

# Diesel engines on the pathway to low impact on local air quality

Joachim Demuynck

Low Carbon Vehicle Event 2018 •  
Millbrook, UK • 13 September 2018

# Association for Emissions Control by Catalyst (AECC AISBL)

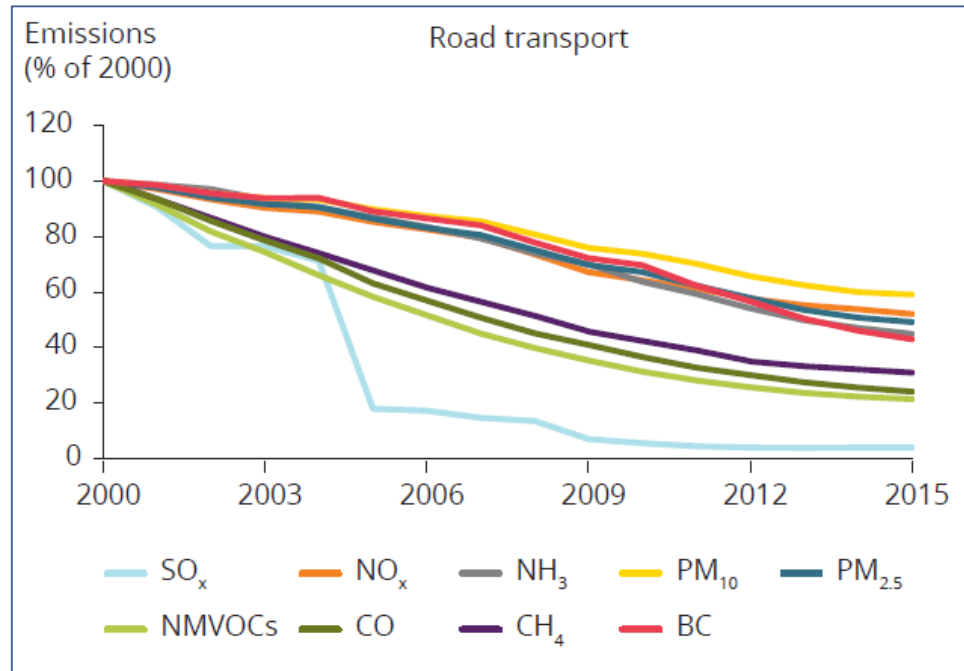
AECC members : European Emissions Control companies



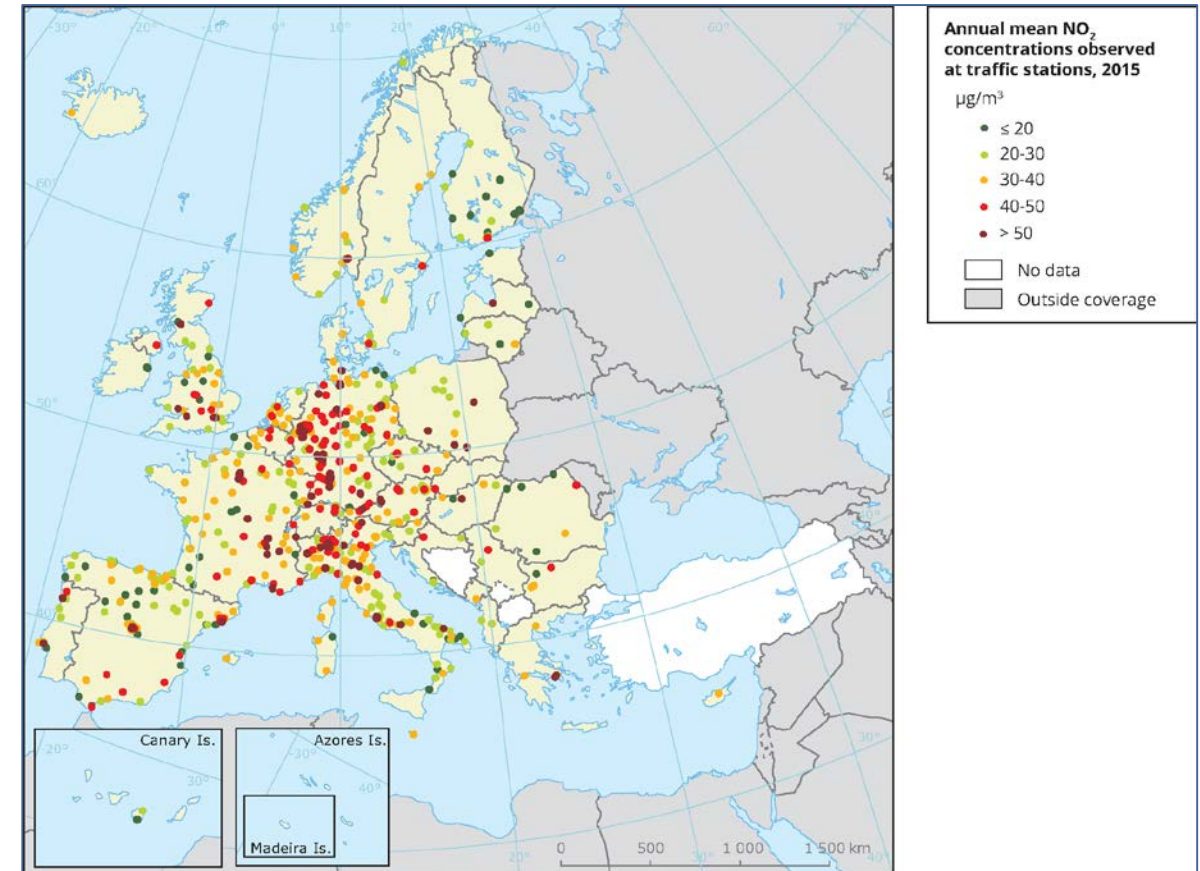
- Exhaust emissions control technologies for original equipment, retrofit and aftermarket for all new cars, commercial vehicles, motorcycles, and non-road mobile machinery

