

# AECC input to the post-Euro 6 consideration

AGVES meeting • Brussels • 18 October 2019

# Agenda

- RDE legislation has significantly improved real-world emissions
  - Gasoline cars
  - Diesel cars
- General legislative principles to enhance real-world compliance
- Results of AECC diesel demonstrator car

# Light-duty gasoline emissions control technology evolution

Single Three-Way Catalyst  
for Euro 6a/b

Three-Way Catalyst (TWC)

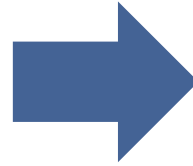


Source: Volvo



TWC

Source: VW



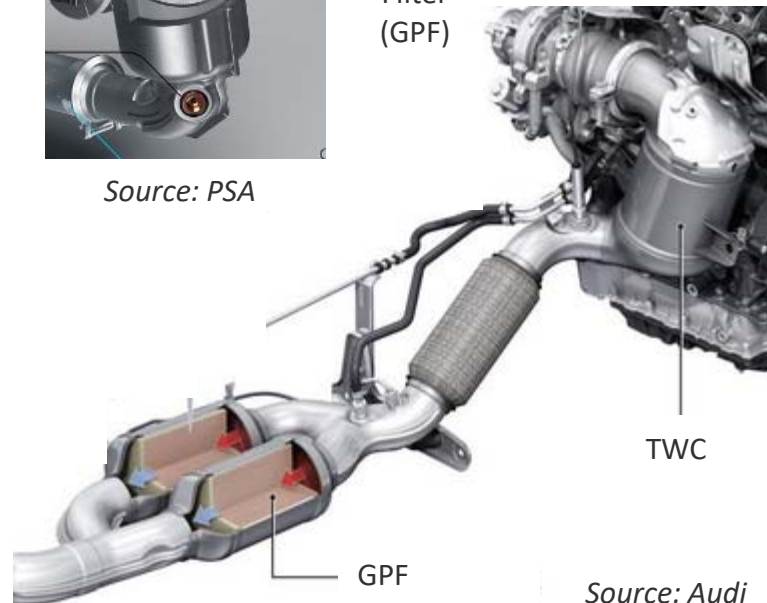
Introduction of Gasoline Particulate Filter on cars with direct injection and  
integration with Three-Way Catalyst for Euro 6d(-TEMP)



TWC

Gasoline  
Particulate  
Filter  
(GPF)

