



Department  
for Transport

# Vehicle Emissions Test Programme

October 2015 – April 2016





## Background

- ▶ Revelations in September 2015 that VW Group used software to distort emissions tests
- ▶ UK Government took swift action to protect consumer interests and the environment:
  - ▶ Contacted all manufacturers with UK-approved vehicles
  - ▶ Launched Vehicle Emissions Testing Programme
  - ▶ Lobbied successfully for the early introduction of Real Driving Emissions (RDE) testing



## Objectives

Secretary of State informed Parliament of UK's Vehicle Emissions Test Programme on 10 November 2015, to:

- ▶ Establish whether the use of strategies to defeat emissions tests goes wider than the VW Group
- ▶ Gather much-needed evidence to restore public confidence and improve our understanding of the real world emissions performance of vehicles





## How vehicles selected

- ▶ Produced list of 100 top selling diesels (based on study of buying preferences 2010-2015)
- ▶ Aimed to capture 75% of sales of top 70 vehicles, representing >50% of all diesels on UK roads
- ▶ All major manufacturers
- ▶ Engine sharing effectively increases the size of our sample
- ▶ Even split of Euro 5 and Euro 6
- ▶ Snapshot in time of a single example of each model's NOx performance



## Methodology – set up

### Vehicles

- ▶ Sourced from car hire fleets
- ▶ Unmodified and no defects
- ▶ <30,000 miles
- ▶ Typical winter grade diesel

### Tests

- ▶ Lab: Full lab-grade analysers (plus PEMS to confirm calibration)
- ▶ Track and road: Portable Emissions Measurement Systems (PEMS)



## Methodology – tests

### Laboratory

1. Official NEDC test with cold engine at 20-30°C ambient
2. Official NEDC test with fully warmed up engine (repeated)
3. Reversed NEDC test with fully warmed up engine

### Track

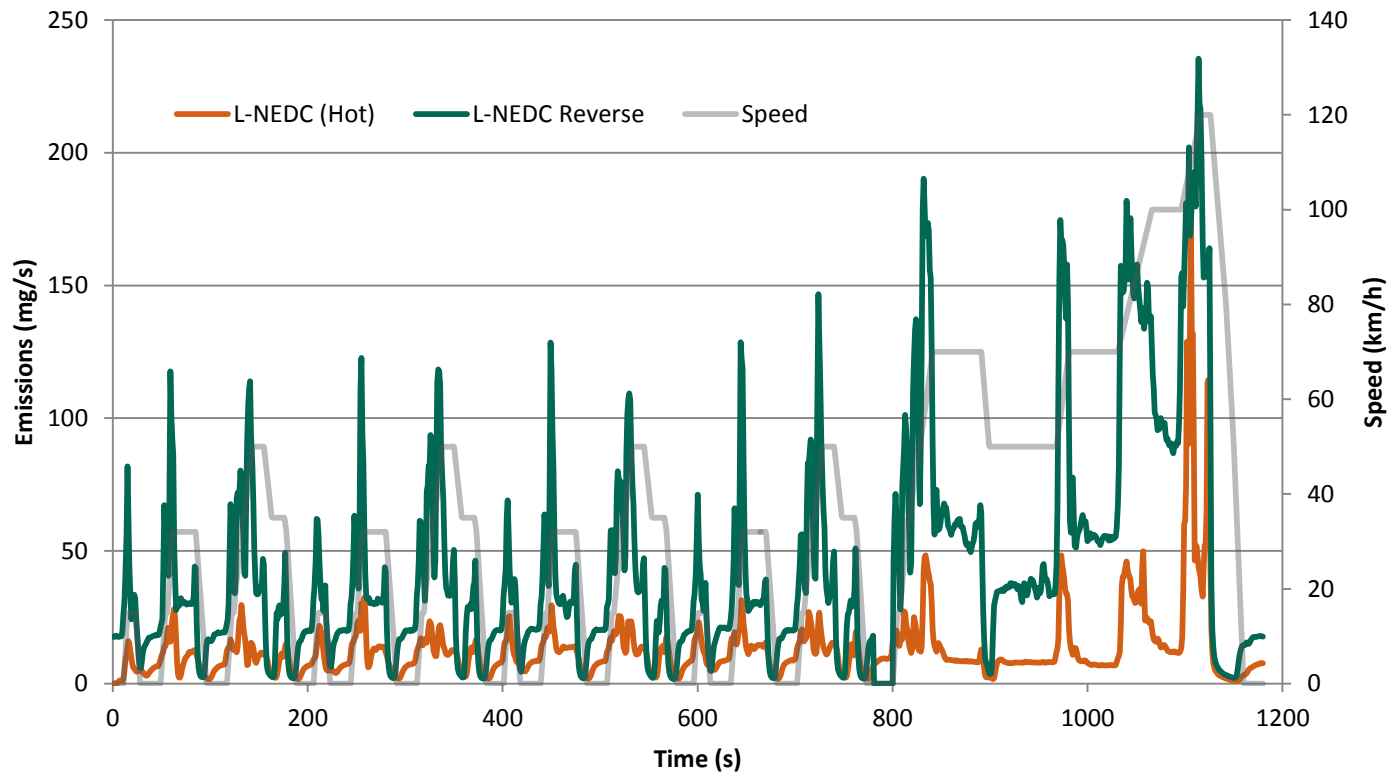
Replicate official NEDC test plus laboratory variations (as above) plus a further NEDC test with fully warmed up engine but driving speed increased by 10%