# EU Air Quality has improved over the years

But further efforts are needed

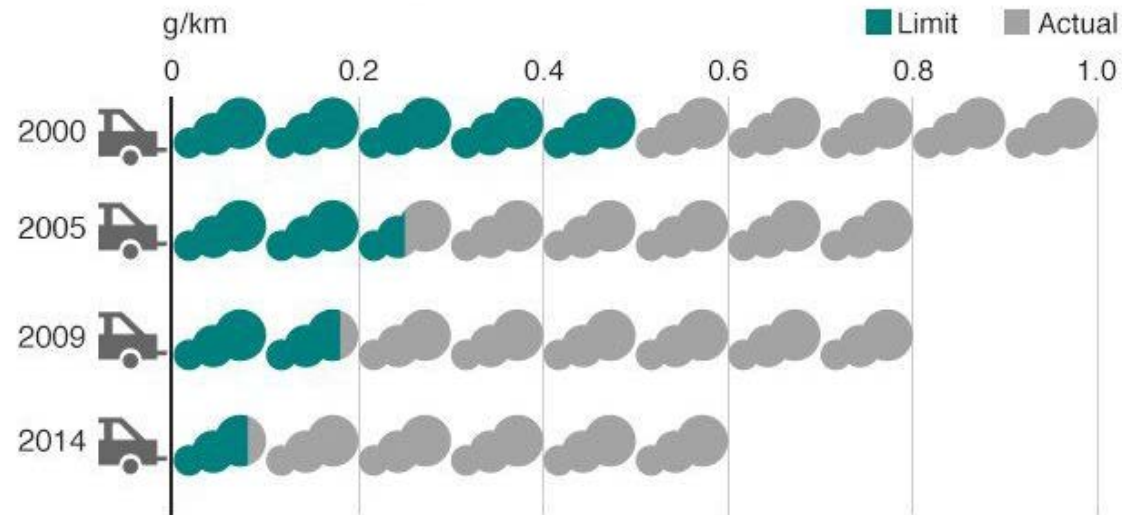


Source: European Environment Agency (EEA)

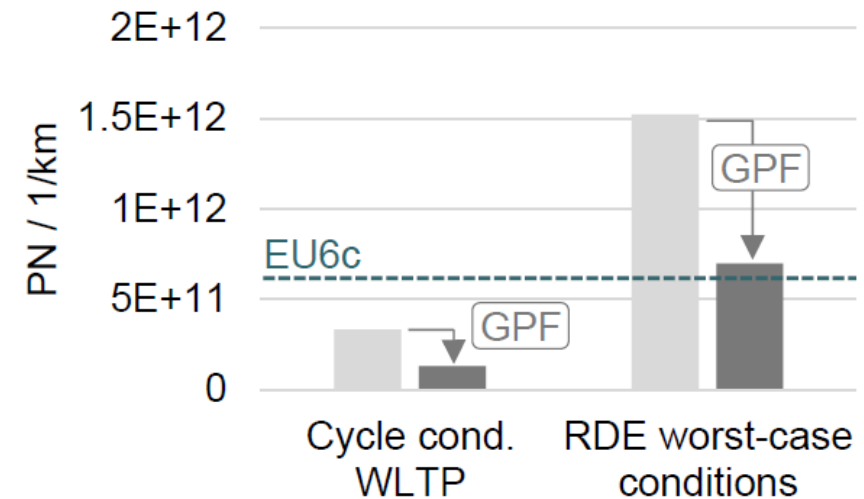


# EU RDE legislation introduced as of 1/9/2017

Aims to close the emissions gap between lab and real-world



Source: average on-road diesel NOx emissions, the ICCT



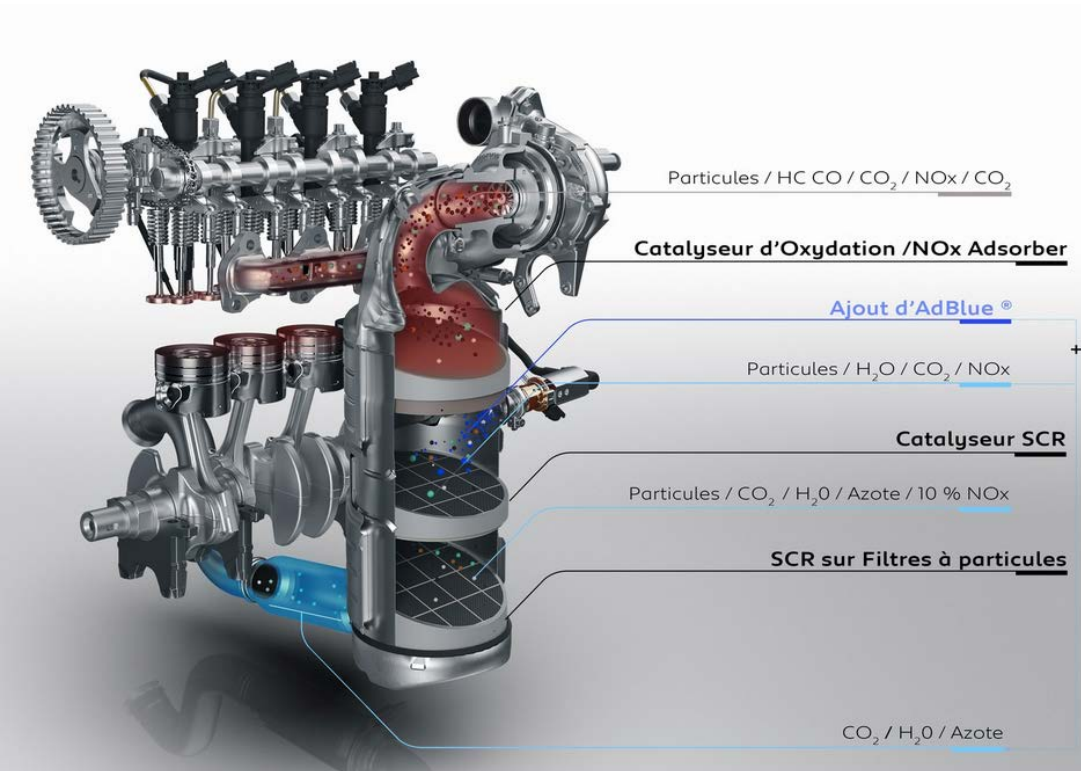
Source: Gasoline Particulate Filters Market and Technology Trends and their Impact on Calibration, FEV, SIA powertrain 2017