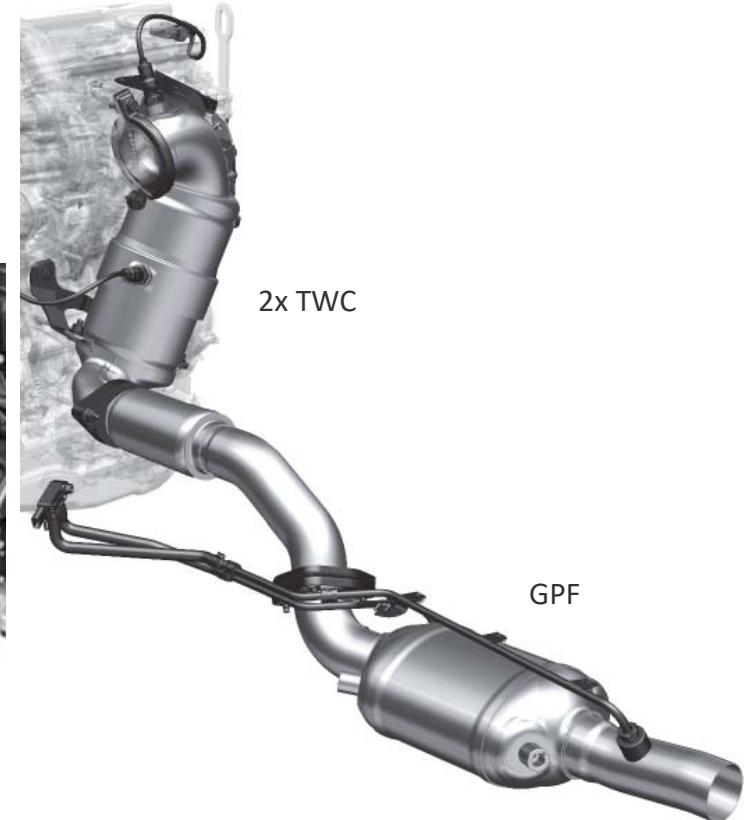
Source: PSA



TWC

GPF

Source: Audi



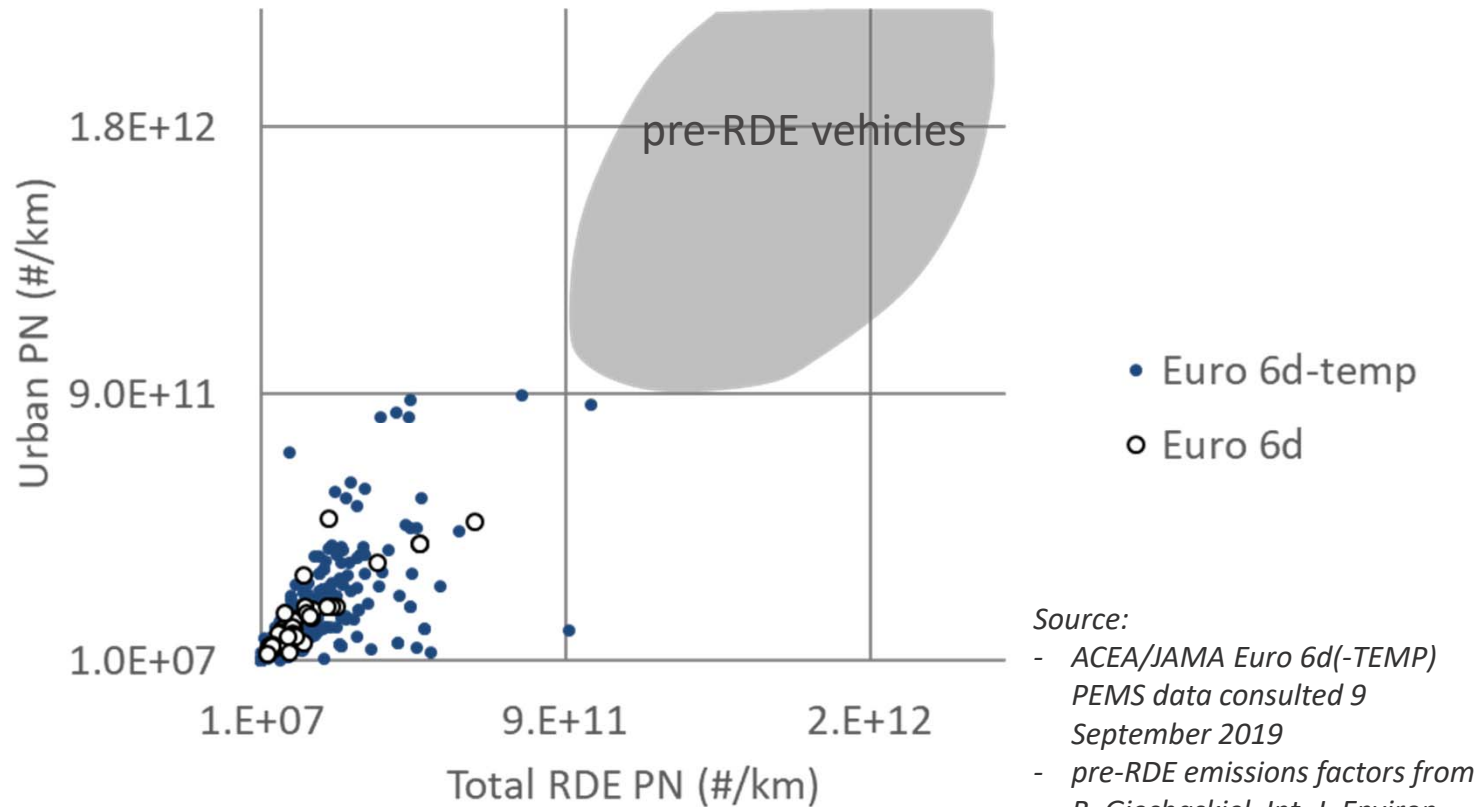
2x TWC

GPF

Source: Opel

# RDE has significantly improved GDI PN emissions

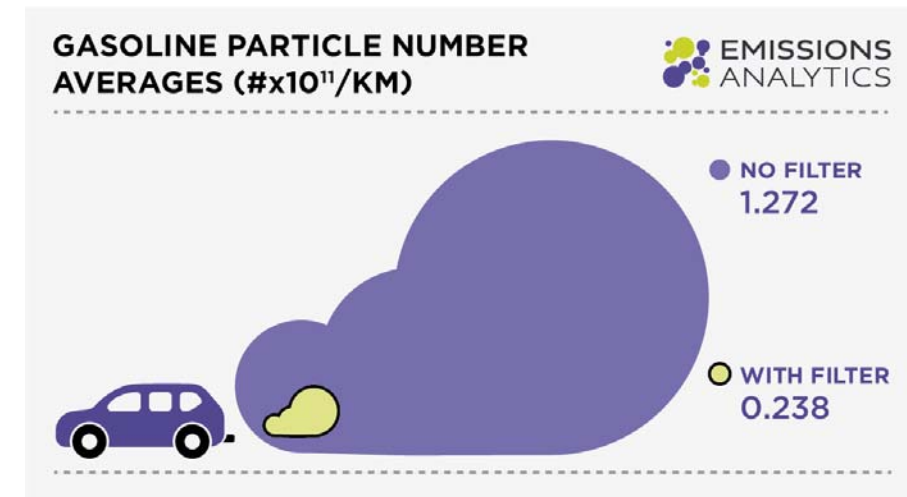
- On-road emissions of Euro 6d(-TEMP) cars are well within standards



