

# Development of the New Euro 7 Emission Legislation in Europe

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

# Association for Emissions Control by Catalyst (AECC AISBL)

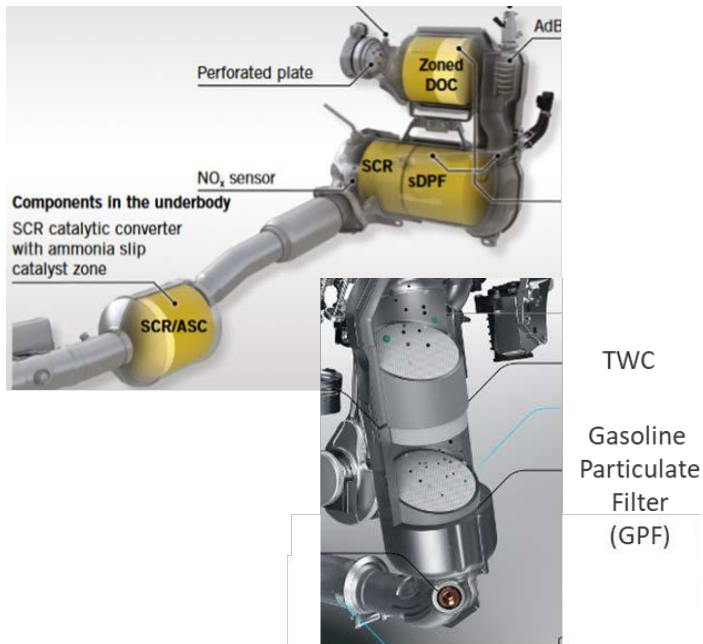
AECC members : European Emissions Control companies



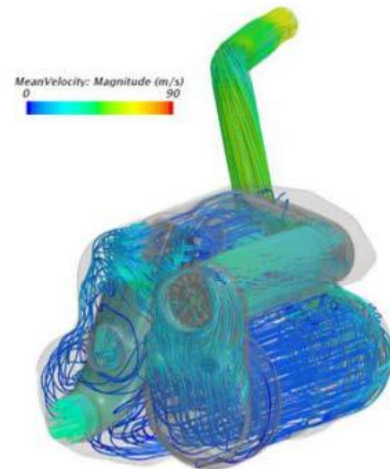
- Exhaust emissions control technologies for original equipment, retrofit and aftermarket for all new cars, commercial vehicles, motorcycles, and non-road mobile machinery
  - AECC is listed in EU Transparency Register (# 78711786419-61) and has consultative status with the UN Economic and Social Council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

