

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

Dirk Bosteels

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# Association for Emissions Control by Catalyst (AECC AISBL)

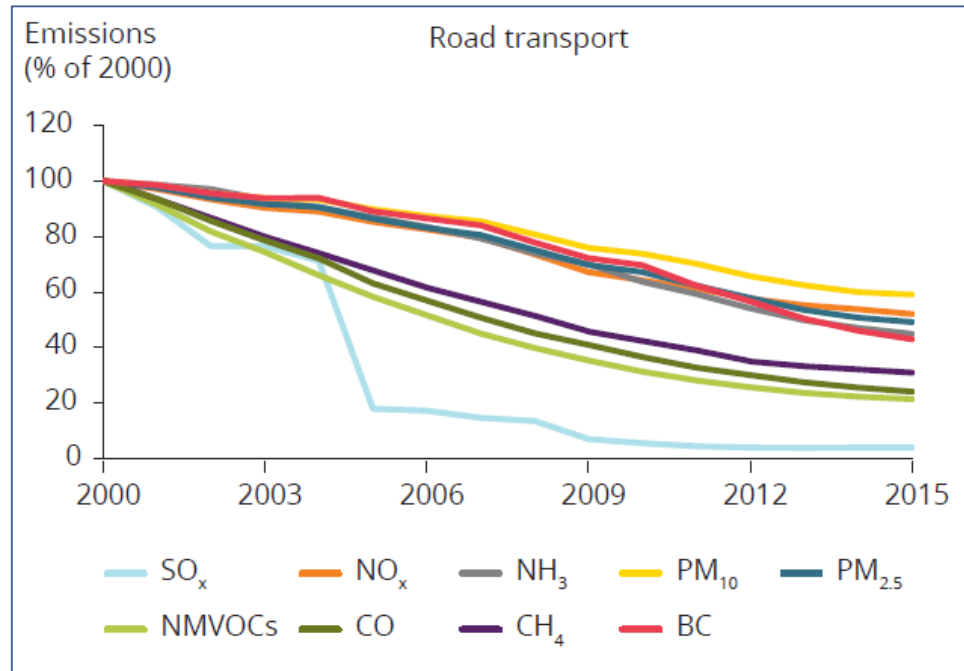
AECC members : European Emissions Control companies



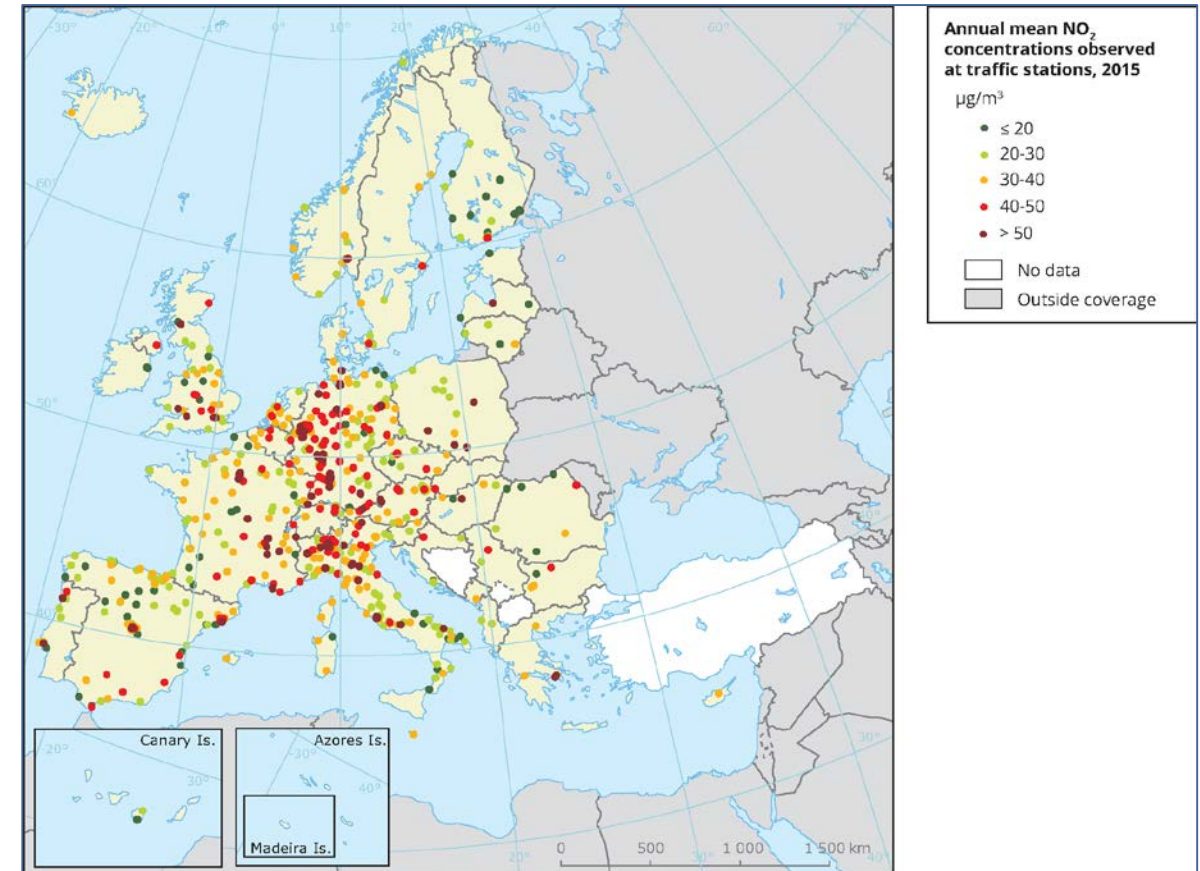
- Exhaust emissions control technologies for original equipment, retrofit and aftermarket for all new cars, commercial vehicles, motorcycles, and non-road mobile machinery

