BIRMINGHAM CITY COUNCIL

REPORT OF THE ACTING DIRECTOR OF REGULATION AND ENFORCEMENT TO THE LICENSING AND PUBLIC PROTECTION COMMITTEE

15 JUNE 2016
ALL WARDS

VEHICLE EMISSIONS TESTING PROGRAMME

1 Summary

1.1 In September 2015, Volkswagen confirmed that they had been using software in their cars, which caused the engines to behave differently during emissions tests compared to real world driving.

1.2 This admission prompted the UK Government to commence an investigation into whether this practice was more widespread, and also to understand why real world emissions differed significantly from those under laboratory testing. This became known as the Emissions Testing Programme (ETP)[1].

1.3 The ETP report concludes that it did not detect any defeat device in any vehicle other than those from within the Volkswagen Group.

1.4 The ETP report also identified the discrepancy between in-laboratory testing and real world emissions across all vehicles tested, with real world driving giving rise to significantly more emissions than detected in the laboratory. The ETP report explains how the testing regime will be improved upon in upcoming years to hopefully reduce or remove the discrepancy in emissions between laboratory tests and real world driving.

1.5 This report seeks to introduce the ETP to Committee and provide a summary of the work undertaken. The topic area is of relevance given the Government announcement to mandate a Clean Air Zone in Birmingham.

1.6 The ETP did not involve officers from Birmingham City Council and as such this report is merely an informative on the outcomes from this Programme.

2 Recommendation

2.1 That the report be noted.

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[1] The actual ETP report may be viewed at: https://www.gov.uk/government/publications/vehicle-emissions-testing-programme-conclusions

3 Background

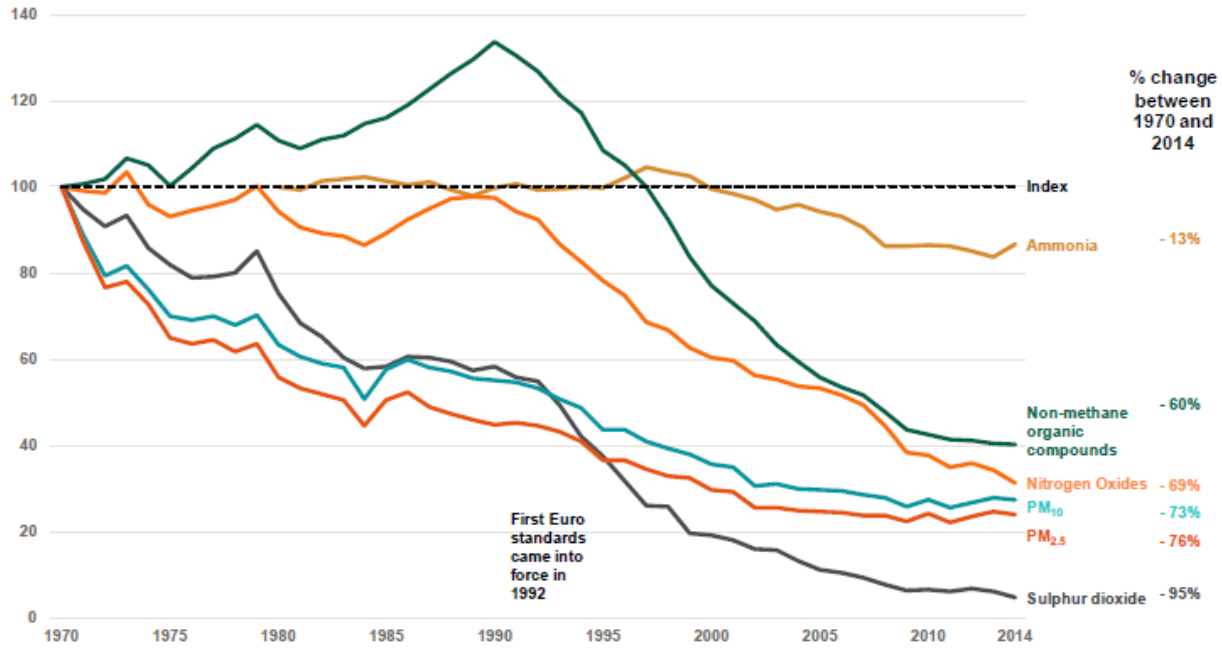
3.1 In September 2015, Volkswagen confirmed that they had been using software in their cars, which caused the engines to behave differently during emissions tests compared to real world driving. Not only did this cause disruption and distress to the 1.2m Volkswagen users in the UK, it showed a lack of regard for the serious health consequences of nitrogen oxide (NOx) emissions and caused significant damage to the trust consumers have placed in car manufacturers across the country.

