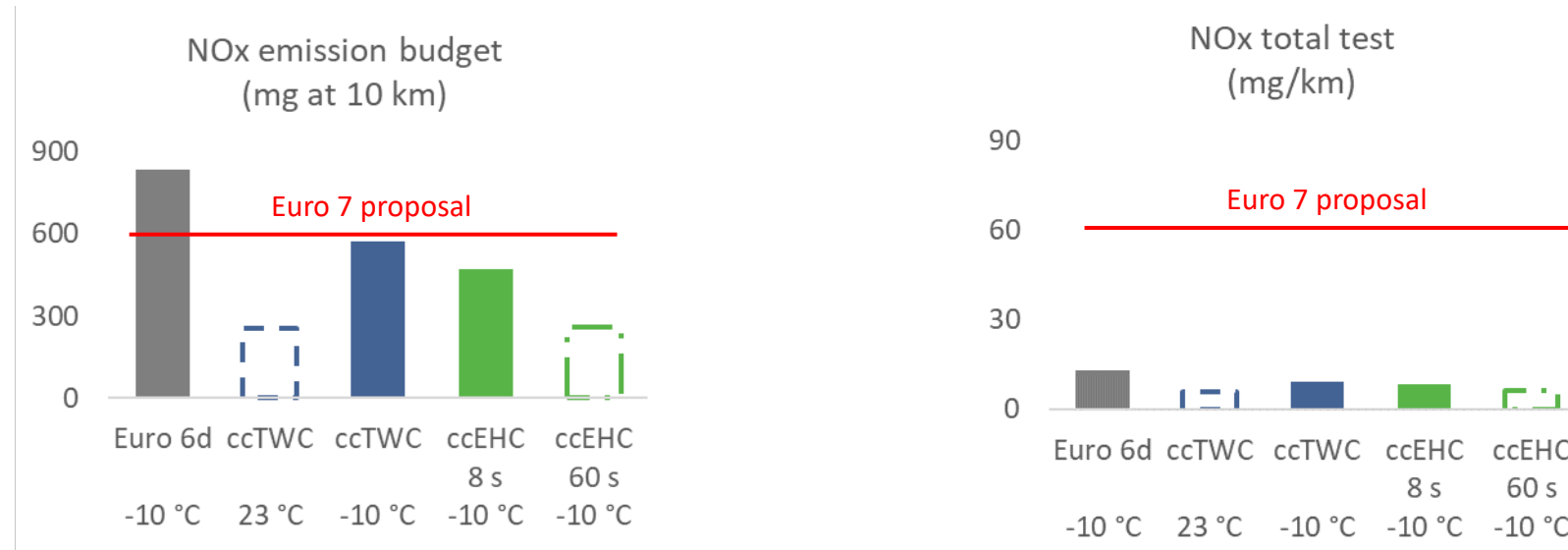
EHC
heating



Closed-loop
lambda
control

Gaseous emissions are mainly from initial cold-start

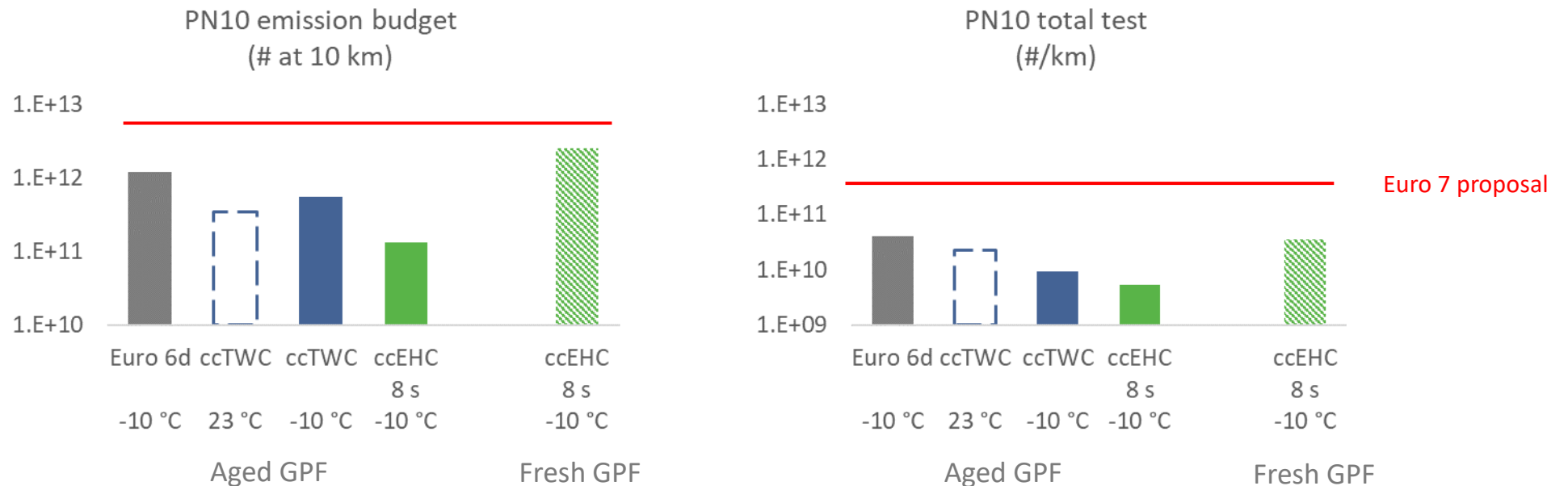
- The highest cold-start NOx peak measured is below the proposed Euro 7 emission budget limit
- Near-zero emissions under warm operation
- Further potential is possible for initial cold-start NOx due to demonstrator constraints