# EU Air Quality has improved over the years

But further efforts are needed

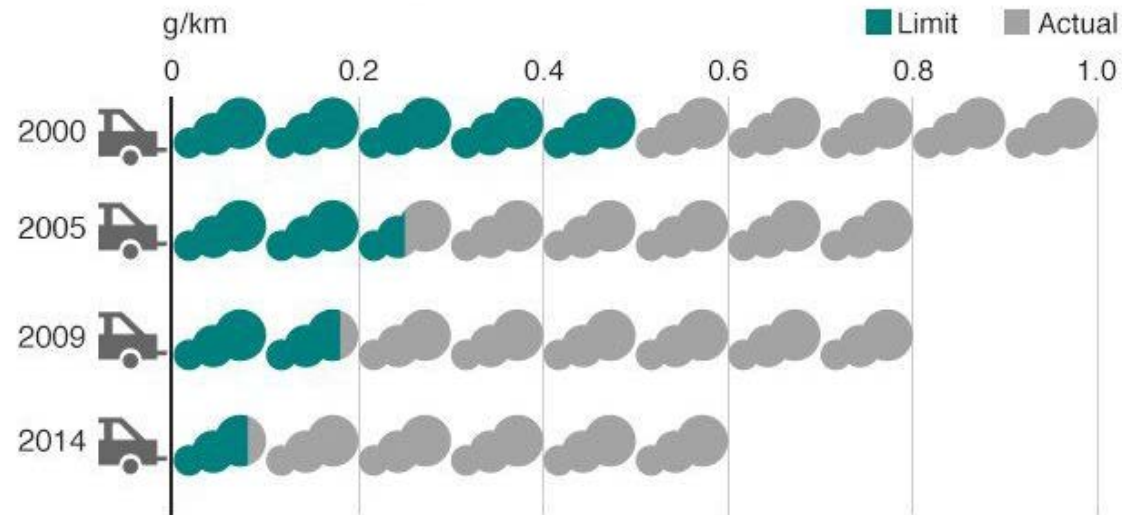


Source: European Environment Agency (EEA)

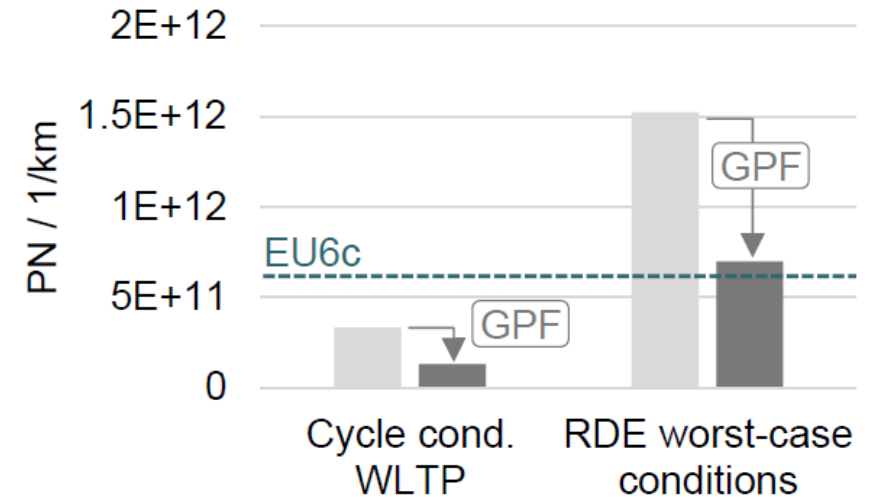


# EU RDE legislation introduced as of 1/9/2017

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



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



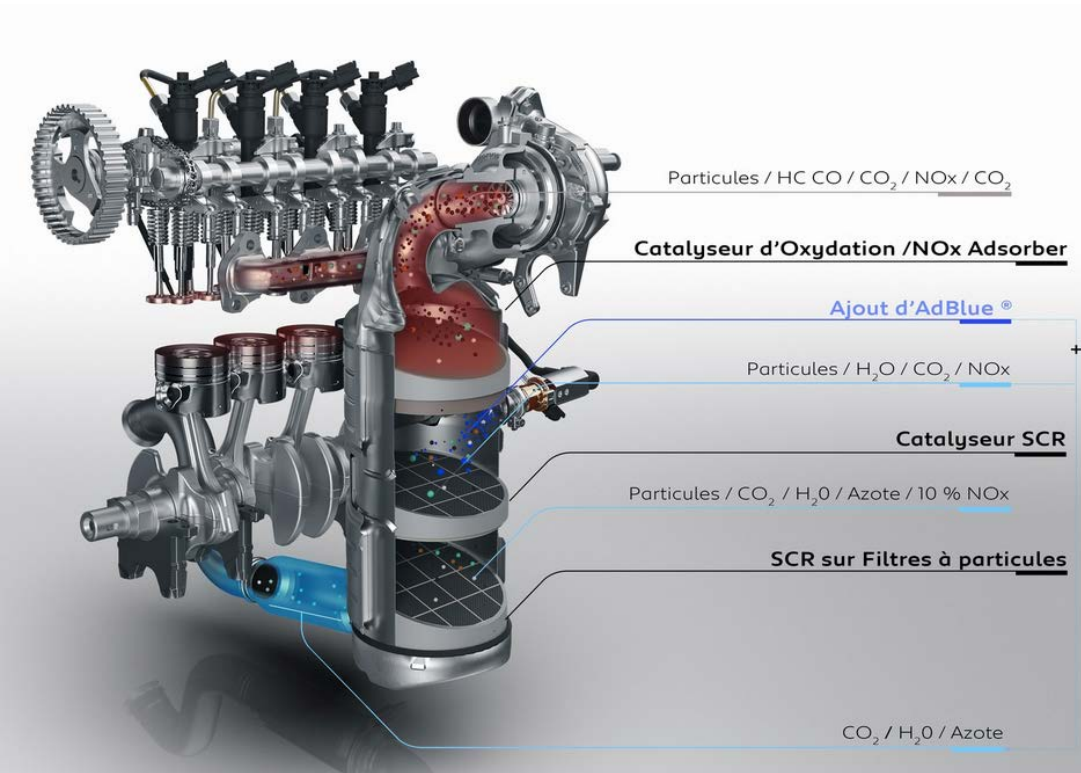
Source: Gasoline Particulate Filters Market and Technology Trends and their Impact on Calibration, FEV, SIA powertrain 2017