### On road

Approximation of RDE test (pending confirmation of final requirements) – 1.5 hours on public roads including urban, rural and motorway

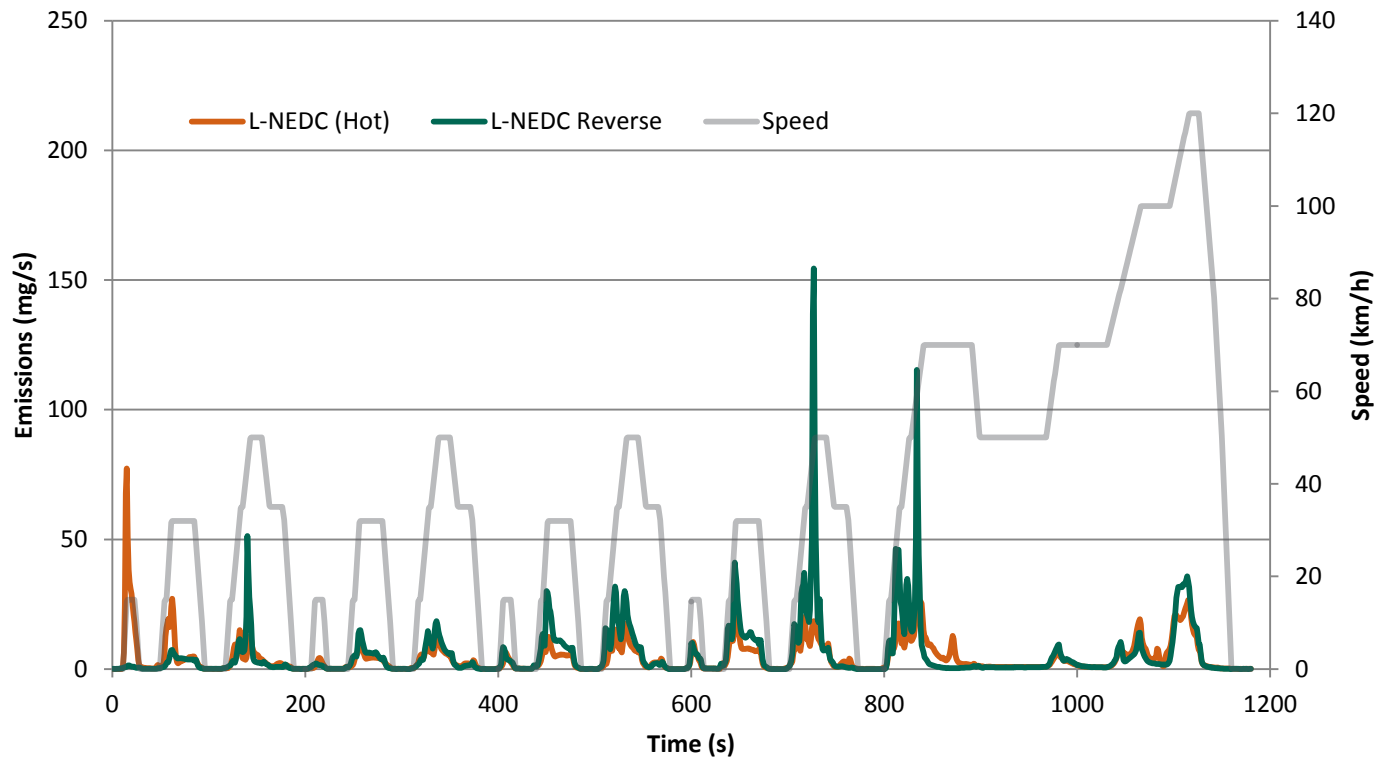


# Comparison of NO<sub>x</sub> emissions on NEDC tests showing impact of VW Group cycle recognition software





# Comparison of NO<sub>x</sub> emissions on NEDC tests showing vehicle which does not appear to vary emissions behaviour



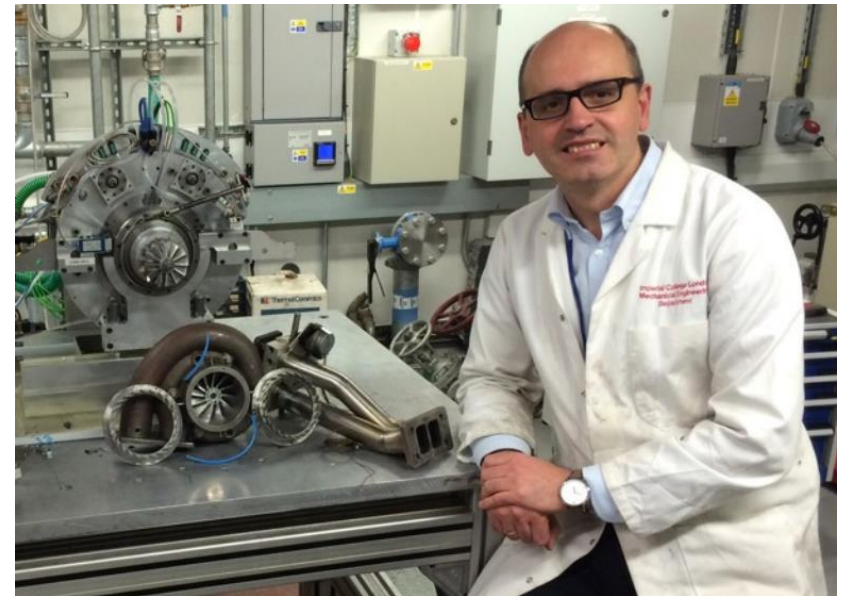




## Independent assessment

**Professor Ricardo Martinez-Botas**, Head of Thermofluids Division,  
Mechanical Engineering Department, Imperial College London

- ▶ Independent oversight of programme to confirm integrity of processes
- ▶ Involved in vehicle selection
- ▶ Full access to tests across all laboratories and test tracks
- ▶ Witnessed tests and processing of results
- ▶ Tests undertaken at independent laboratories