# Content

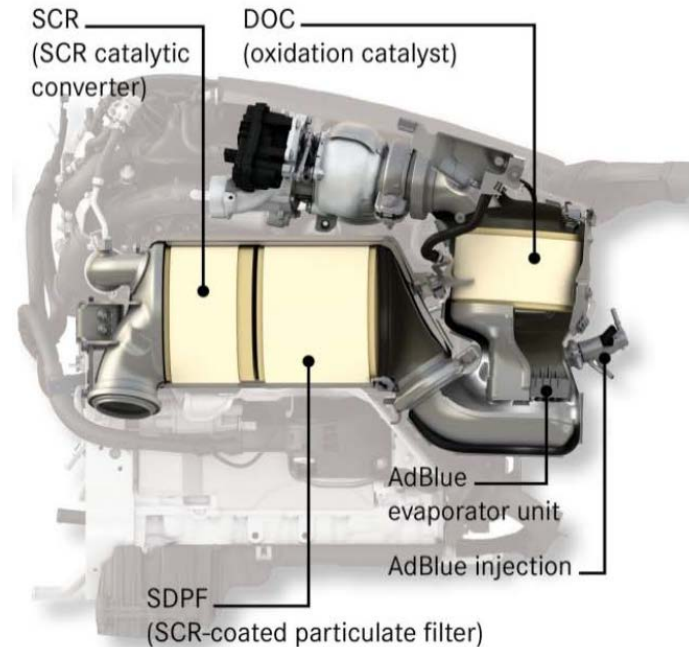
- Evolution in diesel emissions control technologies
- Low NOx emission diesel cars: a reality
- Air quality modelling

# Light-duty diesel emissions control technology evolution

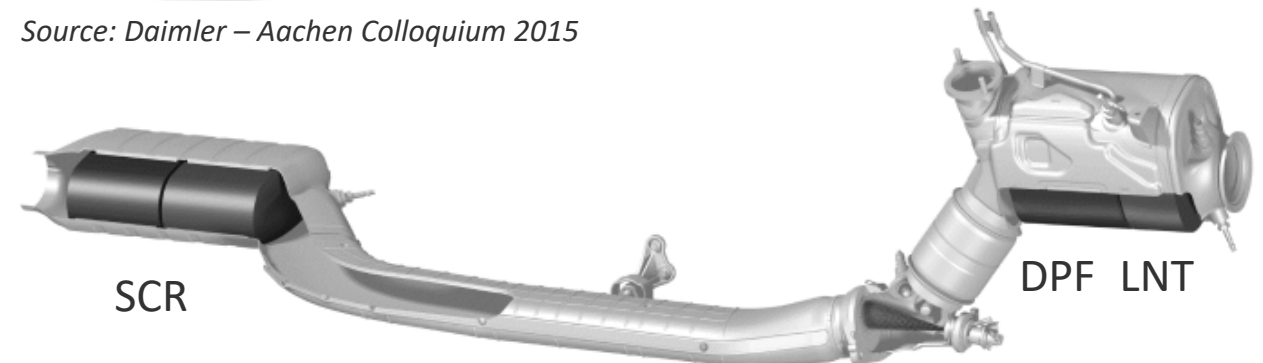
Towards combination of technologies in a compact design for RDE compliance