Source:

- ACEA/JAMA Euro 6d(-TEMP) PEMS data consulted 9 September 2019
- pre-RDE emissions factors from B. Giechaskiel, Int. J. Environ. Res. Public Health, 2018

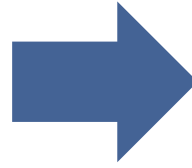
- Trend is confirmed by 3<sup>rd</sup> party testing



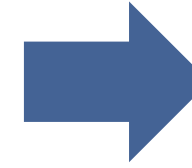
Source: Emissions Analytics

# Light-duty diesel emissions control technology evolution

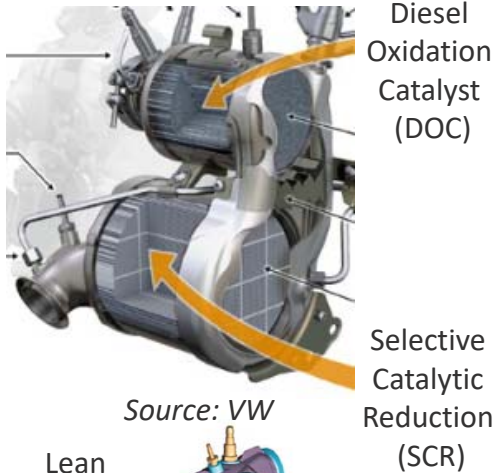
Introduction of individual deNOx technologies for Euro 6a/b



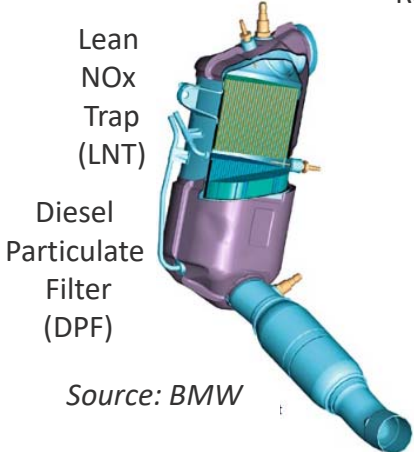
Combination of deNOx technologies for Euro 6d-TEMP