Note: RDE aggressive test results, 1.6 divider applied to data at -10 °C

Particulate emissions are mainly from initial cold-start

- Most data is measured with aged GPF
 - Ash and soot accumulation supports filtration efficiency
 - Test with ccEHC at -10 °C repeated with fresh GPF
- All PN10 data remains below the proposed Euro 7 limit

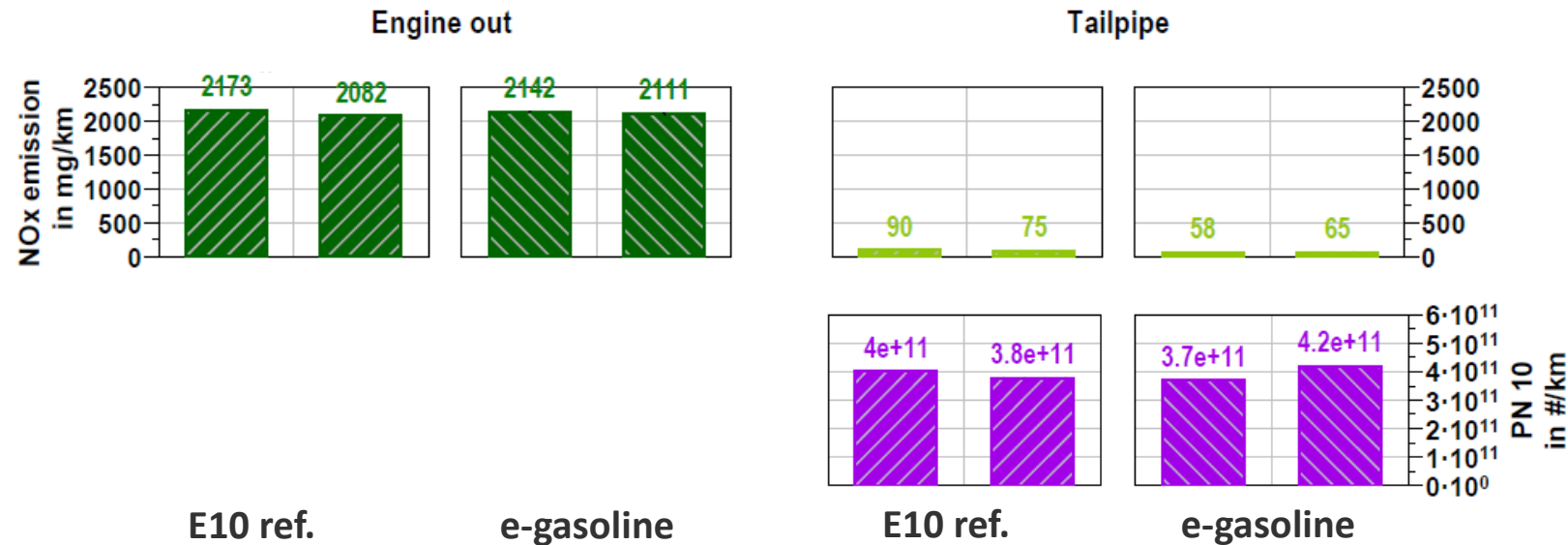


LD gasoline demonstrator with sustainable renewable fuels

➤ Sustainable renewable fuels tested

- Blue Gasoline  **BOSCH**  
- 2x samples of e-gasoline  

➤ Ultra-low pollutant emissions confirmed



Note: RDE aggressive test results at -10 °C after 10 km (1.6 divider not applied), 2 test repeats on E10 reference fuel and e-gasoline