Source: Peugeot – 308 press release 2017



Source: Daimler – Aachen Colloquium 2015

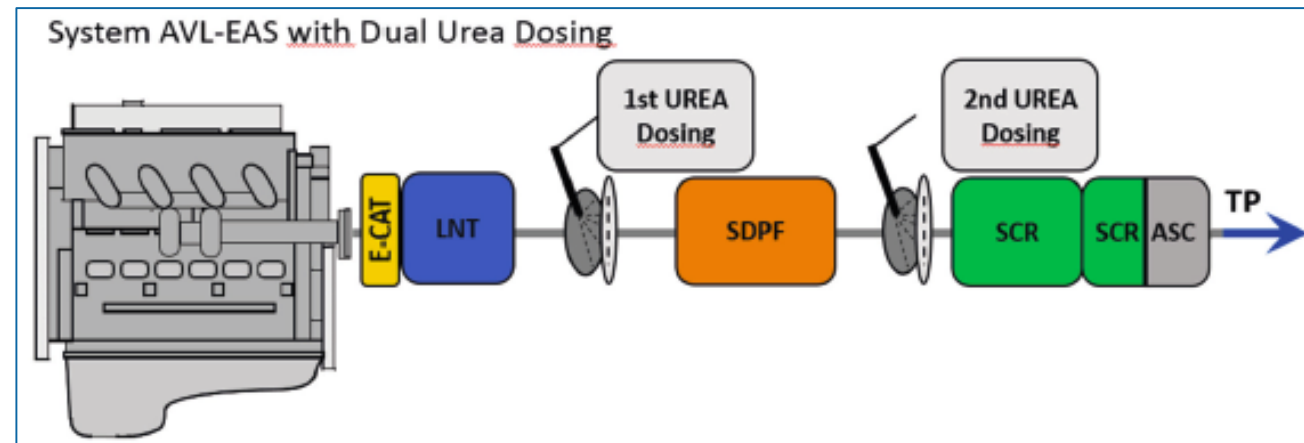


Source: BMW – Aachen Colloquium 2015

# Light-duty diesel emissions control technology evolution

Potential for future improvements to cover a wide range of driving conditions

- SCR in different locations to cover urban and motorway driving
- Dual urea injection to provide more flexible dosing
- Optimising thermal management for urban driving

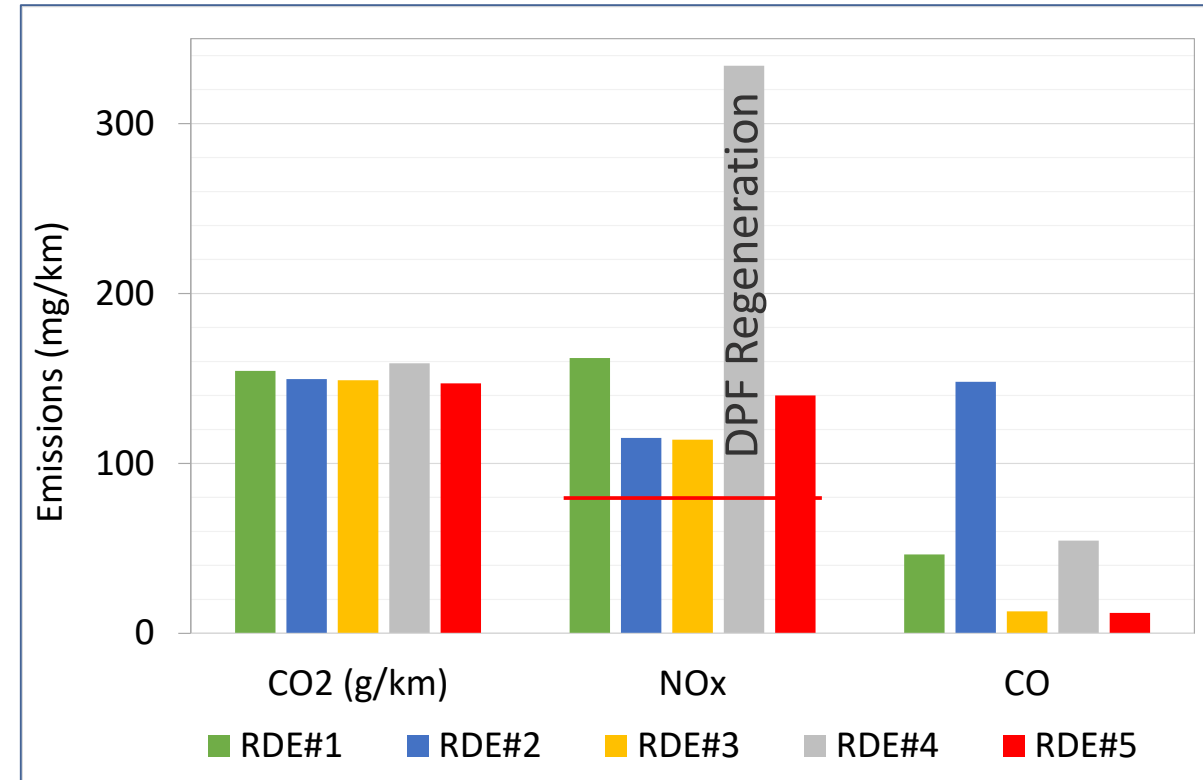
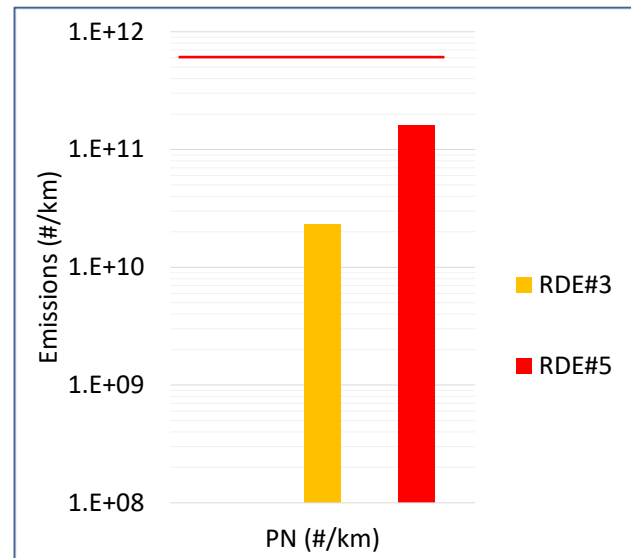


Source: AVL – Highly Efficient Exhaust Gas Aftertreatment for Future Diesel Applications – 10<sup>th</sup> International Exhaust Gas and Particulate Emissions Forum February 2018