# Content

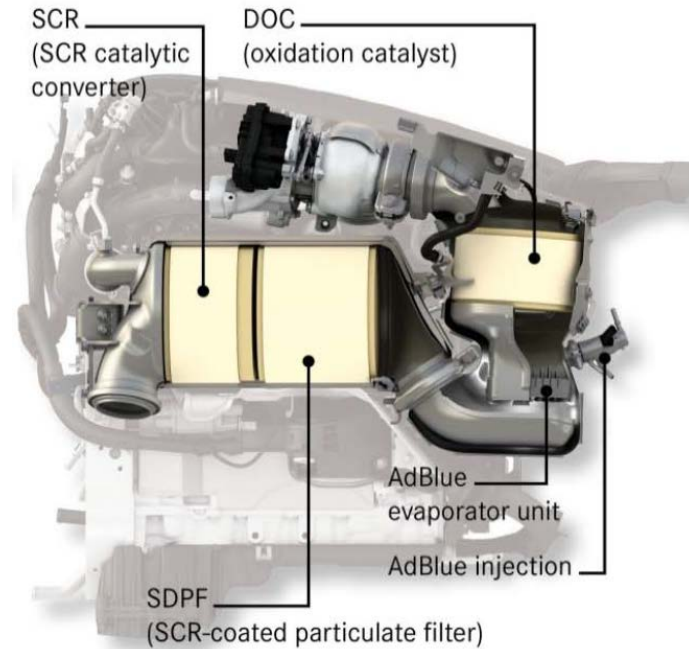
- Evolution in diesel emissions control technologies
- Low NOx emission diesel cars: a reality
- Air quality modelling

# Light-duty diesel emissions control technology evolution

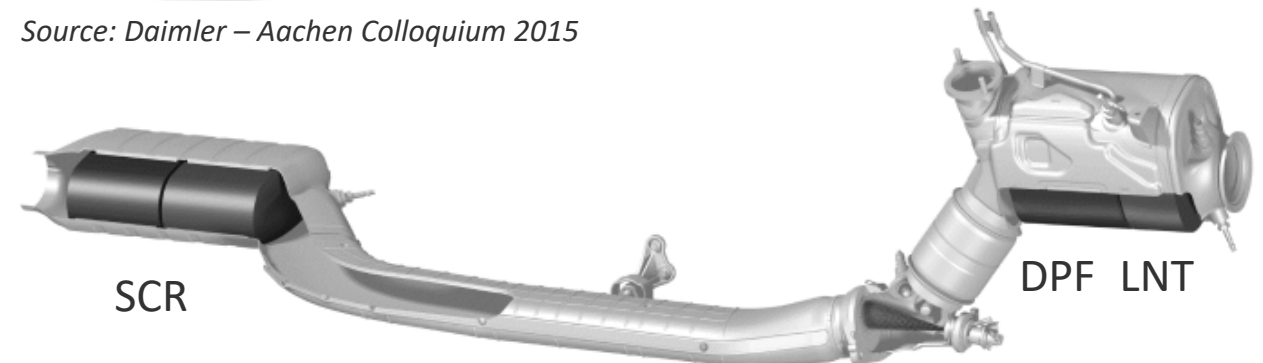
Towards combination of technologies in a compact design for RDE compliance