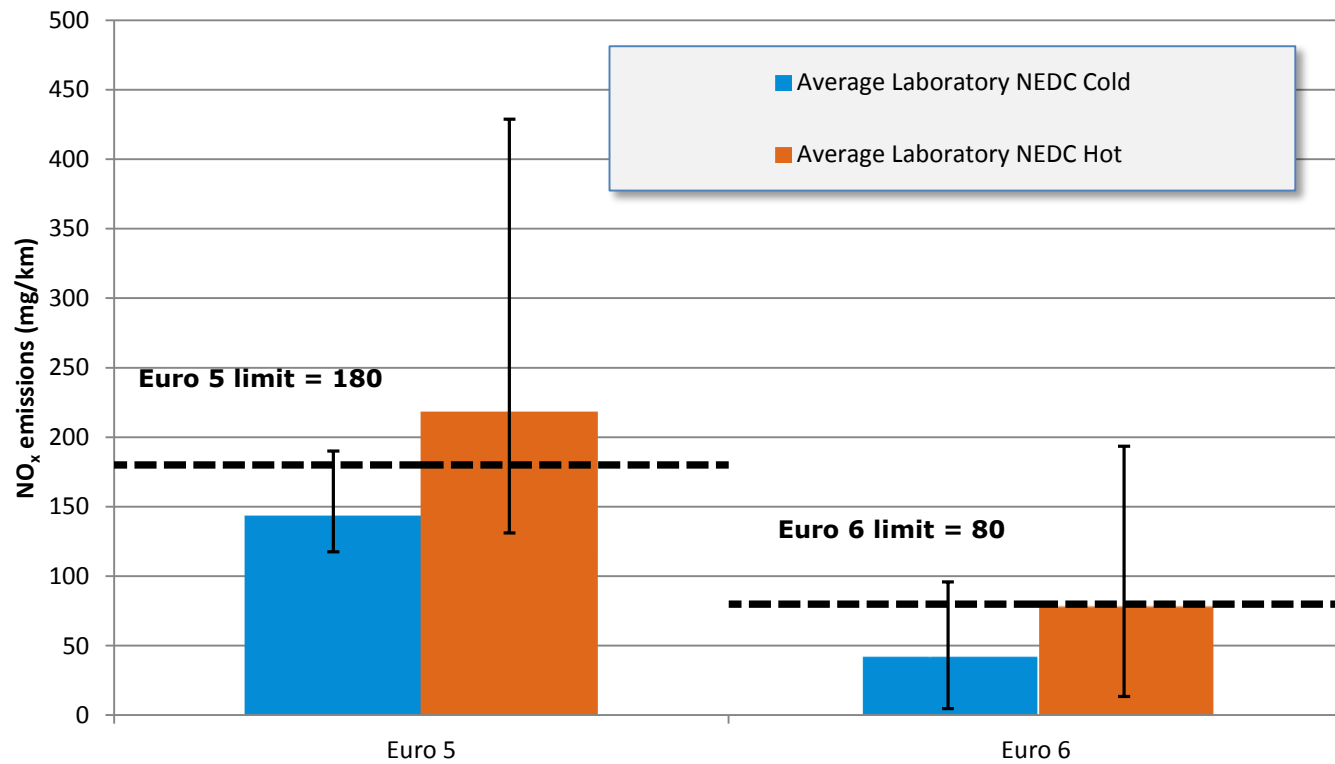


Department  
for Transport

# Results

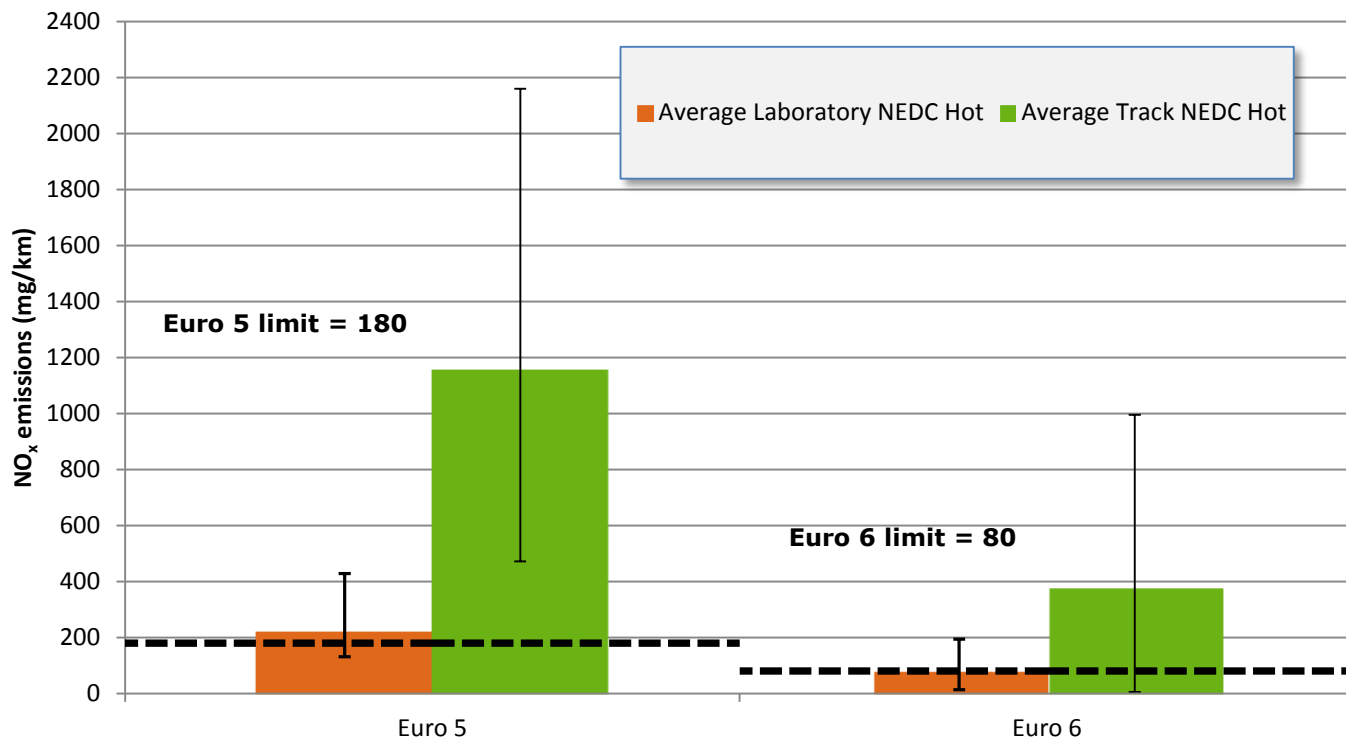