# AECC RDE test programmes demonstrated low emissions

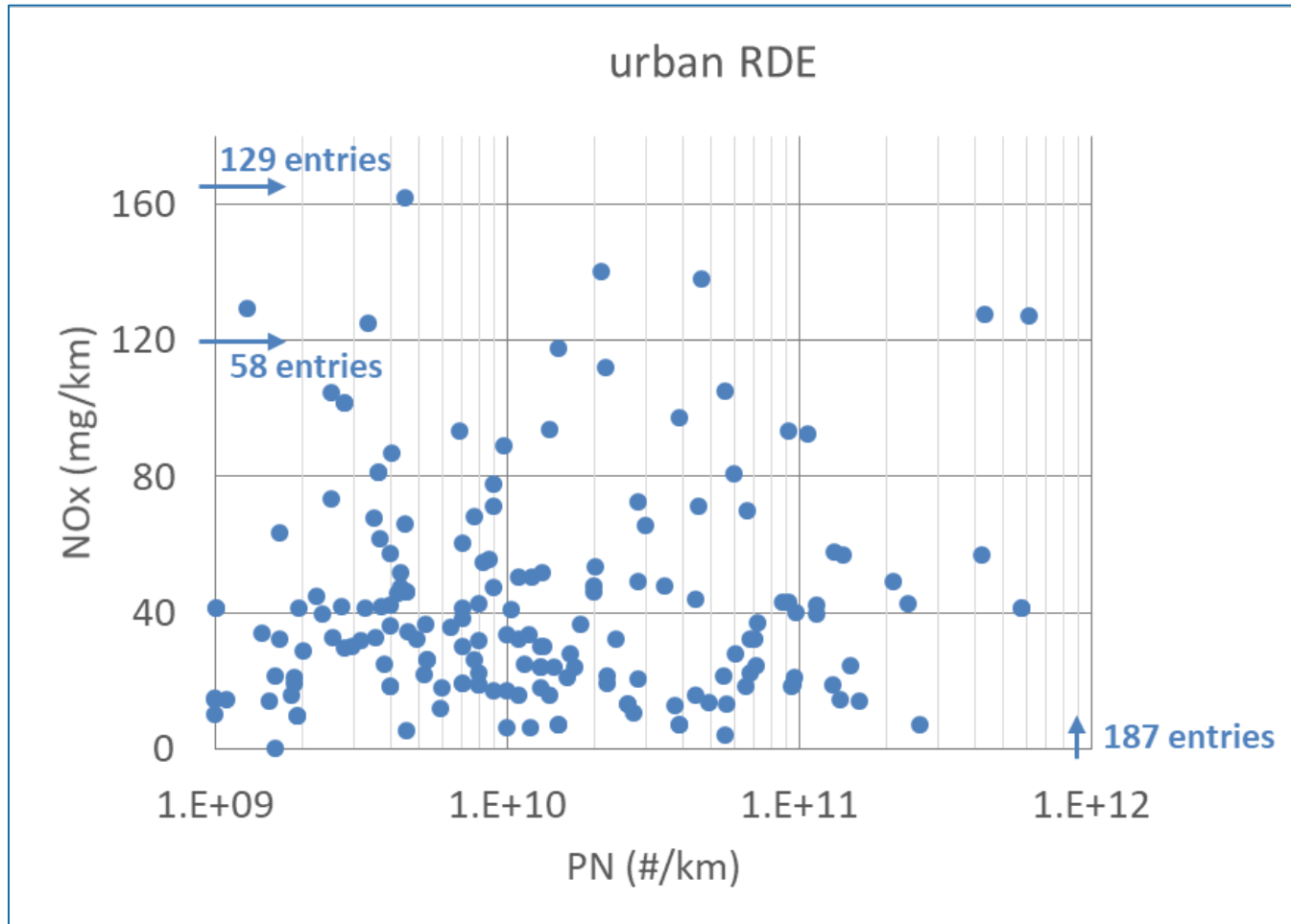
- 2014: demonstrator with SCR on DPF
- 2015: series vehicle with SCR on DPF
- Results
  - NOx towards Euro 6d NTE (120 mg/km)
  - PN with DPF below  $6 \times 10^{11}/\text{km}$



2015 AECC series vehicle results:  
PN & NOx emissions on RDE total



# Emissions of Euro 6d-Temp diesels well within standards



→ Max. declared values

Source: PEMS results and maximum declared values from ACEA RDE database consulted on 28 August 2018

# Content

- Evolution in diesel emissions control technologies
- Low NOx emission diesel cars: a reality
- Air quality modelling

# Air quality modelling study done by IIASA up to 2040

Impact of Euro 6d/RDE legislation investigated for AECC

➤ Scenario = impact assessment of the EU's Thematic Strategy on Air Pollution

- PRIMES, including Euro 6d
- Extended for developments up to 2040

➤ Assumptions

- Emissions factors = RDE Conformity Factors
- Fleet turnover from COPERT model
- NOx control tampering issues not included (e.g. AdBlue® emulator): effects?