Source: Peugeot – 308 press release 2017



Source: Daimler – Aachen Colloquium 2015

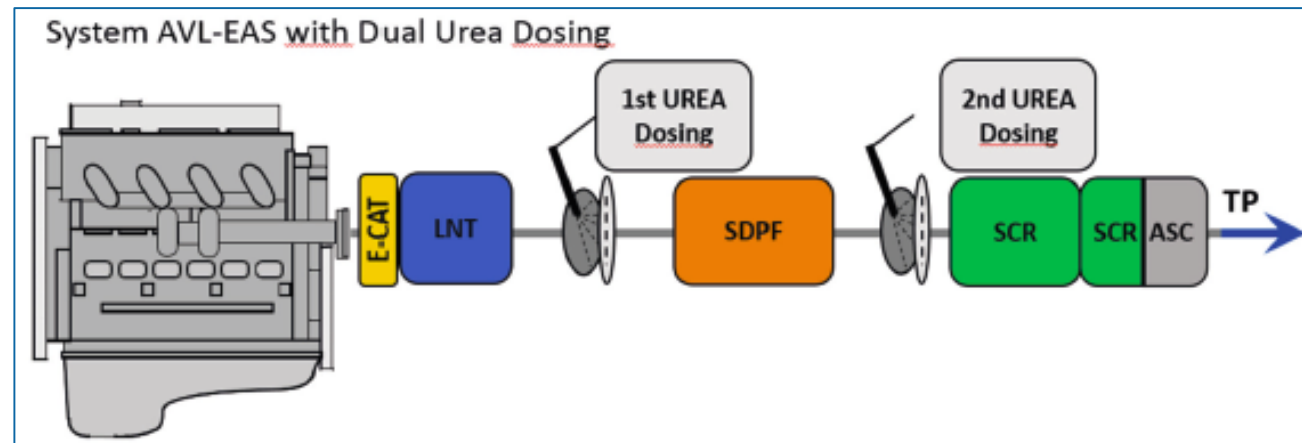


Source: BMW – Aachen Colloquium 2015

# 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

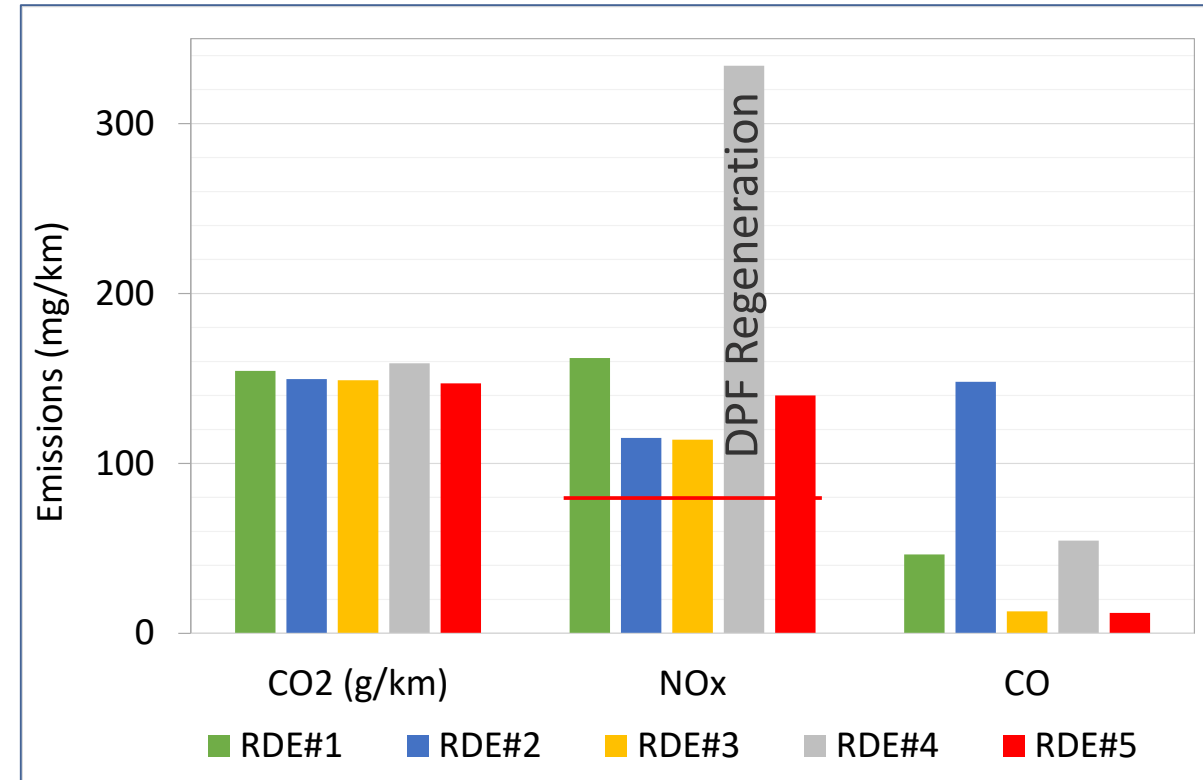
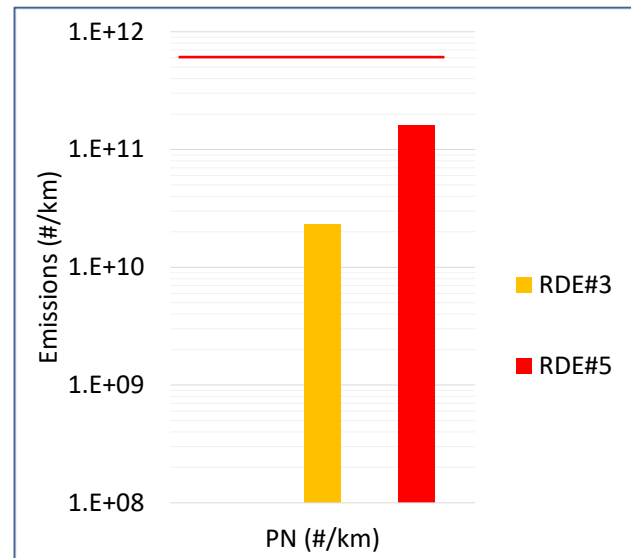


Source: AVL – Highly Efficient Exhaust Gas Aftertreatment for Future Diesel Applications –  
10<sup>th</sup> International Exhaust Gas and Particulate Emissions Forum February 2018