3.2 This prompted the UK Government to commence an investigation into whether this practice was more widespread, and also to understand better why real world emissions from cars differed significantly from those under laboratory testing. This became known as the Emissions Testing Programme (ETP).

4 Policy Context

4.1 As a city Birmingham does not comply with ambient emission limits for nitrogen dioxide (NO_2), the primary source for which is road transport.

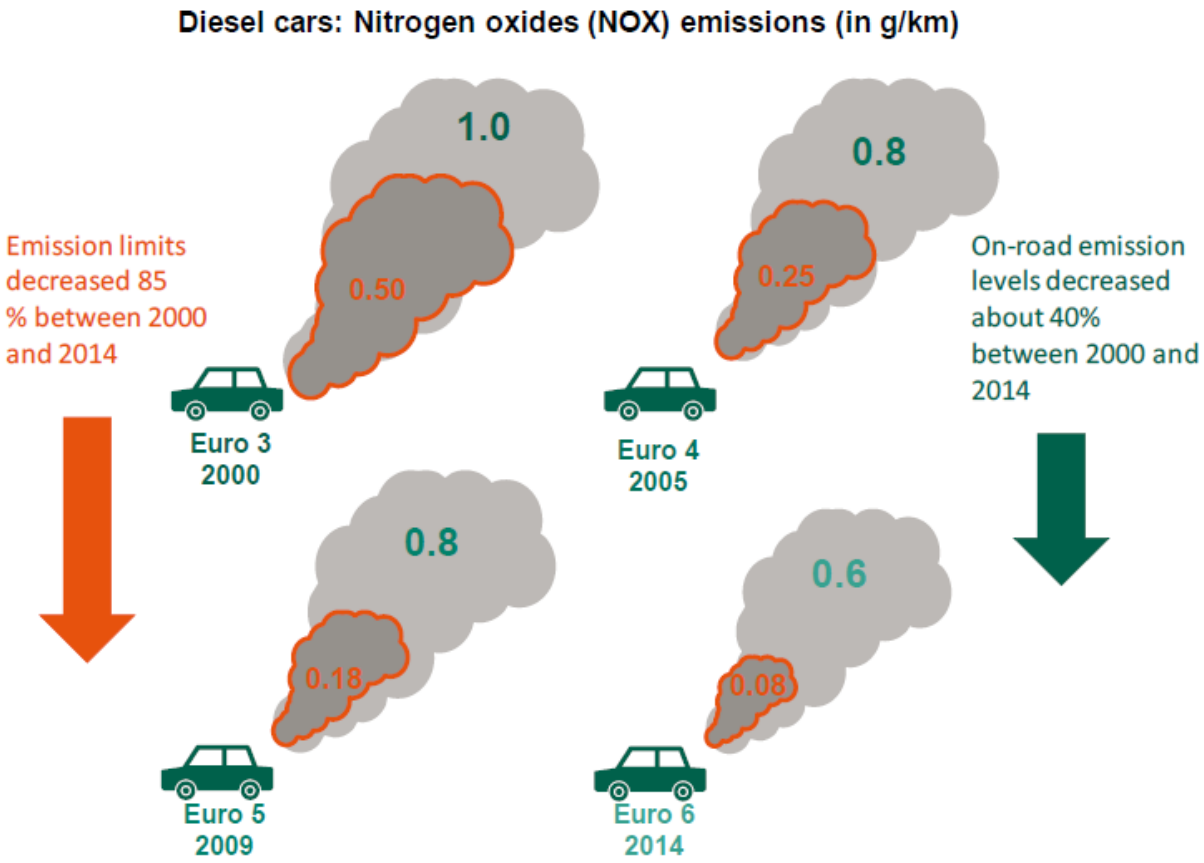
4.2 Over the years legislated emissions have reduced, including those from road vehicles, and the introduction of the Euro standards for vehicles which direct emissions reductions have had some effect. The following graph taken from the ETP report shows this reduction.



4.3 The greatest contribution of oxides of nitrogen (NO_x) from road vehicles is from diesel engine vehicles, which comprise most of the heavy duty fleet, a

significant bulk of the light duty fleet and around 38% of all passenger cars, an increase from 7% in 1994.