Further integration for Euro 6d



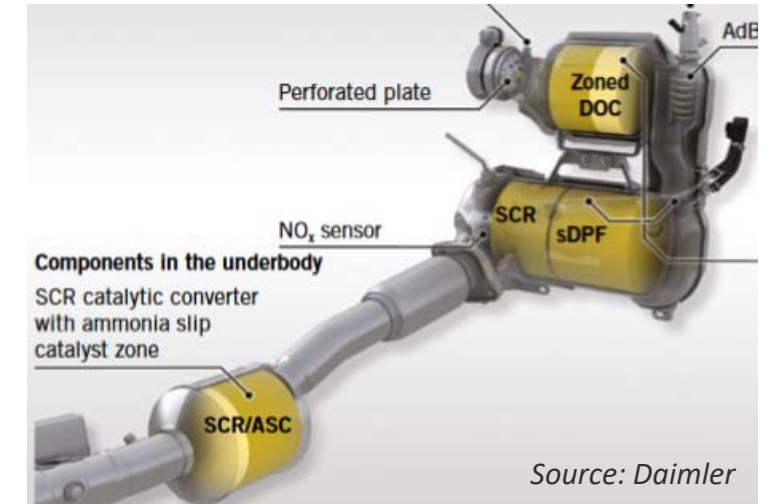
Source: VW



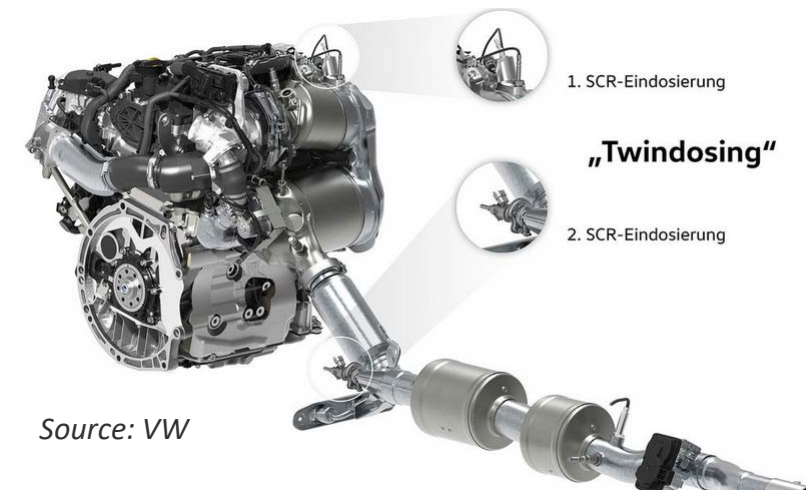
Source: BMW



Source: Hyundai



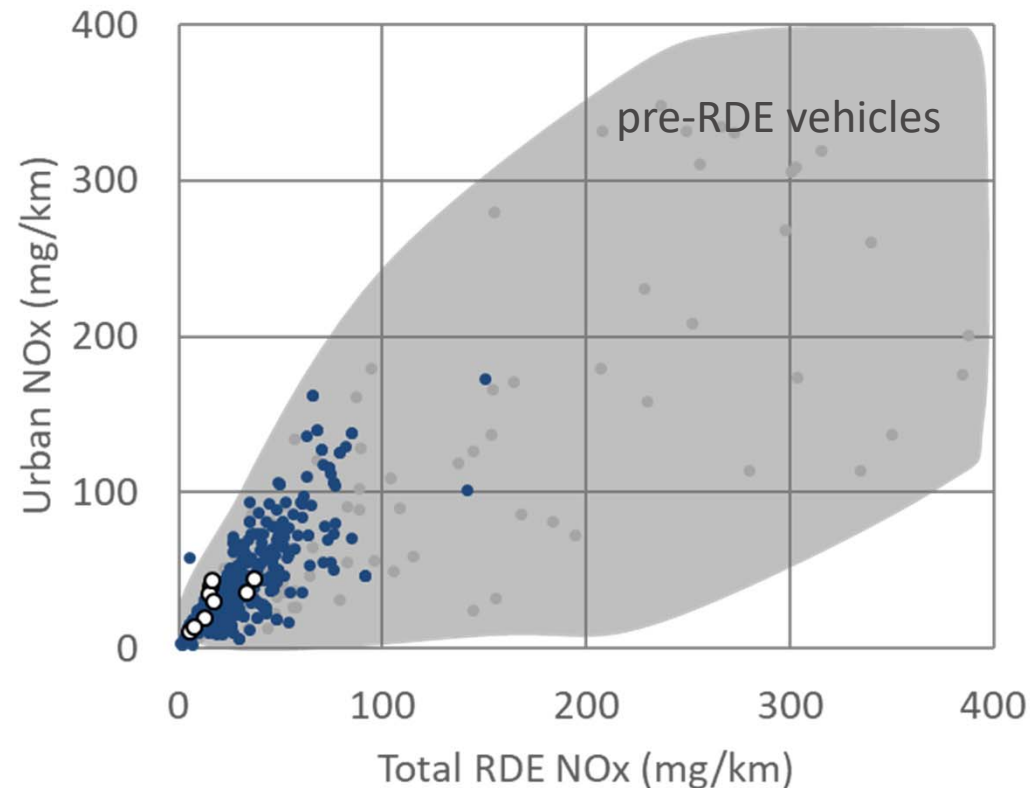
Source: Daimler



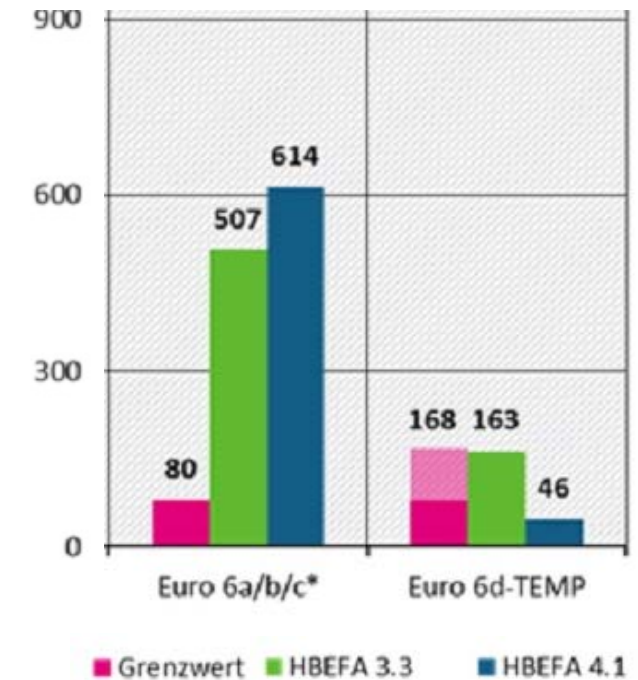
Source: VW

# RDE has significantly improved diesel NOx emissions

- On-road emissions of Euro 6d(-TEMP) cars are well within standards



Source: ACEA/JAMA PEMS  
data consulted  
9 September 2019

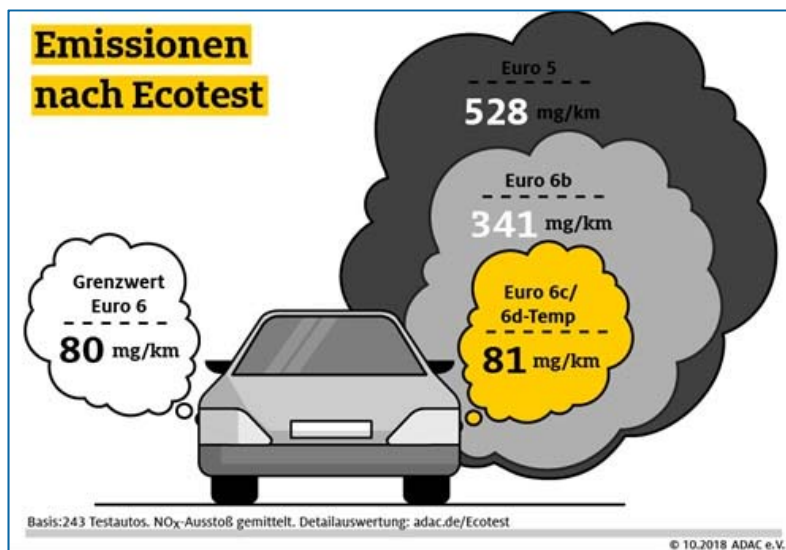


Source: Handbook of Emissions Factors 4.1,  
UBA press release 11 September 2019

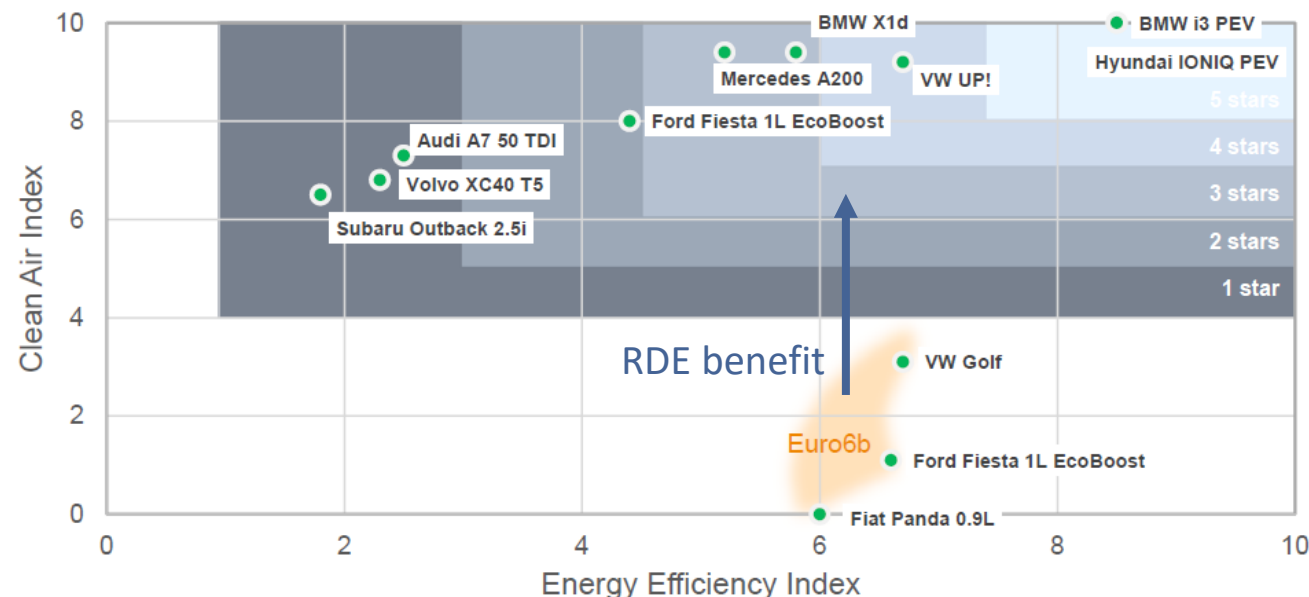


# RDE has significantly improved diesel NOx emissions

➤ Trend is confirmed by 3<sup>rd</sup> party testing



Source: ADAC Ecotest



Source: Green NCAP

## DIESEL NO<sub>x</sub> AVERAGES (G/KM)



- EURO 5  
0.814
- EURO 6 PRE-RDE  
0.334
- EURO 6 POST-RDE  
0.048



Source: Emissions Analytics

**Diesel und Benziner:  
Jetzt sind beide sauber!**



Source: Auto Motor und Sport

# General legislative principles to enhance real-world compliance

To build further on success of RDE in Euro 6d for the next step in emission legislation

## ➤ Effective

- Ensure exposure of individual citizens to vehicle pollution is within safe limits
- Towards zero-impact on air quality with specific attention to urban environment

## ➤ Real-world

- Legislate actual tailpipe emissions
- No more data exclusion and normalisation

## ➤ Neutral

- Fuel- & technology-neutral procedures and limits
- Application-neutral with similar stringency for every type of vehicle and machine