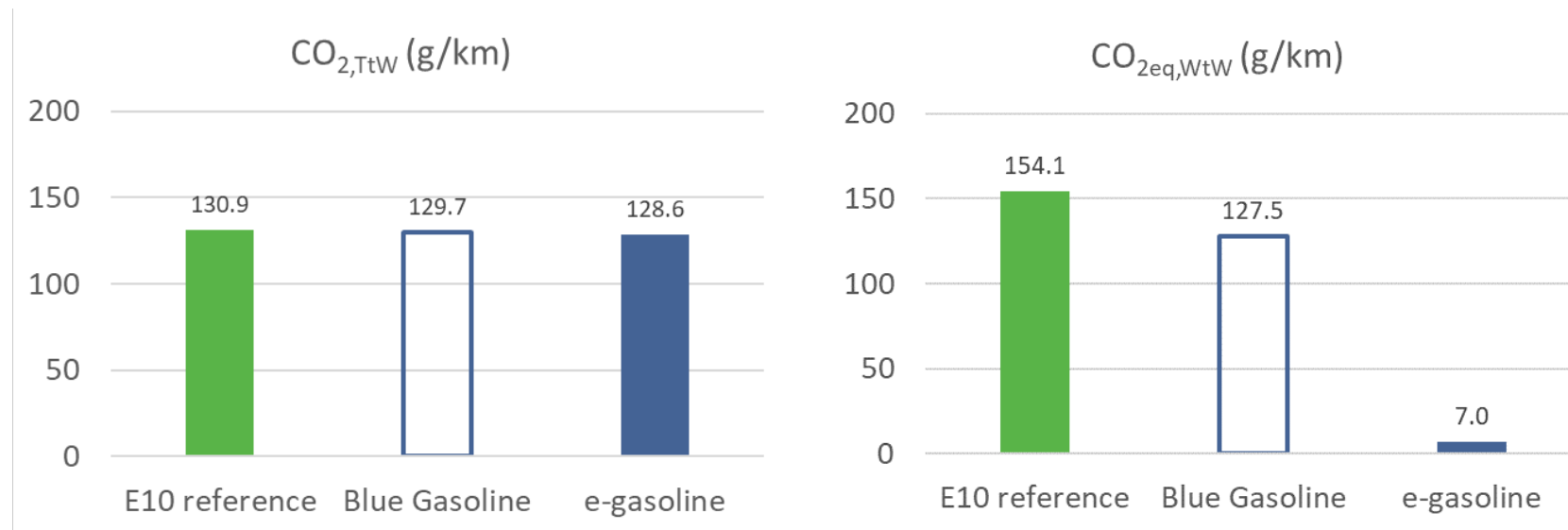
J. Demuynck, et al.; [“Zero-Impact Emissions from a Gasoline Car with Advanced Emission Controls and E-Fuels”](#) 43rd International Vienna Motor Symposium, 2022

J. Demuynck, et al.; [“Advanced Emission Controls and E-fuels on a Gasoline Car for Zero-Impact Emissions”](#), SAE paper 2022-01-1014, 2022

LD gasoline demonstrator with sustainable renewable fuels

Well-to-Wheel CO₂ analysis

- Blue Gasoline already offers significant reduction of -17% WtW CO₂ emissions
- E-gasoline has the potential to nearly eliminate WtW CO₂ emissions



J. Demuynck, et al.; [“Zero-Impact Emissions from a Gasoline Car with Advanced Emission Controls and E-Fuels”](#) 43rd International Vienna Motor Symposium, 2022

J. Demuynck, et al.; [“Advanced Emission Controls and E-fuels on a Gasoline Car for Zero-Impact Emissions”](#), SAE paper 2022-01-1014, 2022