4.4 As stated in 4.2 the Euro standards have been semi-successful in reducing emissions from diesel cars, although the reason why this success is limited is because the permitted limit, as evidenced through in-laboratory testing, is not realized by actual emissions arising from real world driving. The following infogram taken from the ETP report displays this differential.



4.5 This failure of real-world emissions to meet the tightening emission standards is partly contributing to the ongoing air quality problems within European Member States and, more relevantly, within Birmingham.

5 The Vehicle Approval Regime and Defeat Devices

5.1 The current vehicle approval regime is based on type approvals, which involves testing a vehicle against a range of standards or regulations before approval is granted. Only once the manufacturer has the Type Approval Certificate from the Type Approval Authority can it release the vehicle to market.

5.2 Insofar as emissions are concerned these are covered by a number of regulations which encompass a range of pollutants. The testing is undertaken on a chassis dynamometer (rolling road) in a laboratory and is known as the

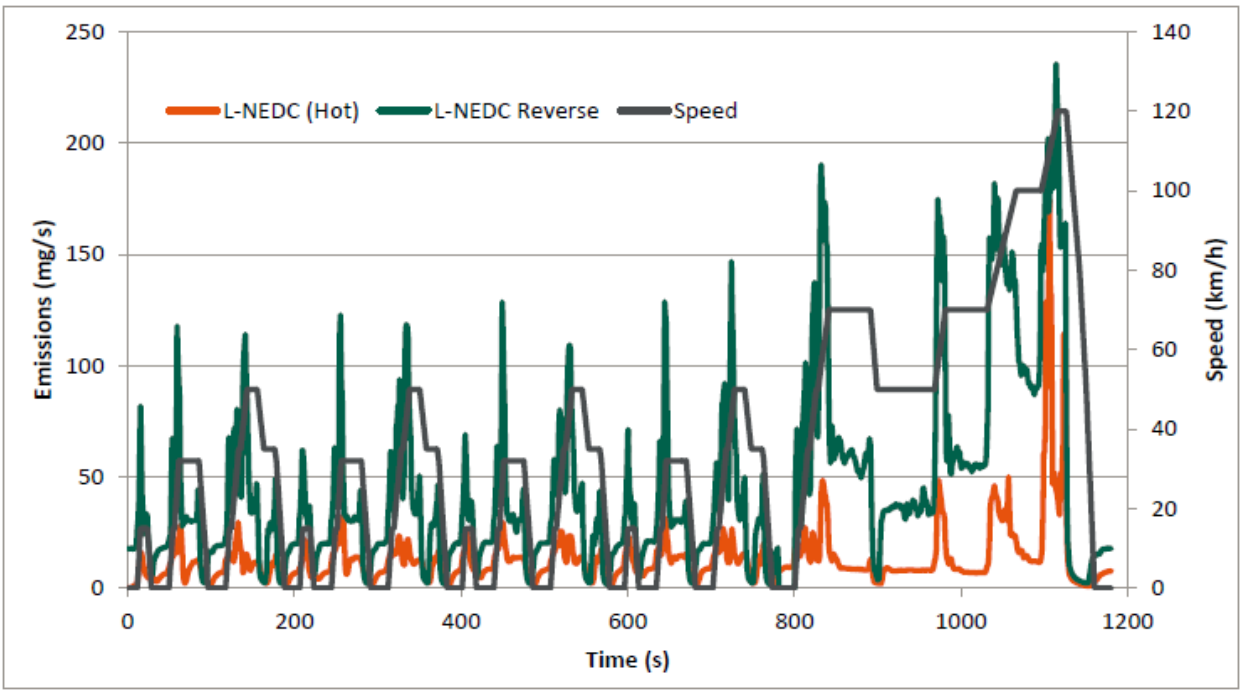
New European Drive Cycle (NEDC). The test cycle used is some 20 years old and has been previously criticized for not being representative of real world driving conditions.

5.3 In order to meet the increasingly strict emission levels (see infogram at 4.4) vehicle manufacturers have developed a range of technologies to reduce the NO_x emissions of a diesel vehicle e.g. exhaust gas recirculation, diesel oxidation catalyst.

5.4 One option that is not available is what is commonly known as a 'defeat device'. This is a system which results in a vehicle producing significantly higher emissions in normal use than it does when being subjected to the official laboratory emissions test. Importantly, defeat devices are defined as reducing the effectiveness of the vehicle's emissions control, therefore resulting in higher exhaust emissions. In other words, a defeat device would not operate during the official laboratory test, but would become 'active' in specific real-world use conditions. These are also known as cycle recognition / detection software or systems.