# Euro 6/VI significantly reduced impact on air quality

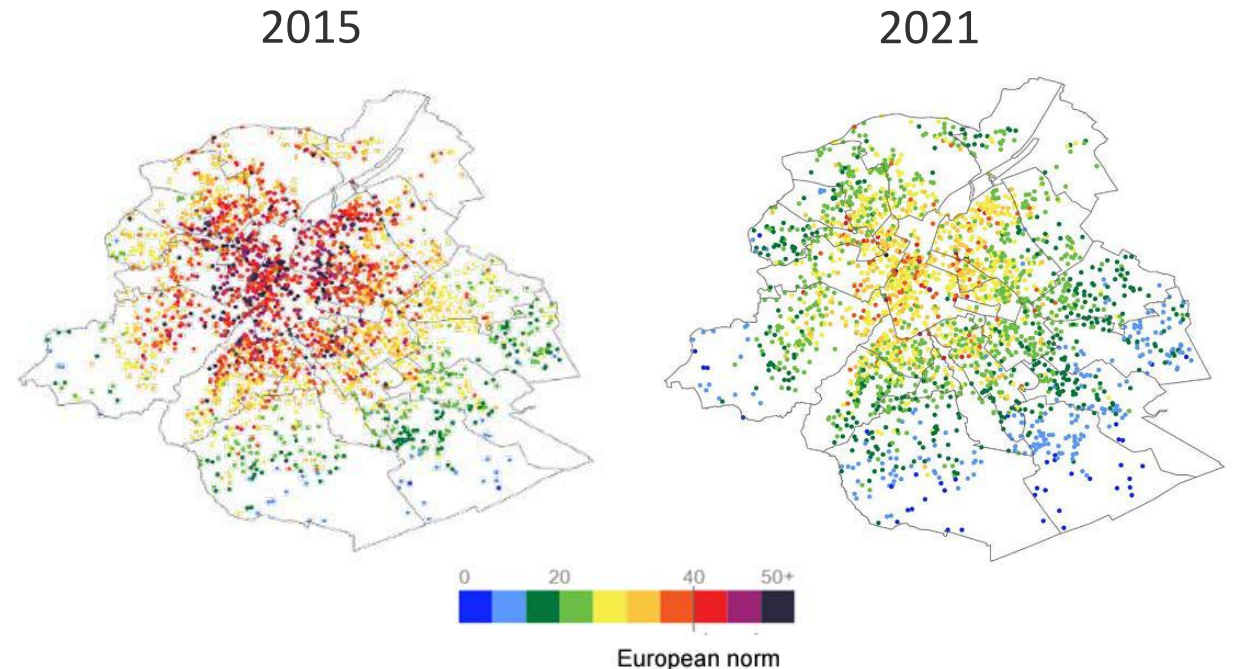
- Evolution in emission control systems
  - LD diesel - combination of deNOx technologies
  - LD gasoline - introduction of particulate filter
  - HD diesel - compact design of SCR and filter
- Several reports about improved air quality
- Example of NO<sub>2</sub> in Brussels



Source: PSA



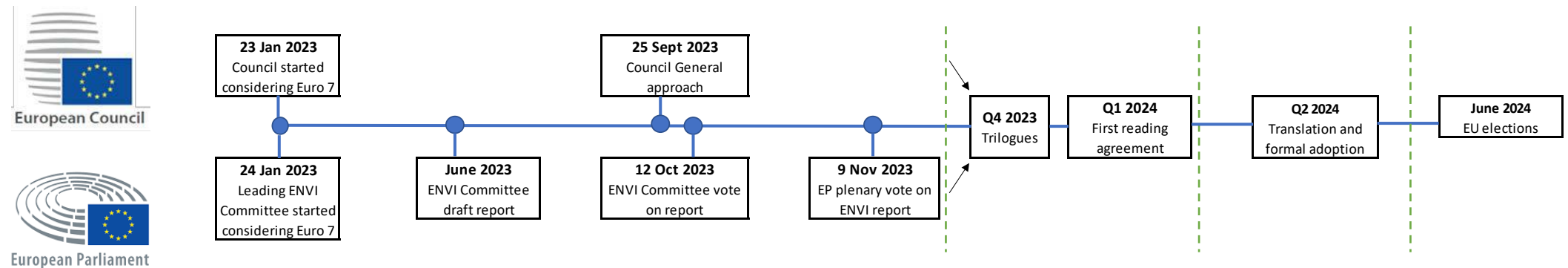
Source: Daimler 2022



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 <sub>2</sub> + range determination for LDV
5. Anti-tampering, security and cybersecurity systems	10. CO <sub>2</sub> + 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 <sub>3</sub> Emission budget <10 km Extended area: emissions / 1.6 Additional lifetime: limit x 1.2	Moving Window 90 <sup>th</sup> and 100 <sup>th</sup> 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 PN<sub>23</sub> procedure
  - Euro VI test conditions kept including Moving Average Window methodology

Table 2: Euro 7 exhaust emission limits for M<sub>2</sub>, M<sub>3</sub>, N<sub>2</sub> and N<sub>3</sub> vehicles

Pollutant emissions	<u>WHSC (CI) and WHTC (CI and PI)</u>	<u>Real Driving Emissions (RDE)</u>
	<i>per kWh</i>	<i>per kWh</i>
NO <sub>x</sub> in mg	<u>230</u>	<u>300</u>
PM in mg	<u>8</u>	=
PN <sub>10-23</sub> in #	<u>6 x 10<sup>11</sup></u>	<u>9 x 10<sup>11</sup></u>
CO in mg	<u>1500</u>	<u>1950</u>
NMOG in mg	<u>80</u>	<u>105</u>
NH <sub>3</sub> in mg	<u>65</u>	<u>85</u>
CH <sub>4</sub> in mg	<u>500</u>	<u>650</u>
N <sub>2</sub> 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 CO<sub>2</sub>-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<sub>x</sub>: 200-260 mg/kWh)

# Euro 7 needed to further improve air quality

Works together with other legislative efforts which reduce CO<sub>2</sub> 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](https://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.