# AECC ultra-low NOx emissions diesel demonstrator

➤ Robust NOx control over wide range of driving conditions

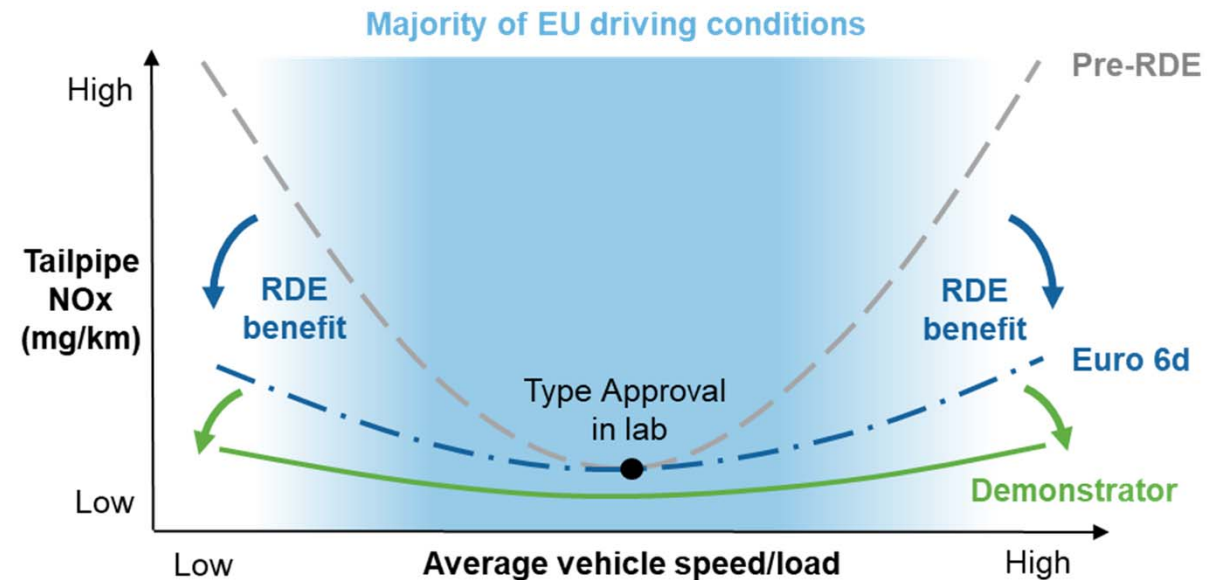
➤ Low speed/load  
e.g. city driving



➤ High speed/load  
e.g. motorway driving



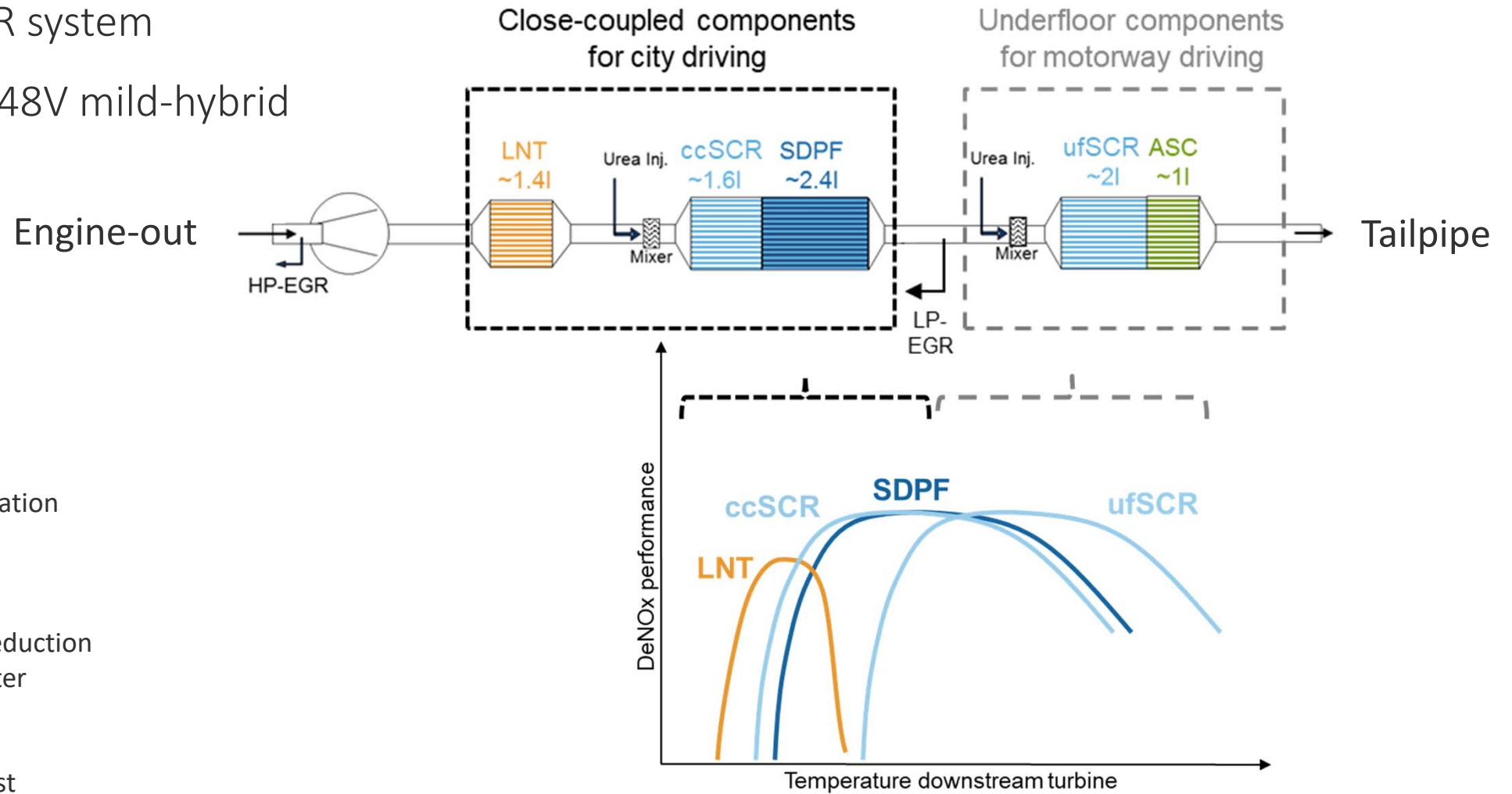
➤ Transients  
e.g. overtaking



More details: J. Demuynck, et al.; "Integrated Diesel System