5.5 The ETP tested a Skoda vehicle (part of the Volkswagen Group) which Volkswagen had identified as having cycle recognition software to compare the standard NEDC test (which the defeat device would detect) with a reversed NEDC test (which the defeat device may not be able to detect).

5.6 The following chart shows the outcome of these tests. The orange line is the standard NEDC, whilst the green line is the reverse NEDC. It is evident that the standard NEDC was detected whilst the reverse NEDC was not detected, as evidenced by the reverse NEDC emitting more pollutants i.e. the emissions controls were disabled by the software as it considered the vehicle to be not under emissions testing conditions.



5.7 As can be seen the reverse NEDC was not detected and became a standard for use within the ETP as a test which any cycle detection software would not detect as a test.

6 The Emissions Testing Programme

6.1 The ETP was designed to test a range of the best-selling passenger cars in order to ascertain whether there was evidence of systematic use of defeat devices and to inform policy makers on the general trends in vehicle emissions. The programme selected an independent and representative sample of vehicles to test in a variety of conditions using the latest technology.

6.2 The criteria involved in the ETP are contained in full in the actual report.

6.3 The principal aim of the testing programme was to understand whether there is evidence of use of defeat devices or cycle recognition strategies by manufacturers other than the Volkswagen Group. For this reason, much of the testing revolved around the use of the New European Driving Cycle (NEDC), which is the current emission test for vehicles in type approval and therefore the cycle that such strategies would be designed to recognise.

6.4 The test programme was constructed around variations of this cycle with testing being undertaken both in emissions laboratories and on test tracks. Further tests were conducted on public roads to establish the emissions performance of the vehicles in typical real-world use conditions.

Findings

6.5 The testing did not find any evidence of the use of cycle recognition strategies in any of the vehicles tested, except those of the Volkswagen Group. Other manufacturer's vehicles did not appear to be able to recognise when they were being tested in the laboratory and so change the emissions strategy of the engine.

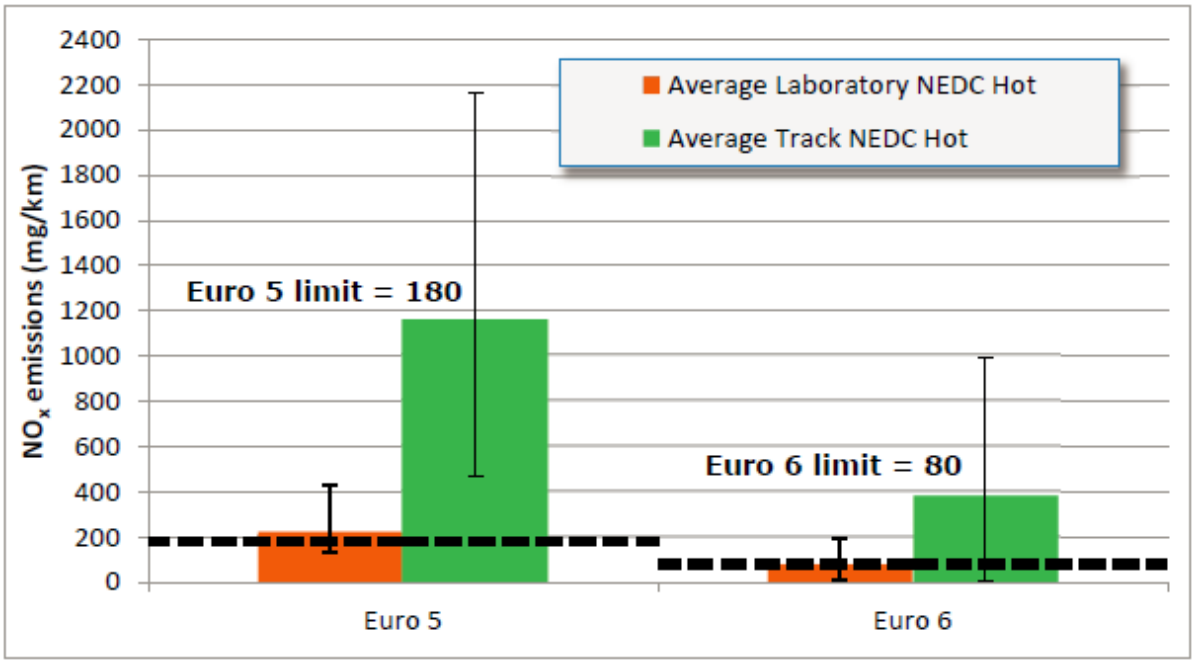
6.6 A new Volkswagen Golf (Euro 6) was tested and it was confirmed that this vehicle did not employ any cycle recognition system.