<h3>Euro 7 is <del>un</del>necessary</h3> <p>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.</p> <p><b>Keeping Euro 6/VI is not sufficient.</b> 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.</p>	<h3>Euro 7 limits are <del>not</del> feasible</h3> <p>The necessary emission control technology is already available and has been tested successfully with vehicles on the road.</p> <p><b>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.</b> Vehicle manufacturers are already developing new vehicles with more stringent limits than Euro 6/VI in mind.</p>
<h3>Euro 7 will <del>not</del> make Europe competitive</h3> <p>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.</p> <p><b>Investing in Euro 7 comes at incremental cost</b> 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.</p>	<h3>Euro 7 is <del>not</del> affordable</h3> <p>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.</p> <p><b>Studies on the impact of Euro 7 estimate the additional cost of new cars to be between 104-251€ compared to Euro 6d.</b> 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.</p>

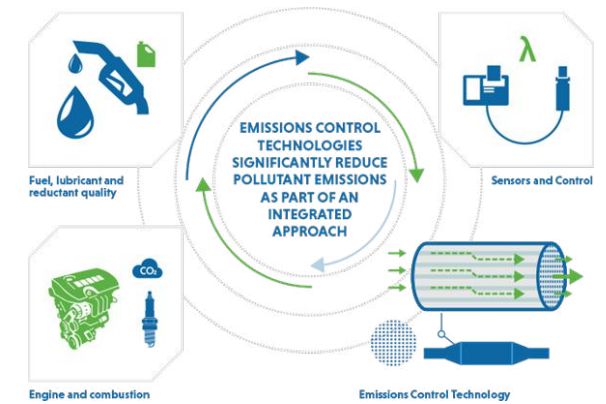
 

[www.aecc.eu](http://www.aecc.eu) [www.ipa-news.com](http://www.ipa-news.com) 

Discover the [full Euro 7 fact list](#) and what technology can deliver.

# AECC demo data supports Euro 7 and CO<sub>2</sub> 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 CO<sub>2</sub> emissions

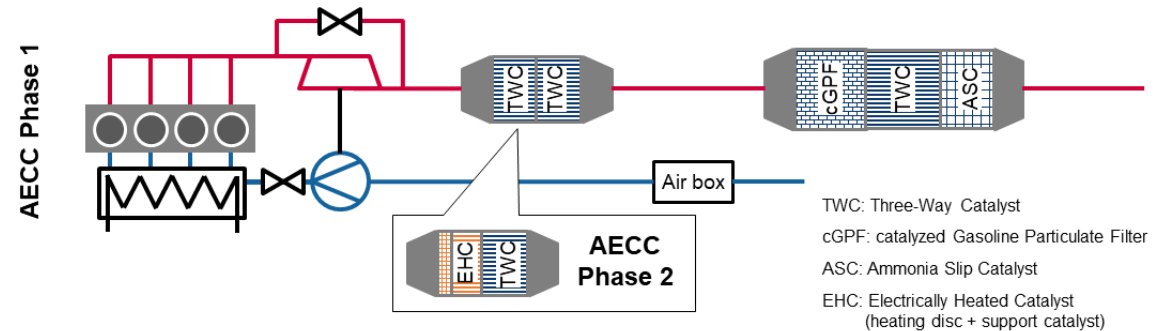


# LD gasoline demonstrator concept

- 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. Demuyck, et al.; *“Ultra-low Emissions of a 48V Mild-Hybrid Gasoline Vehicle with Advanced Emission Control Technologies”*, 15<sup>th</sup> International Conference on Engines and Vehicles, 2021