Achieving Ultra-Low Urban and Motorway NOx Emissions on the Road", 40th International Vienna Motor Symposium, 2019  
<https://www.aecc.eu/wp-content/uploads/2019/04/190516-AECC-IAV-IPA-Integrated-Diesel-System-achieving-Ultra-Low-NOx-on-the-road-Vienna-Symposium.pdf>

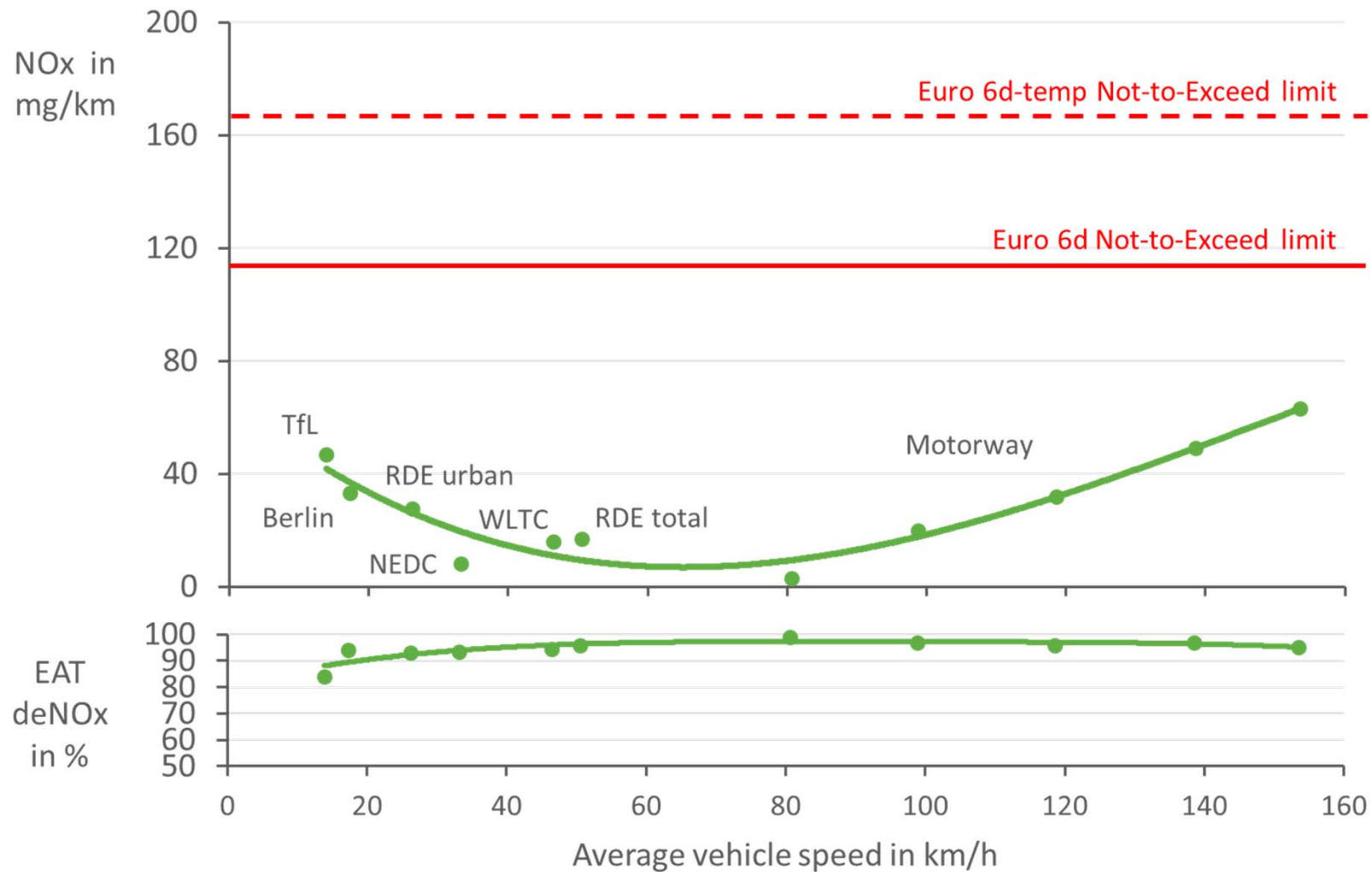
# Emissions controls to cover wide range of driving conditions