HD diesel demonstrator concept

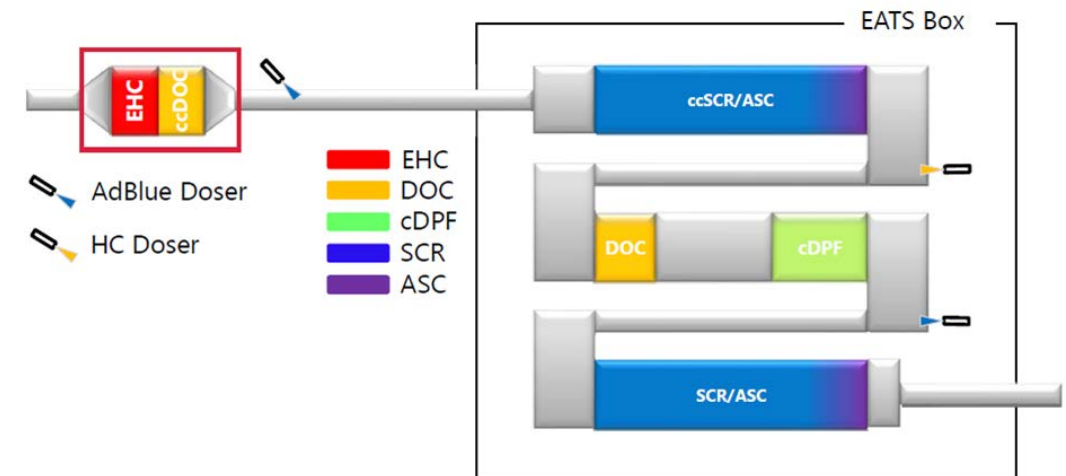
➤ Base vehicle description

- MB Actros 1845 LS 4x2
- Engine OM 471
 - Euro VI C certified
 - 12.8 litres, 6 cylinder in-line
 - High Pressure EGR + DOC + DPF + SCR



➤ AECC emissions control system

- Phase 1: ccDOC, ccSCR/ASC+ ufDOC+cDPF+ SCR/ASC, twin AdBlue dosing and HC doser
- Phase 2: additional EHC as part of the ccDOC
- Components are hydrothermally aged targeting 500k km



P. Mendoza Villafuerte, et al.; [“Demonstration of Extremely Low NOx Emissions with Partly Close-Coupled Emission Control on a Heavy-duty Truck Application”](#), 42nd Vienna Motor Symposium 2021

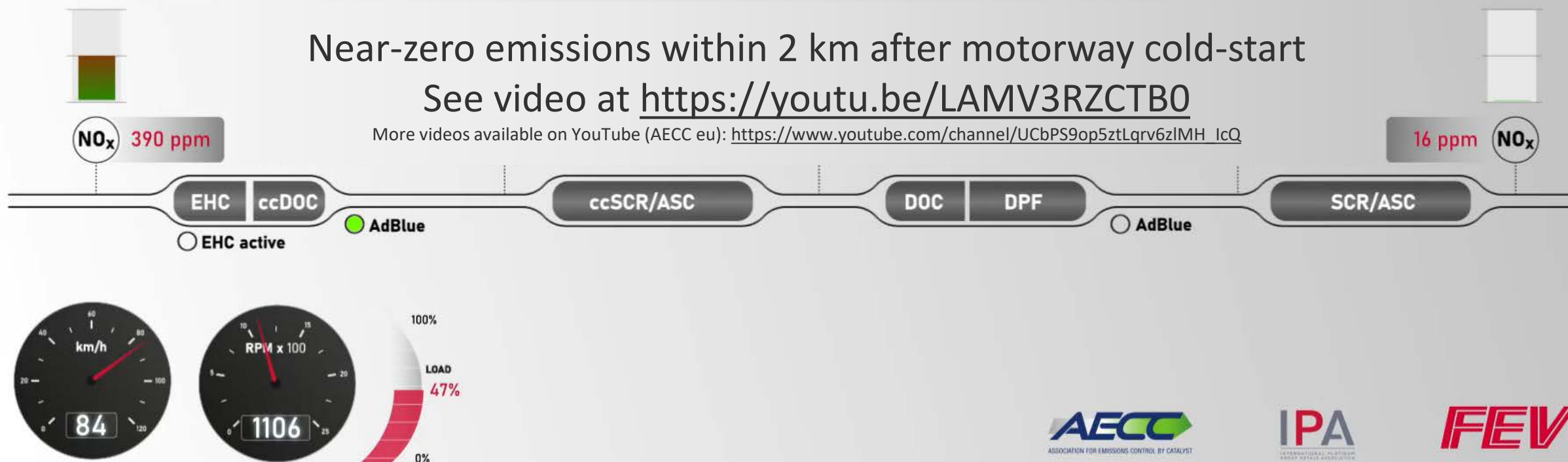
P. Mendoza Villafuerte, et al.; [“Future-proof heavy-duty truck achieving ultra-low pollutant emissions”](#), Transportation Engineering, Volume 9, September 2022, 100125, 2022