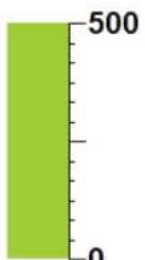
J. Demuyck, et al.; *“Zero-Impact Emissions from a Gasoline Car with Advanced Emission Controls and E-Fuels”* 43<sup>rd</sup> International Vienna Motor Symposium, 2022



Ignition

Engine load: 23%

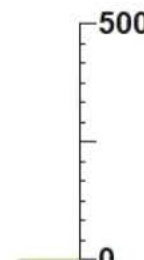
Vehicle speed: 26 km/h



NOx  
1550 ppm



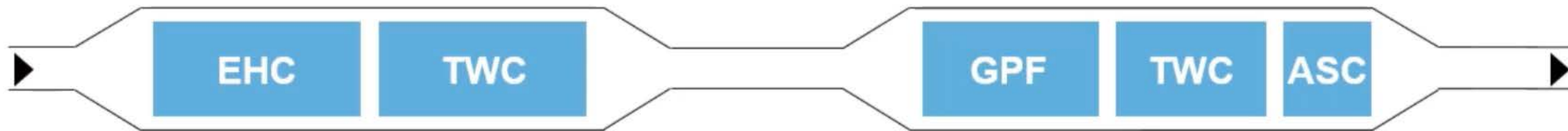
30 s or 150 m to near-zero emissions



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](https://www.youtube.com/channel/UCbPS9op5ztLqrv6zIMH_IcQ)