# 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



# Bosch demonstrated urban RDE NO<sub>x</sub> below 80 mg/km

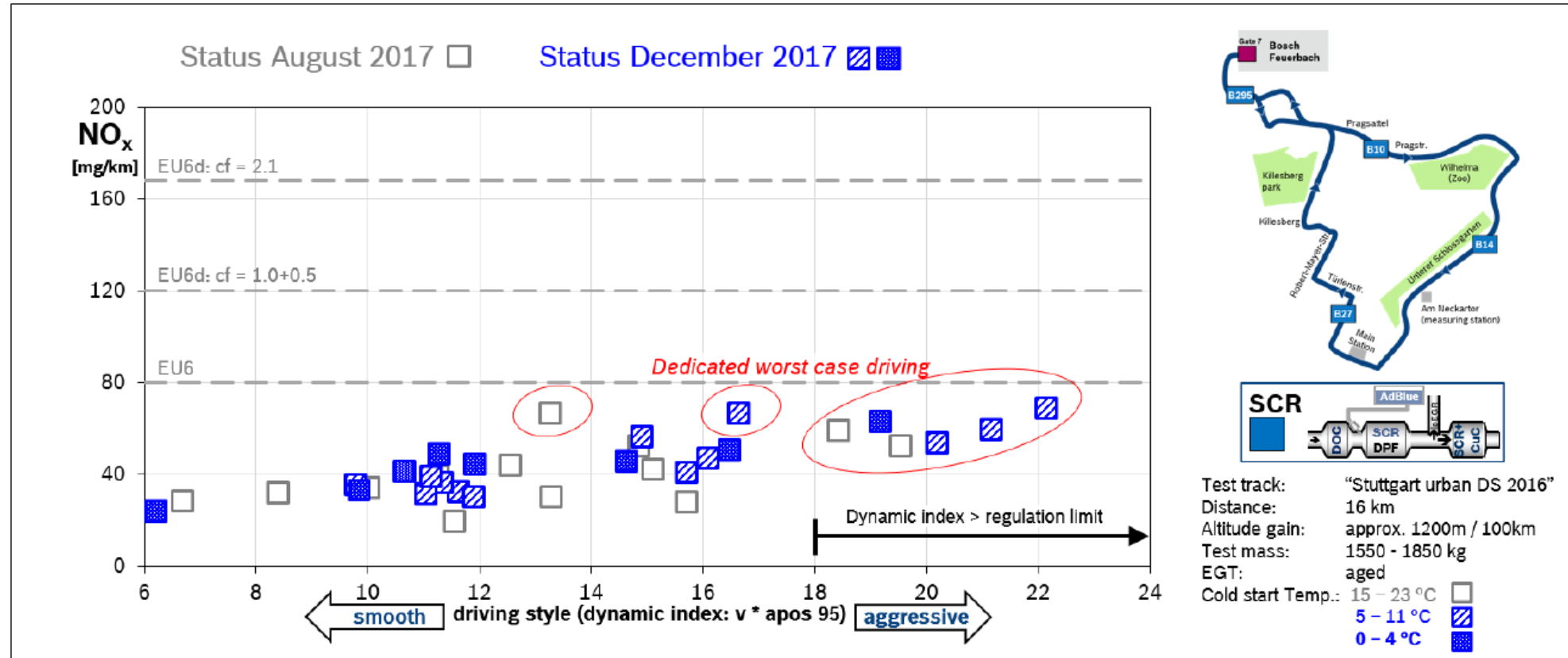
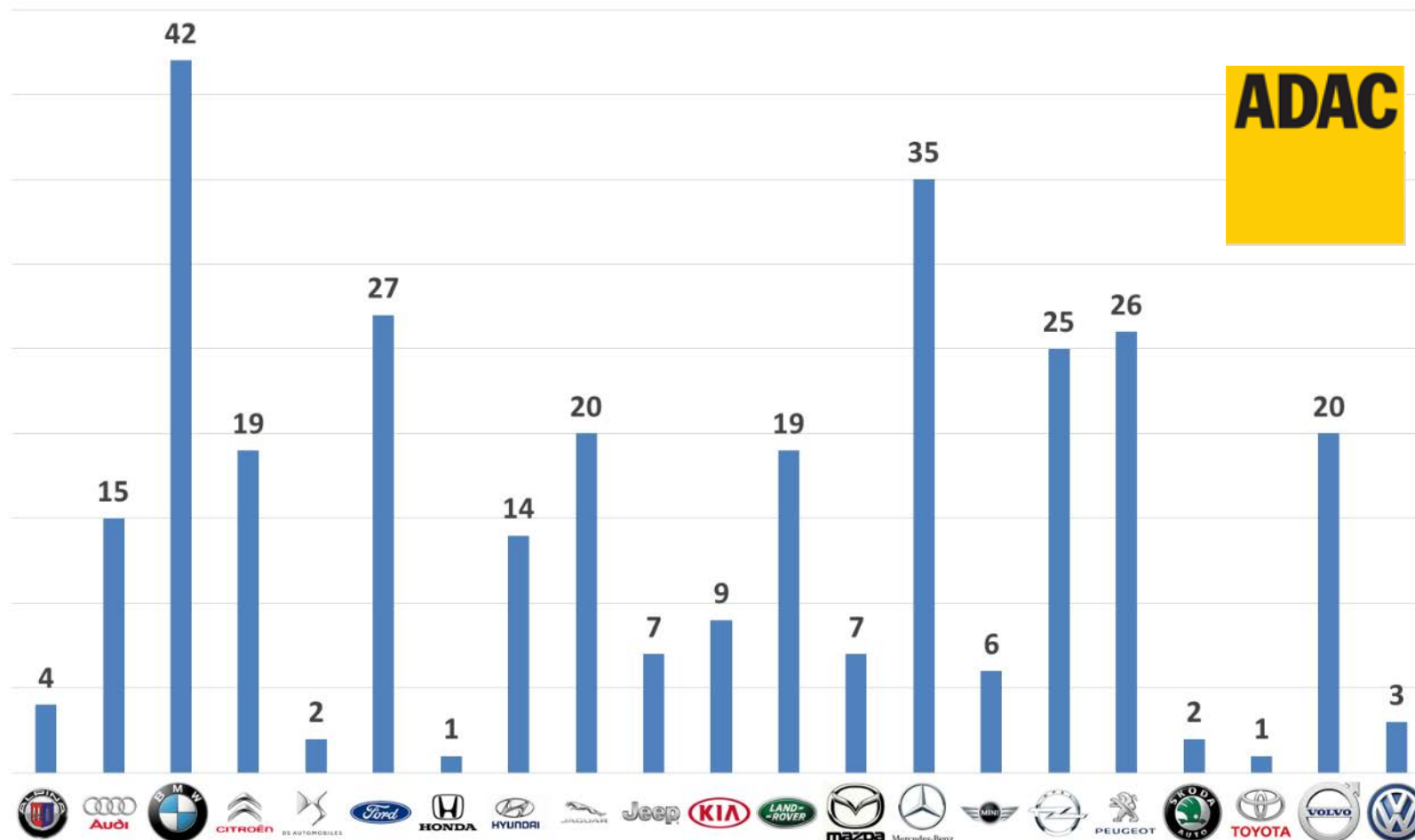


Figure 9: On-road measurements "Stuttgart – urban"

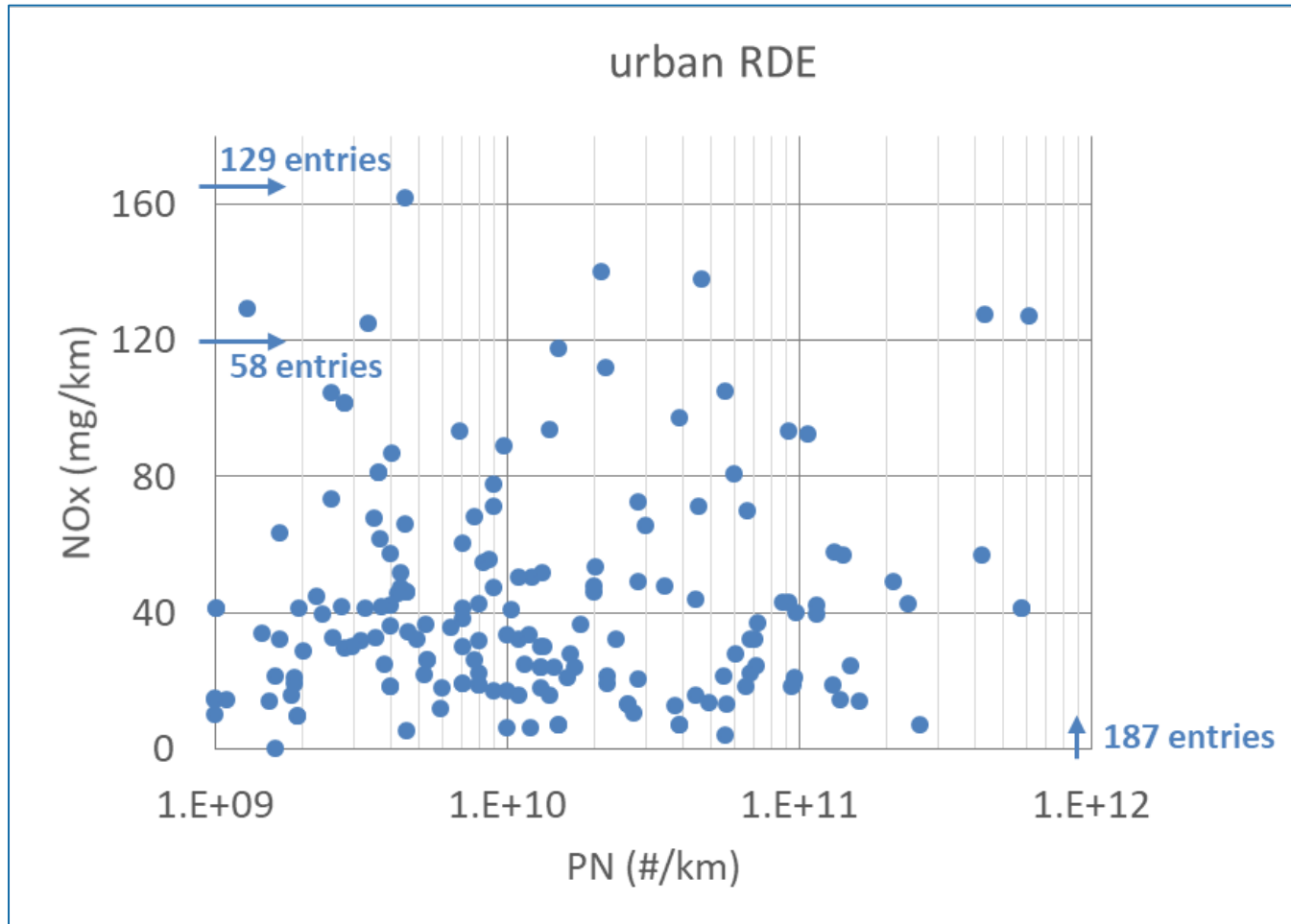
Source: Kufferath (Bosch), the path to a negligible NO<sub>2</sub> immission contribution from the diesel powertrain, Vienna Motor Symposium, April 2018