# 'Cold' versus 'hot' NEDC NO<sub>x</sub> emissions - lab results





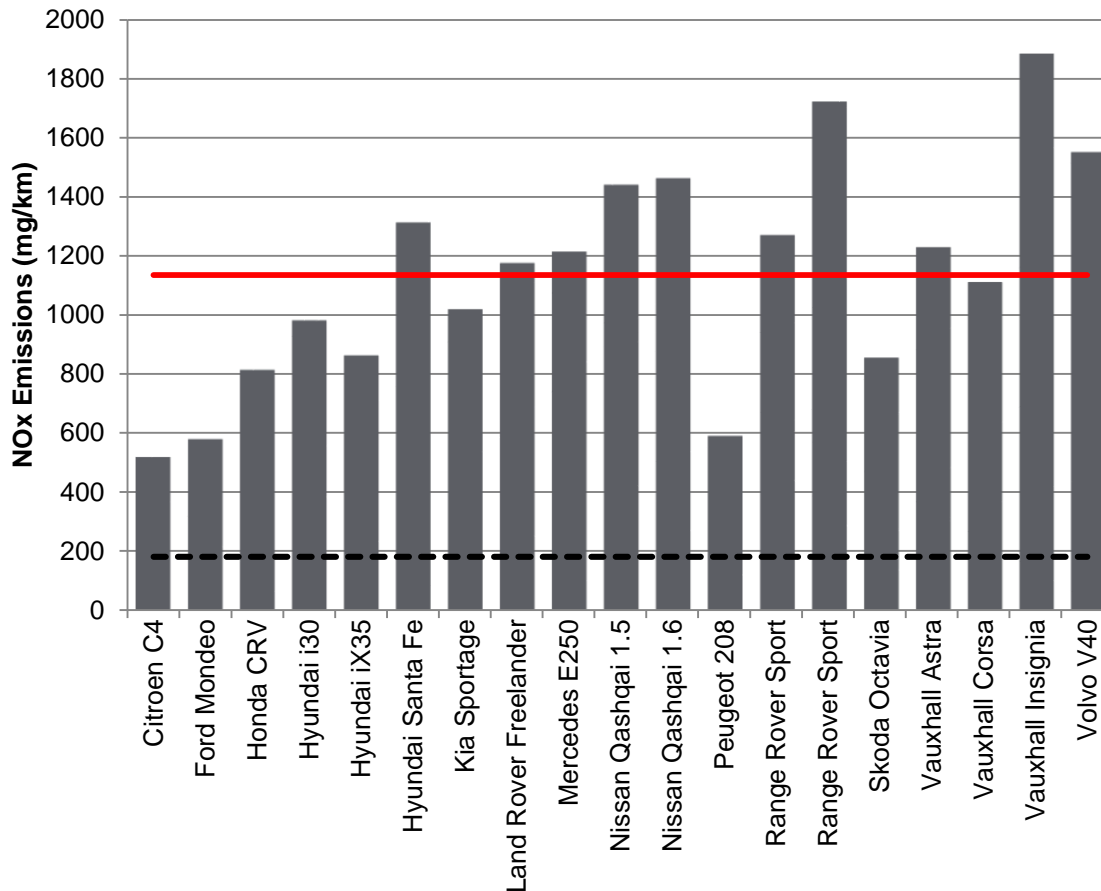
# Comparison of 'hot' NEDC in lab and on the track