Engine catalyst heating



EHC heating

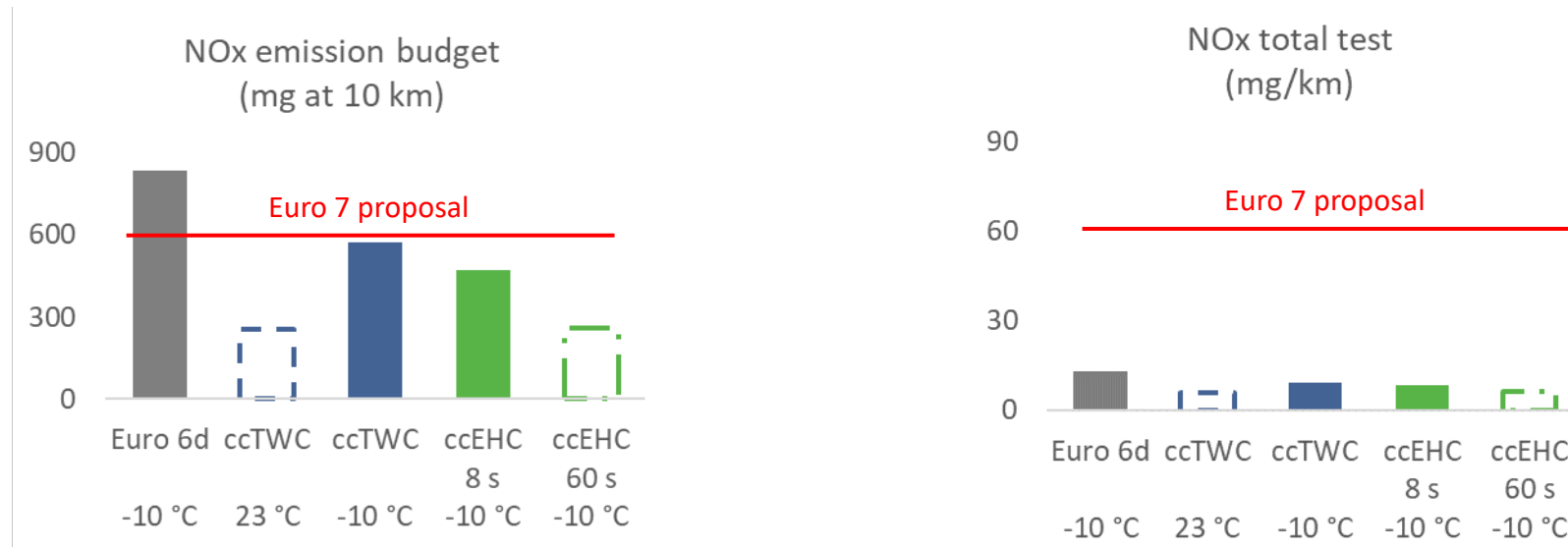


Closed-loop lambda control



# Gaseous emissions are mainly from initial cold-start

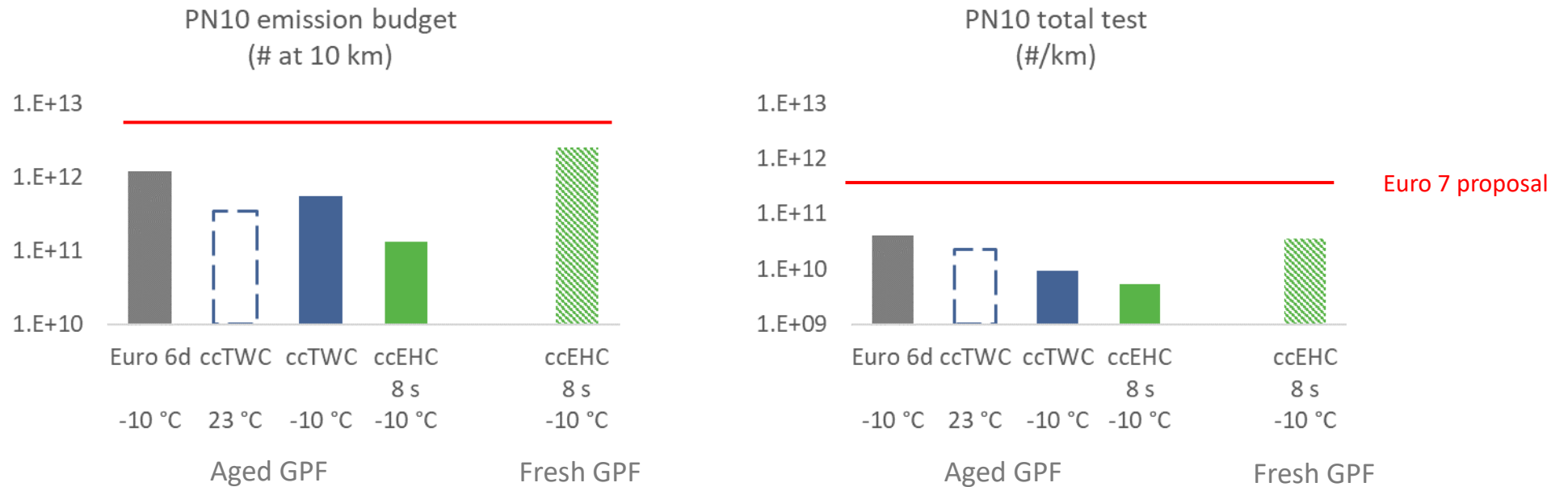
- The highest cold-start NOx peak measured is below the proposed Euro 7 emission budget limit
- Near-zero emissions under warm operation
- Further potential is possible for initial cold-start NOx due to demonstrator constraints