# RDE-compliant diesels are now available on the market

- List at [www.adac.de/infotestrat/umwelt-und-innovation/abgas/modelle mit euro 6d temp/default.aspx](http://www.adac.de/infotestrat/umwelt-und-innovation/abgas/modelle%20mit%20euro%206d%20temp/default.aspx)
- 304 diesel models (on 28.08.18)



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



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

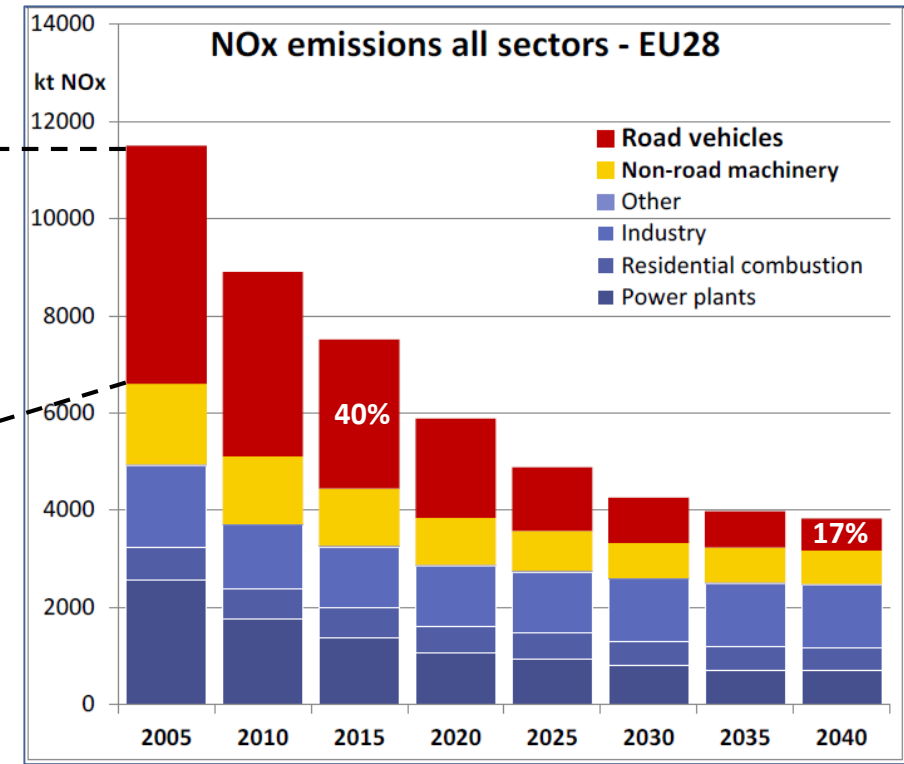
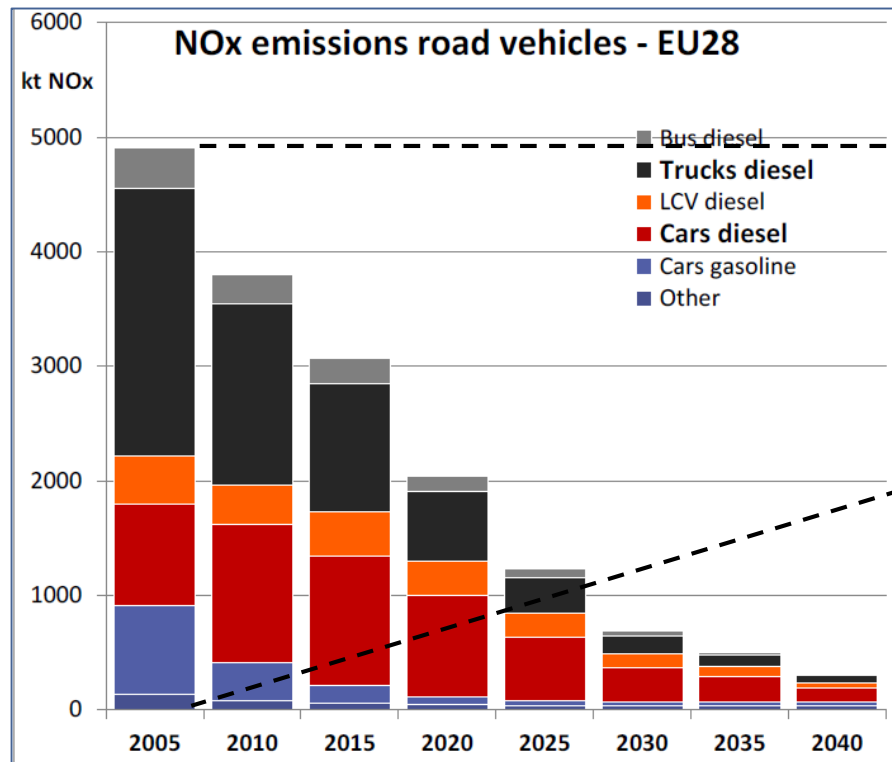
	average NOx emission rate in on-road driving [mg/km]	share of primary NO <sub>2</sub>
Euro 4 and older	~600	range: 7% to 49%
Euro 5 – until 09/15	~750	37%
Euro 6b – 09/15-08/19	~350 (CF:4.4)	32%
Euro 6dTEMP – 09/19-12/20	linear combination of Euro 6b and Euro 6d	
Euro 6d – from 01/21	~120 (CF:1.5)	32%