## Real driving NOx emissions - Euro 5 vehicles

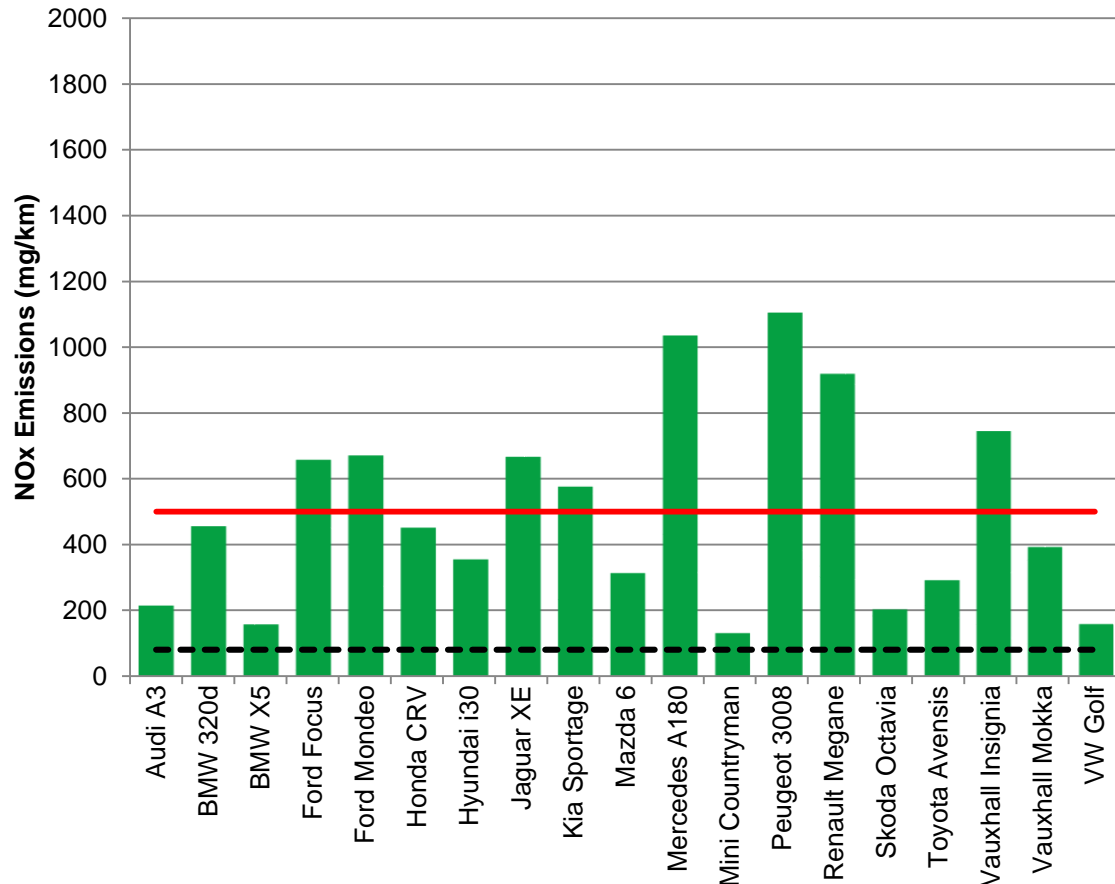
*(note: direct comparisons should not be made between vehicles as test conditions varied)*