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

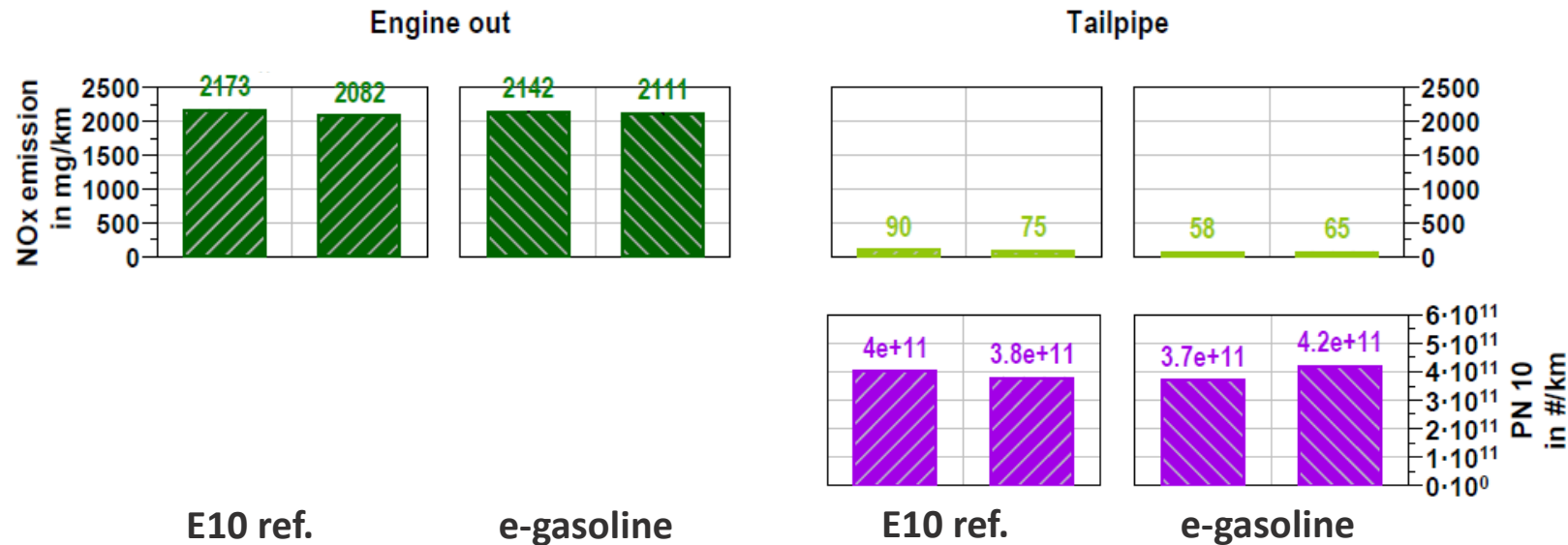


# LD gasoline demonstrator with sustainable renewable fuels

## ➤ Sustainable renewable fuels tested

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

## ➤ Ultra-low pollutant emissions confirmed



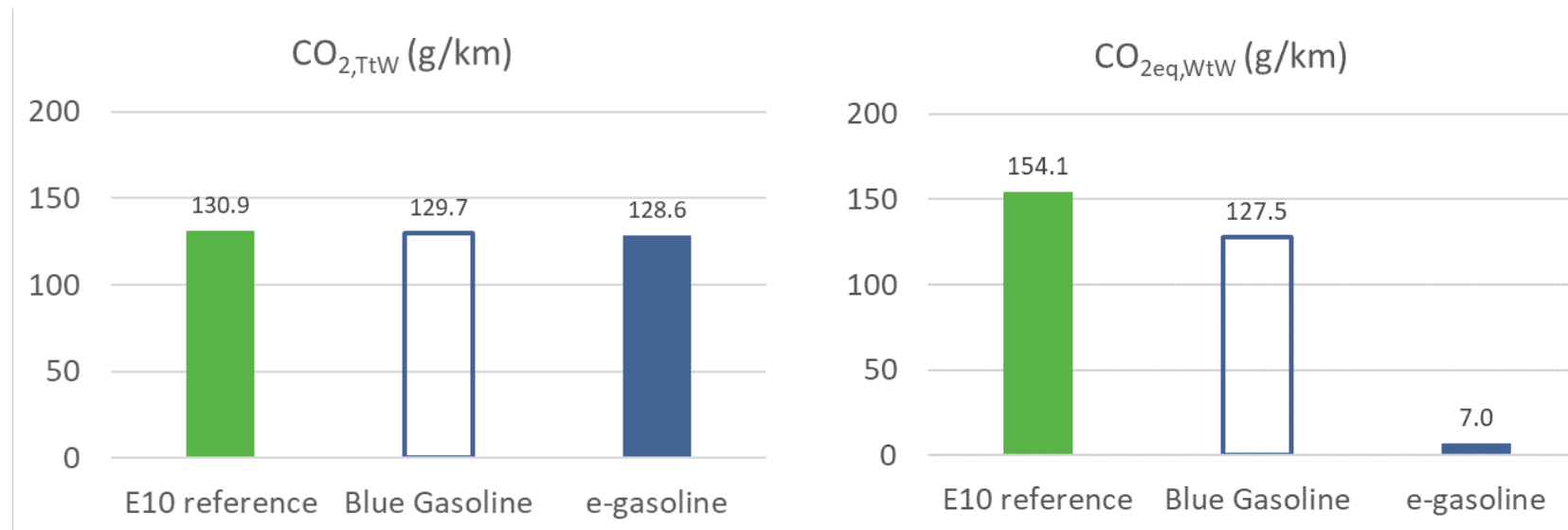
Note: RDE aggressive test results at -10 °C after 10 km (1.6 divider not applied), 2 test repeats on E10 reference fuel and e-gasoline