# Euro 6d benefit to EU NOx emissions inventory

## ➤ Road vehicles contribution

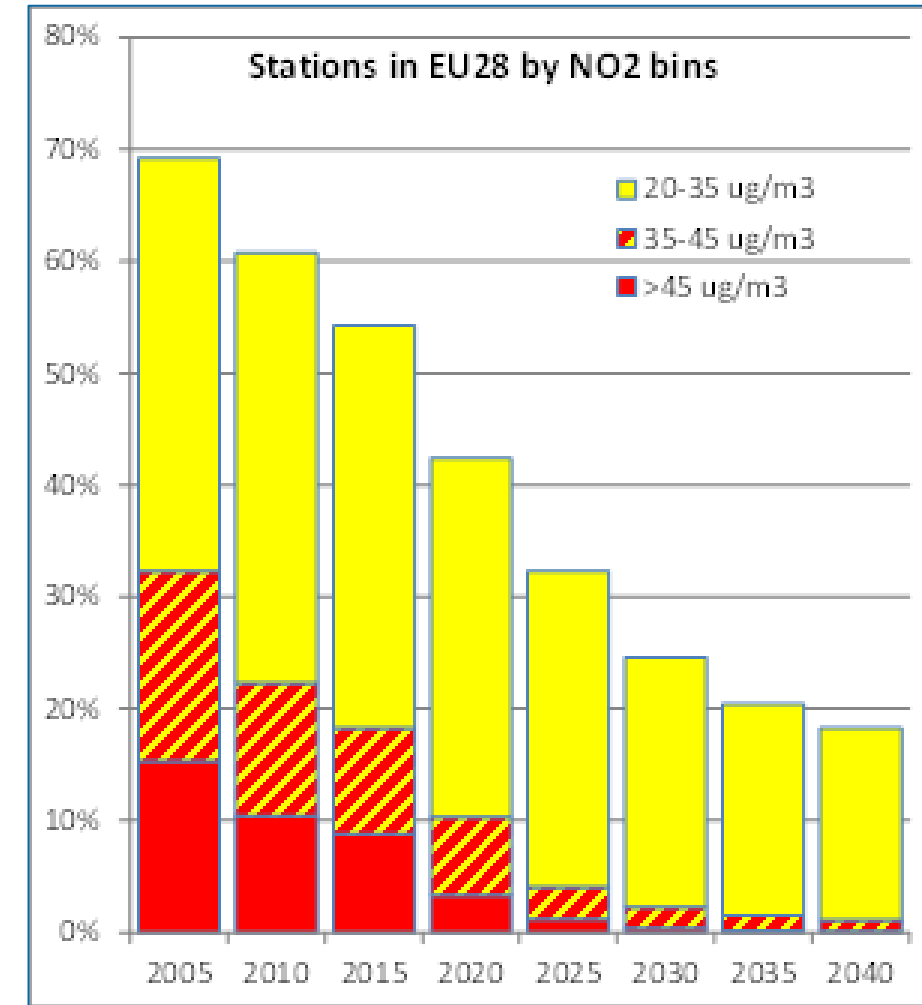
➤ 2015: 40%

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



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

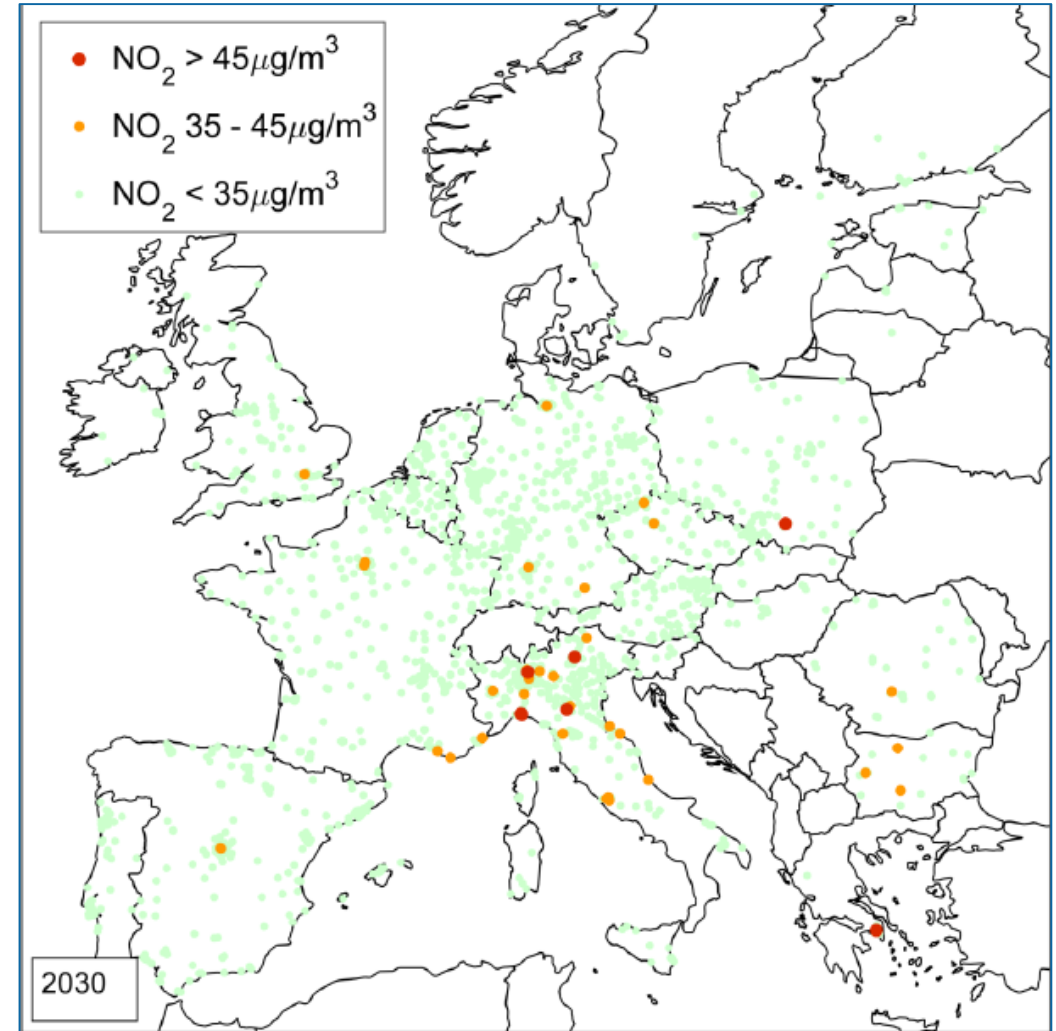
- WHO Global Air Quality Guideline for annual NO<sub>2</sub> concentration
  - Current guideline: 40 µg/m<sup>3</sup>
  - On-going review may lower the guideline value
- NO<sub>2</sub> exceedance classes modelled
  - Severe: >45 µg/m<sup>3</sup>
  - Problematic: 35-45 µg/m<sup>3</sup>
  - Potentially: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