Average NOx emissions and share of primary NO<sub>2</sub> for diesel passenger cars

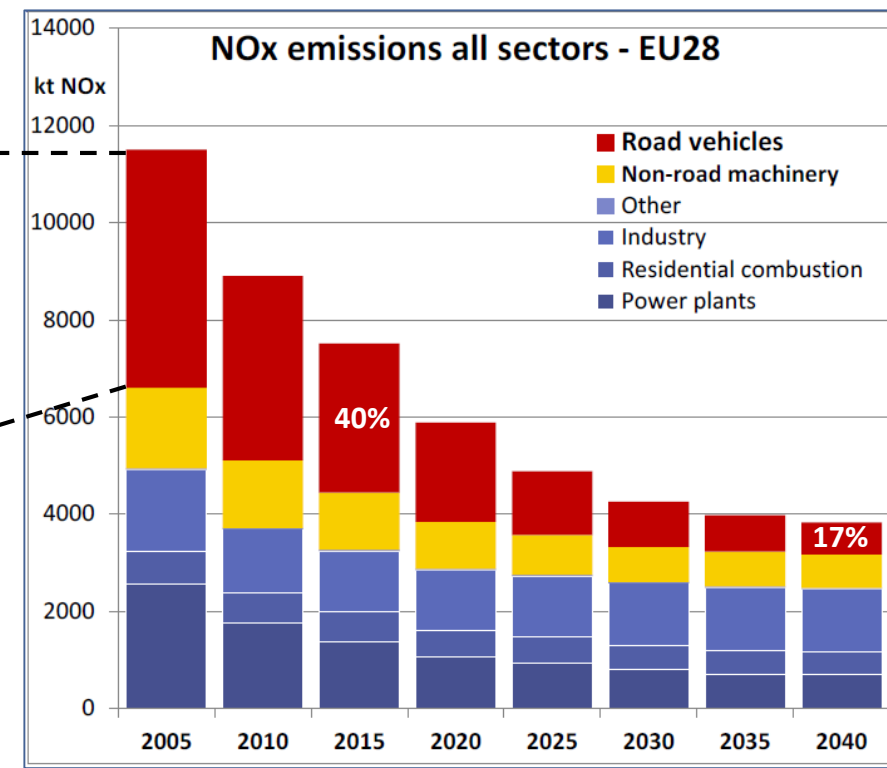
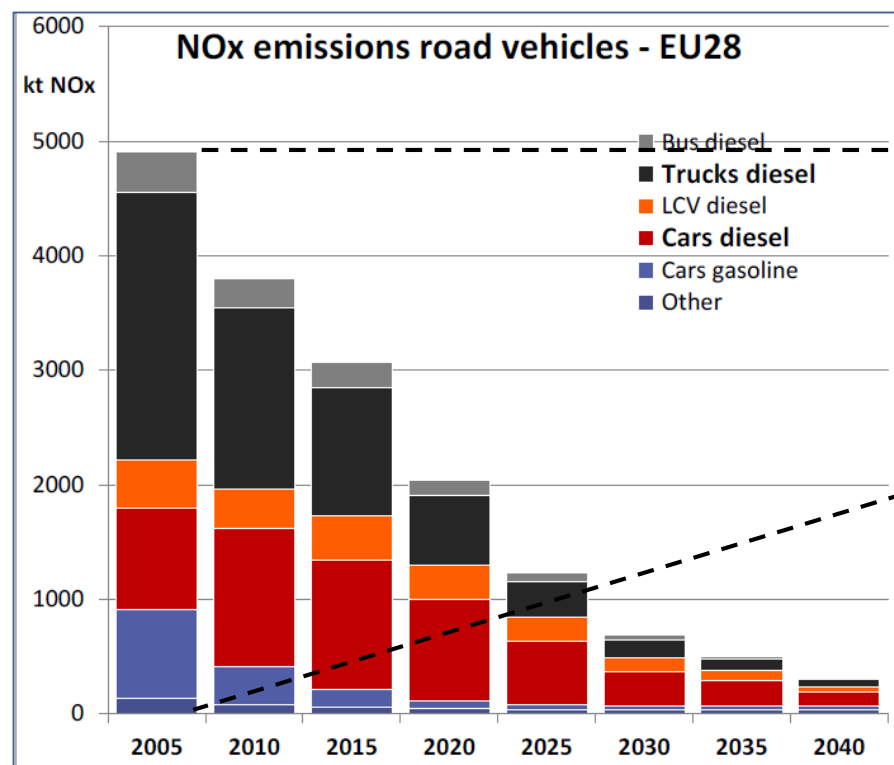
	average NOx emission rate in on-road driving [mg/km]	share of primary NO <sub>2</sub>
Euro 4 and older	~600	range: 7% to 49%
Euro 5 – until 09/15	~750	37%
Euro 6b – 09/15-08/19	~350 (CF:4.4)	32%
Euro 6dTEMP – 09/19-12/20	linear combination of Euro 6b and Euro 6d	
Euro 6d – from 01/21	~120 (CF:1.5)	32%