6.7 The ETP tested both Euro 5 and Euro 6 vehicles on the NEDC in-laboratory cycle under both cold and hot engine conditions. All the Euro 5 vehicles met the legislative standard on the cold conditions, but when the engine was warmed up some vehicles remain compliant but many do not with the highest being 2.4 times above the limit.

6.8 For Euro 6 vehicles all met the limit from a cold start, but when the engine was warmed up there was once again a spread with the highest being also 2.4 times above the limit.

6.9 With regards to the proceeding paragraphs, it is important to understand that the legislative limit for Euro 5 is 180mg/km whilst for Euro 6 is it 80mg/km and as such Euro 6 vehicles are respectively 'cleaner' than their Euro 5 counterparts.

6.10 When the vehicles were taken out onto a test track and therefore not under in-laboratory conditions the results were markedly different, with many more vehicles failing the limit and there being a greater spread. This is evidence for the discrepancy between in-laboratory testing and real world driving. The following graph taken from the ETP displays these results.



6.11 The ETP also looked at how these vehicles actually perform on the public road. The results for both Euro 5 and Euro 6 are all above the legislative limit – for Euro 5 the average was 1135 mg/km - over six times higher than the 180 mg/km official legislative NEDC laboratory test limit, whilst for Euro 6 the best results are less than twice the NEDC limit of 80mg/km, while the worst are more than 12 times higher. For both sets of results it is not appropriate to make comparisons between individual vehicles as conditions varied from test to test.

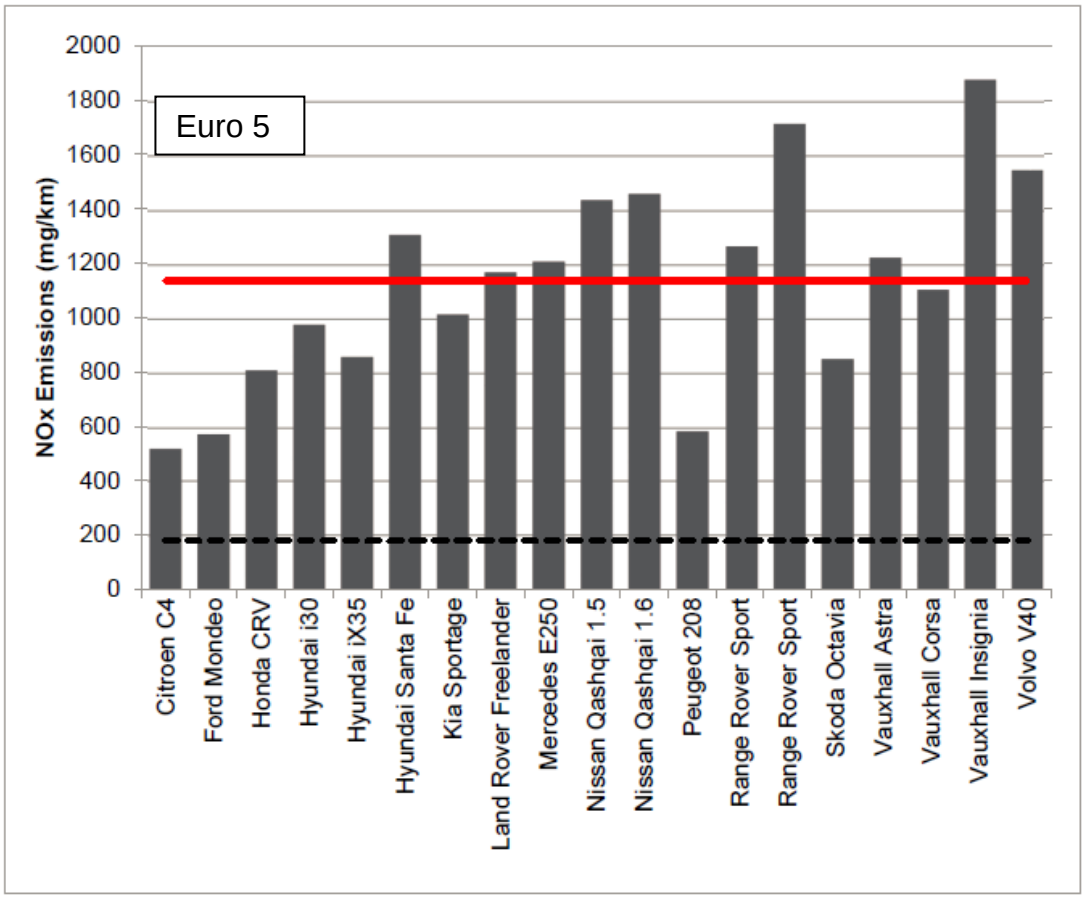
6.12 The graphs on the following page show the outcomes by vehicle for the Euro 5 and Euro 6 public road tests.