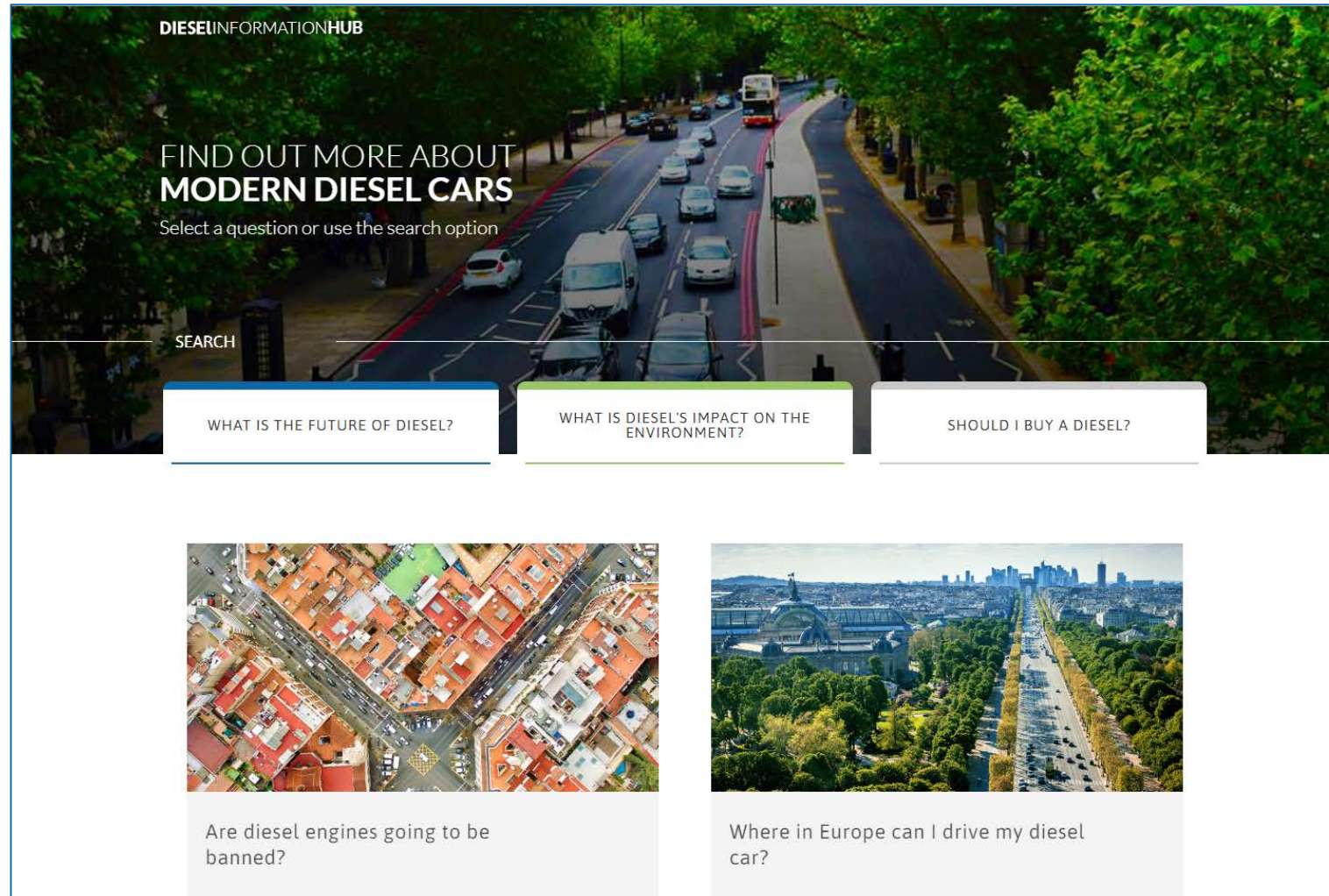
# Conclusions

- 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)



The screenshot shows the Diesel Information Hub website. At the top, the text "DIESELINFORMATIONHUB" is displayed. Below it, the main heading reads "FIND OUT MORE ABOUT MODERN DIESEL CARS", followed by the instruction "Select a question or use the search option". A search bar with the placeholder text "SEARCH" is positioned below the heading. Three navigation buttons are visible: "WHAT IS THE FUTURE OF DIESEL?", "WHAT IS DIESEL'S IMPACT ON THE ENVIRONMENT?", and "SHOULD I BUY A DIESEL?". Below these buttons, there are two image-based question cards. The first card features an aerial view of a dense urban area with red-tiled roofs and asks, "Are diesel engines going to be banned?". The second card shows a wide, tree-lined avenue in a city with a skyline in the background and asks, "Where in Europe can I drive my diesel car?".

DIESELINFORMATIONHUB

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**MODERN DIESEL CARS**

Select a question or use the search option

SEARCH

WHAT IS THE FUTURE OF DIESEL?

WHAT IS DIESEL'S IMPACT ON THE ENVIRONMENT?

SHOULD I BUY A DIESEL?

Are diesel engines going to be banned?

Where in Europe can I drive my diesel car?



# THANK YOU !

Dirk Bosteels

dirk.bosteels@aecc.eu

[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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