- LNT + dual-SCR system
- Supported by 48V mild-hybrid



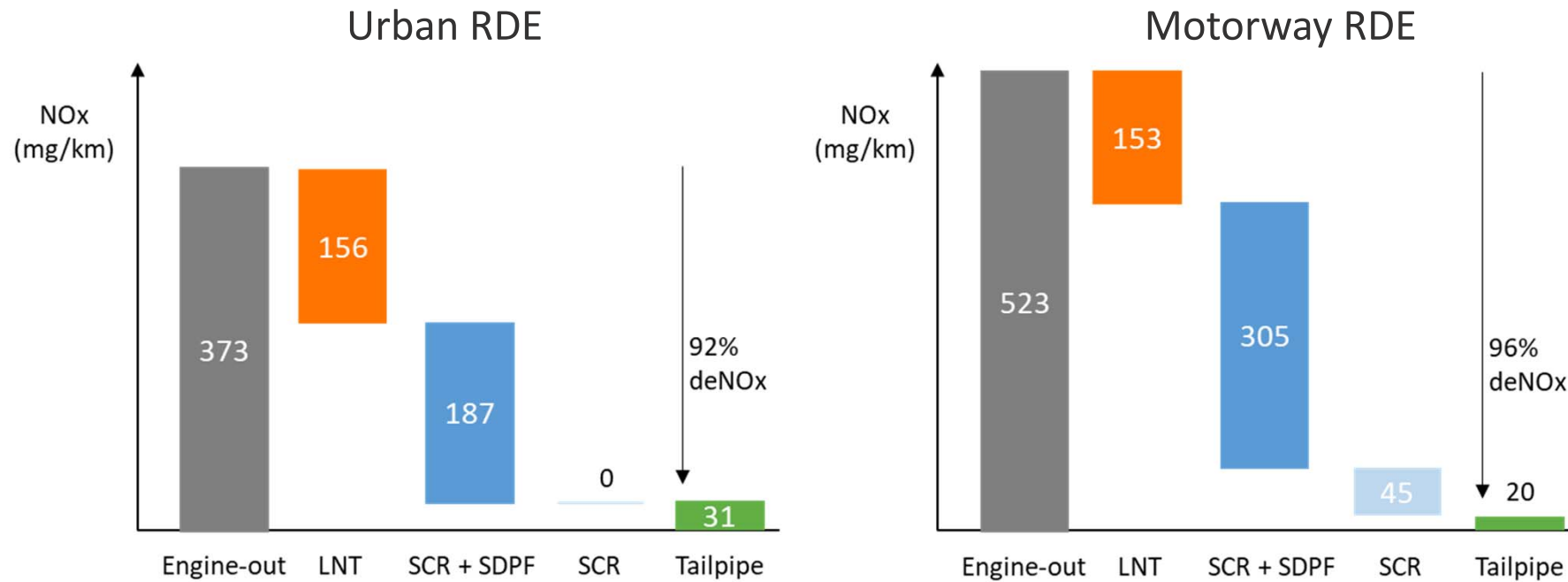
EGR: Exhaust Gas Recirculation  
HP/LP: High/Low pressure  
cc: close-coupled  
LNT: Lean NOx trap  
SCR: Selective Catalytic Reduction  
DPF: Diesel Particulate Filter  
SDPF: SCR on DPF  
uf: underfloor  
ASC: Ammonia Slip Catalyst

# Robust NOx control achieved



# All aftertreatment components contribute to NO<sub>x</sub> control

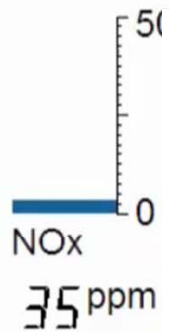
- City driving: LNT and close coupled SCR+SDPF
- Motorway driving: underfloor SCR required to secure robust emissions control





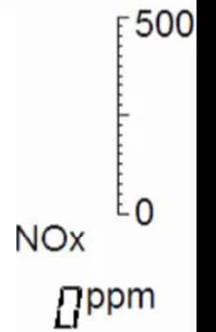


Engine load: 11% Vehicle speed: 0 km/h



More videos available on YouTube (AECC eu):

[https://www.youtube.com/channel/UCbPS9op5ztLqrv6zlMH\\_IcQ](https://www.youtube.com/channel/UCbPS9op5ztLqrv6zlMH_IcQ)



# THANK YOU !

[www.aecc.eu](http://www.aecc.eu)  
[dieselinformation.aecc.eu](http://dieselinformation.aecc.eu)



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AECC (Association for Emissions Control by Catalyst)



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