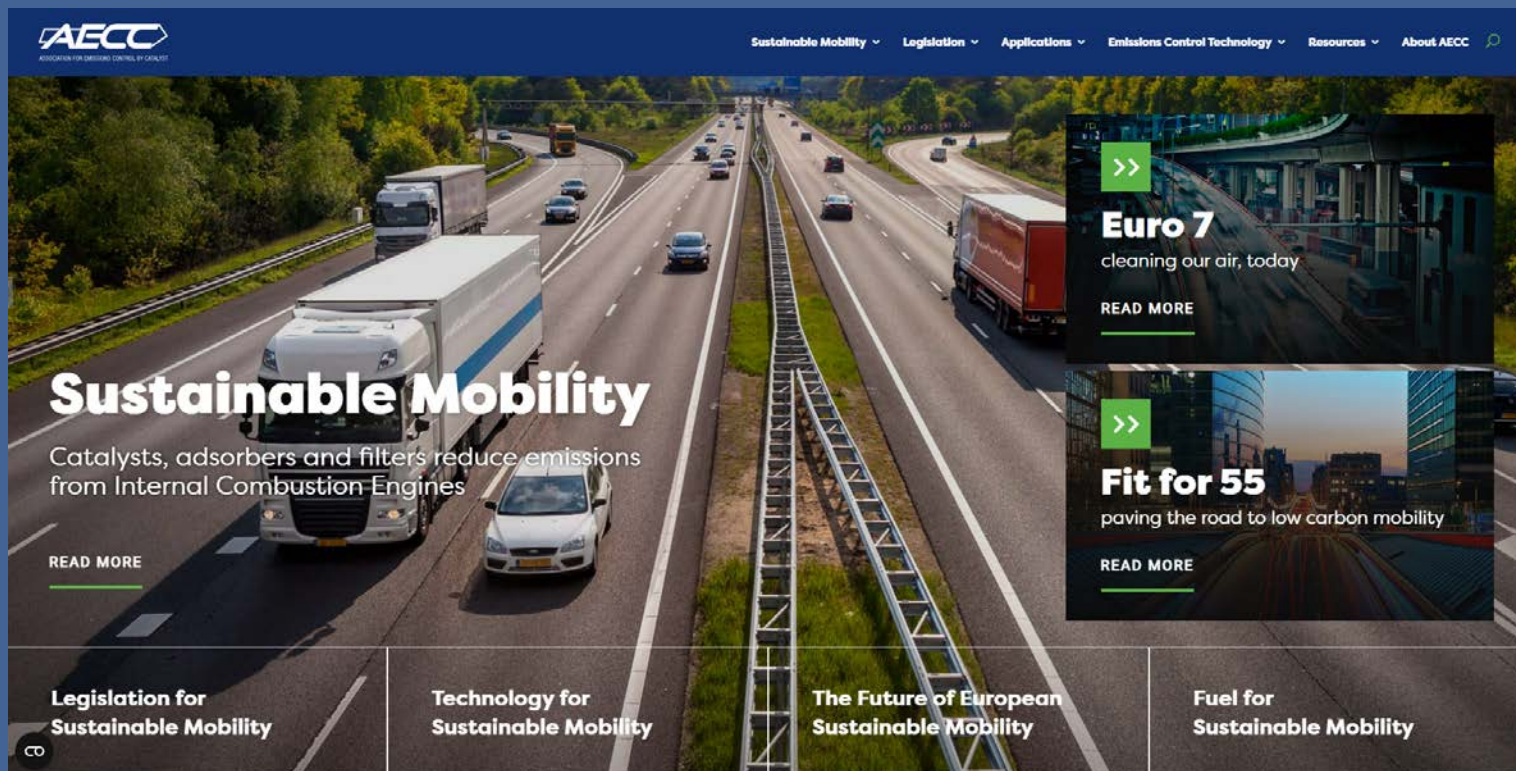


Near-zero emissions within 2 km after motorway cold-start

See video at <https://youtu.be/LAMV3RZCTB0>

More videos available on YouTube (AECC eu): https://www.youtube.com/channel/UCbPS9op5ztLqrv6ziIMH_IcQ





THANK YOU !



www.aecc.eu



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[AECC \(Association for Emissions Control by Catalyst\)](#)



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