# Euro 6d benefit to EU NOx emissions inventory

## ➤ Road vehicles contribution

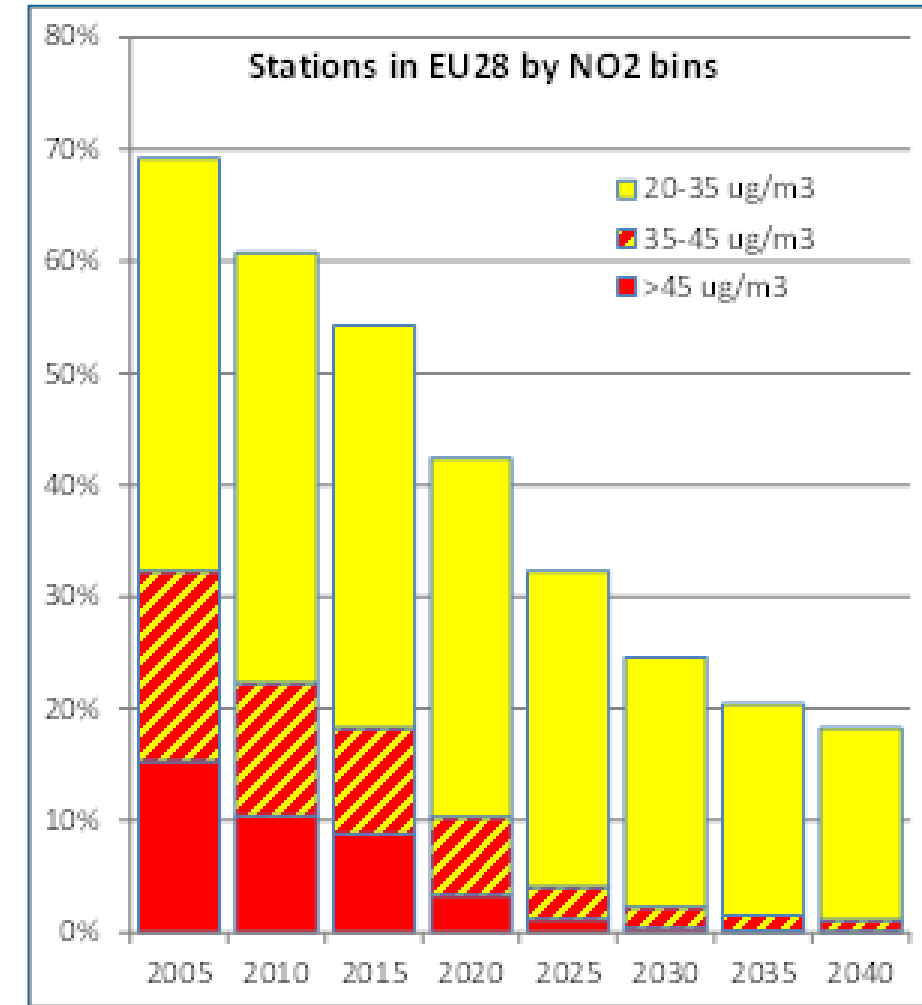
➤ 2015: 40%

➤ 2040: 17% (provided Euro 6d Emissions Factors = Conformity Factors)



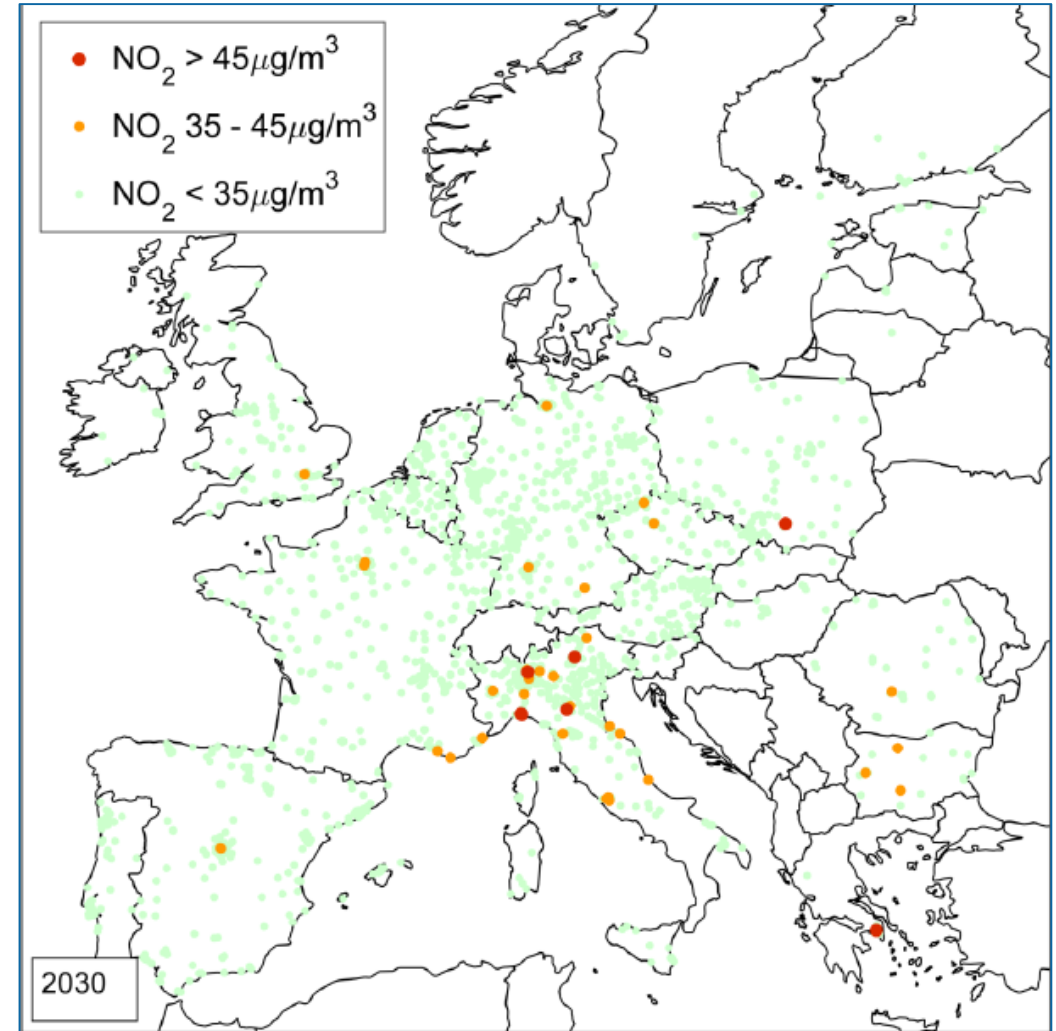
# Euro 6d benefit to NO<sub>2</sub> monitoring stations exceedances