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

J. Demuyne, 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 CO<sub>2</sub> analysis
  - ▶ Blue Gasoline already offers significant reduction of -17% WtW CO<sub>2</sub> emissions
  - ▶ E-gasoline has the potential to nearly eliminate WtW CO<sub>2</sub> emissions



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

J. Demuyne, 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

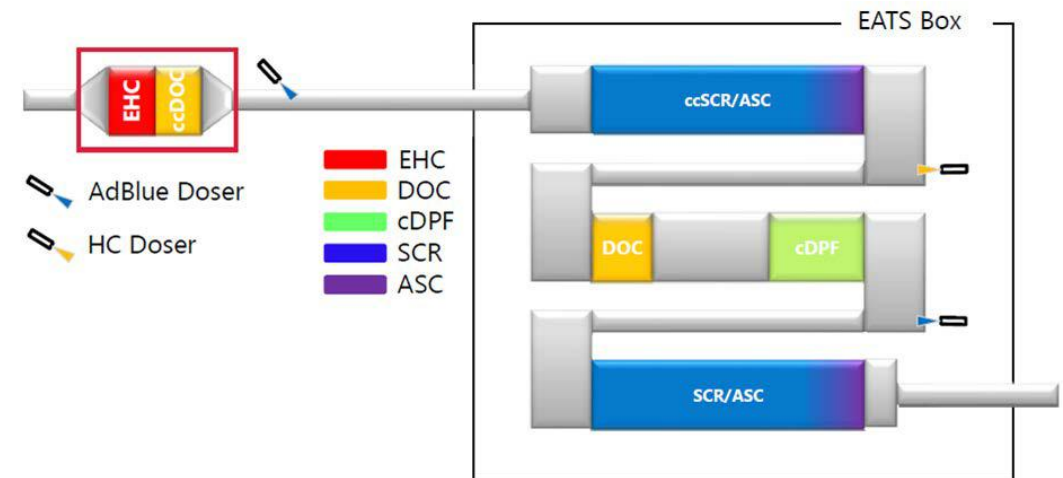
## ➤ Base vehicle description

- 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”](#), 42<sup>nd</sup> Vienna Motor Symposium 2021

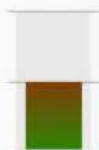
P. Mendoza Villafuerte, et al.; [“Future-proof heavy-duty truck achieving ultra-low pollutant emissions”](#), Transportation Engineering, Volume 9, September 2022, 100125, 2022



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/UCbPS9op5ztLqrv6zIMH\\_lcQ](https://www.youtube.com/channel/UCbPS9op5ztLqrv6zIMH_lcQ)



**NO<sub>x</sub>** 390 ppm



16 ppm **NO<sub>x</sub>**



# Sustainable Mobility

Catalysts, adsorbers and filters reduce emissions from Internal Combustion Engines

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[Legislation for Sustainable Mobility](#)

[Technology for Sustainable Mobility](#)

[The Future of European Sustainable Mobility](#)

[Fuel for Sustainable Mobility](#)



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