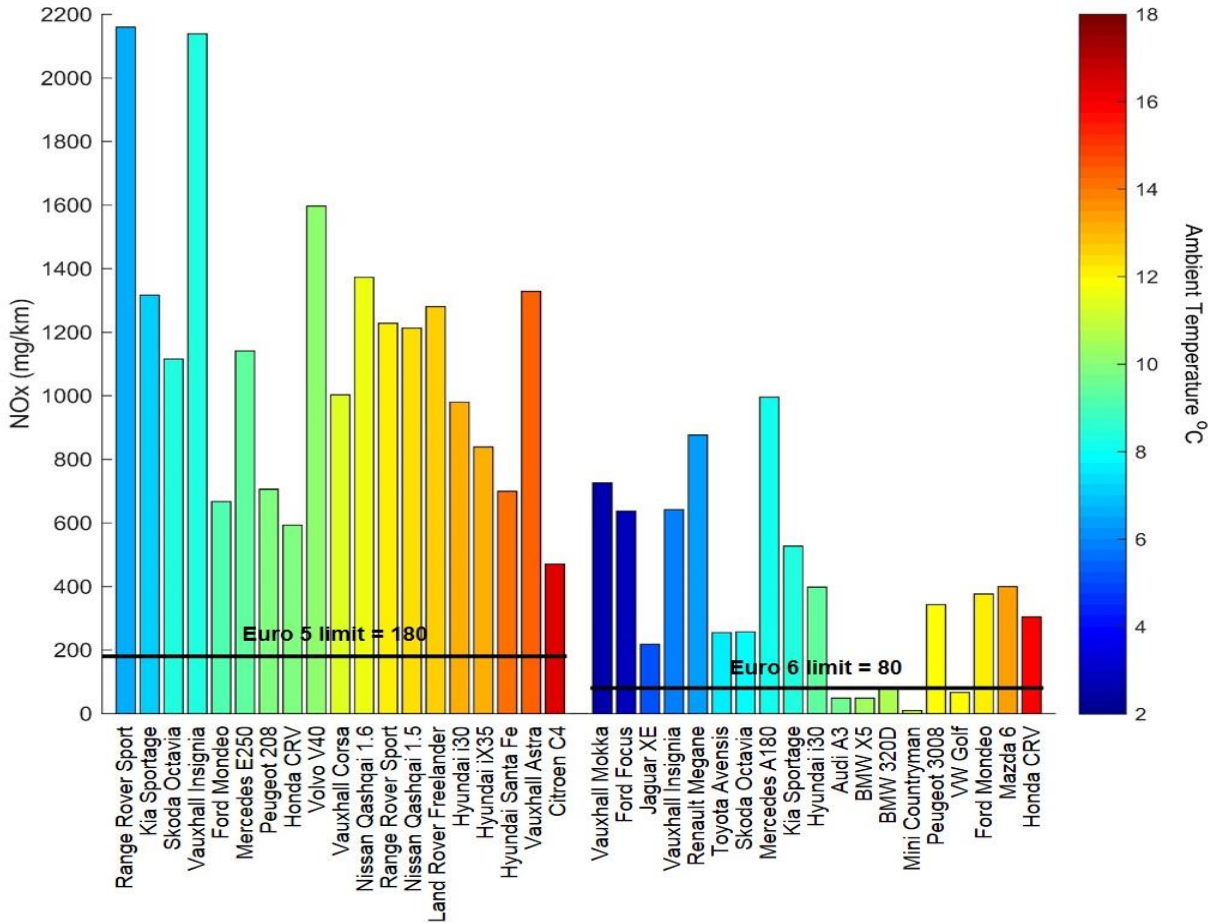
## Real driving NOx emissions - Euro 6 vehicles

*(note: direct comparisons should not be made between vehicles as test conditions varied)*





# Track test results plotted in ambient temperature order





## Observations

- ▶ Observable cycle recognition strategy on Skoda
- ▶ No evidence other manufacturers have acted in the same way as VW Group
- ▶ Large difference between laboratory and track/road results
- ▶ Emission controls are often significantly temperature dependent – but manufacturers say this change with ambient temperature is necessary “*to protect the engine from damage*”
- ▶ Incoming WLTP and RDE testing will overcome these issues and remove the ability to manipulate tests
- ▶ Third parties will be able to conduct their own RDE tests





Department  
for Transport

Thank you