- WHO Global Air Quality Guideline for annual NO<sub>2</sub> concentration
  - Current guideline: 40 µg/m<sup>3</sup>
  - On-going review may lower the guideline value
- NO<sub>2</sub> exceedance classes modelled
  - Severe: >45 µg/m<sup>3</sup>
  - Problematic: 35-45 µg/m<sup>3</sup>
  - Potentially: 20-35 µg/m<sup>3</sup>
- Strong decline of number of NO<sub>2</sub> stations >35 µg/m<sup>3</sup>



# Remaining NO<sub>2</sub> monitoring stations exceedances in 2030

- Cities (e.g. Athens, London, Paris, Madrid, Hamburg, Munich, Stuttgart)
- Areas with high industrial activity and bad air exchange (e.g. Northern Italy, Southern Poland, areas in Bulgaria and Romania)



# Conclusions

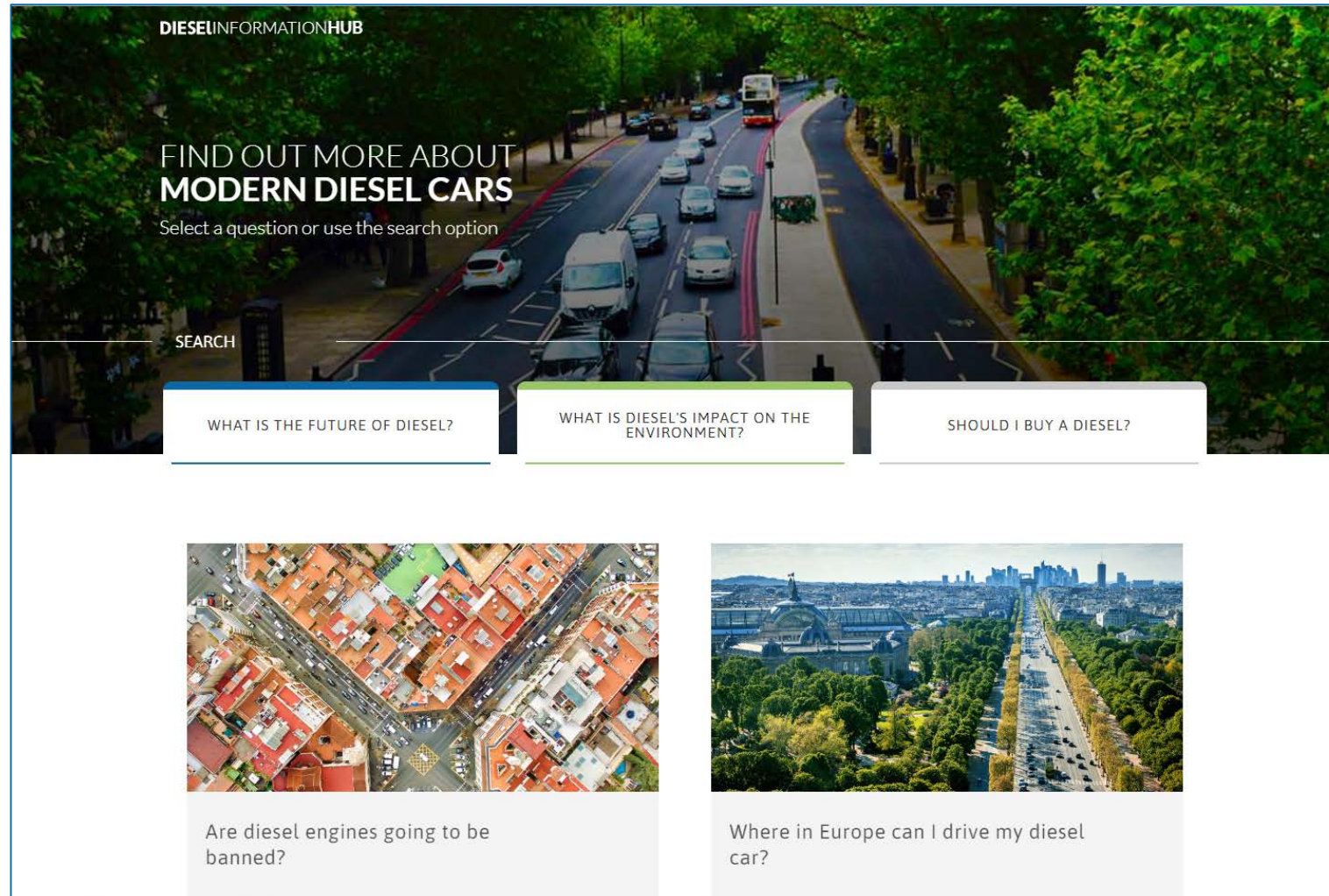
- A new era for vehicle emissions control started in September 2017 with introduction of RDE and WLTP.
- On-road emissions performance of RDE-compliant diesel vehicles are well within standards.
- Air quality simulation demonstrates that modern diesel engines are on the pathway to have a low impact. Contribution projected to be similar to other sources.
- Efforts will nevertheless continue to further reduce the impact of all sources.





# Diesel Information Hub

<https://dieselinformation.aecc.eu> (launched 15 May 2018)



# THANK YOU !

Joachim Demuynck

joachim.demuynck@aecc.eu

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

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



@AECC\_eu



AECC (Association for Emissions Control by Catalyst)



@aeccbrussels