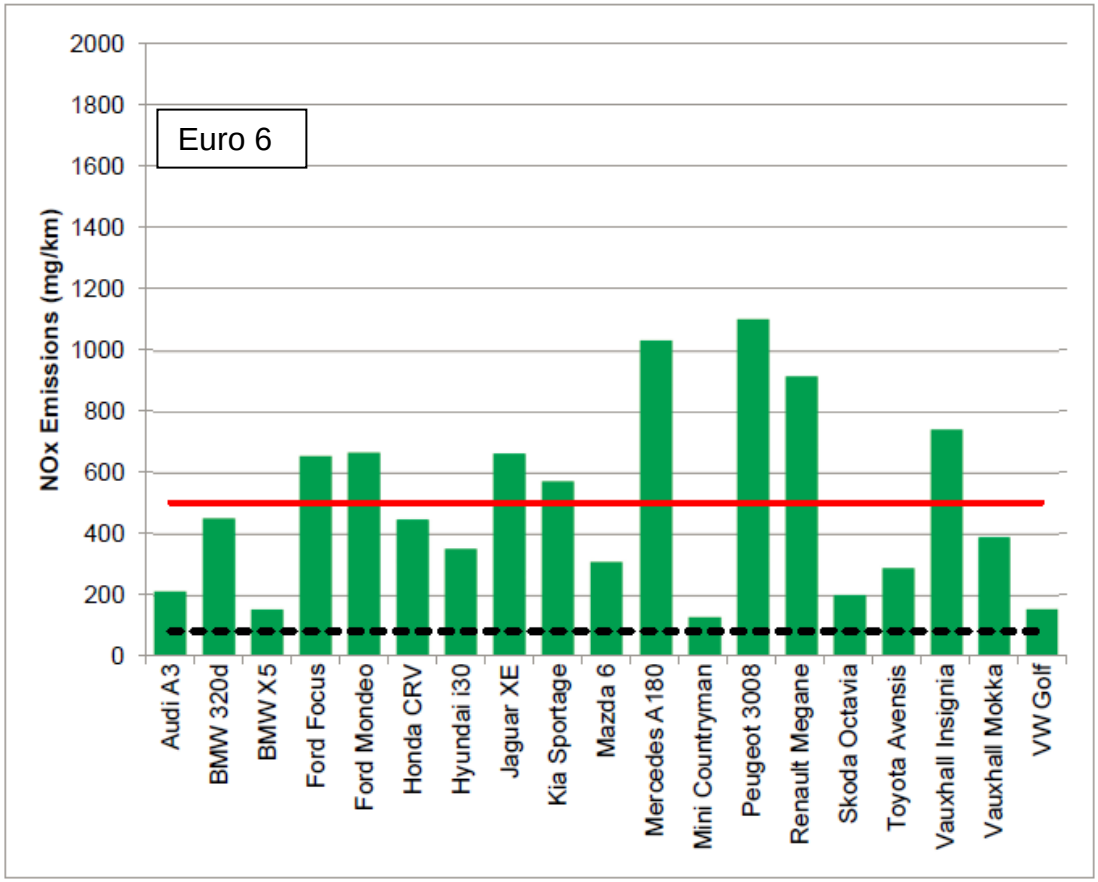
6.13 The first graph is for Euro 5, the second for Euro 6.

6.14 The red line on both graphs is the average across the vehicles tested, whilst the dashed line is the relevant legal limit.

6.15 The ETP report provides further analysis of these results along with general comments from manufacturer's and a breakdown between vehicles running

hot or cold. Referral to the actual report will provide a more detailed context for some of these outputs.





7 The Future for Testing

7.1 In order to improve on the laboratory v real world discrepancy, two changes are set to be introduced into the testing regime within the next two years.

7.2 The first is Real Driving Emissions (RDE) which will run on real roads, in real traffic using portable emissions testing equipment. This is due to be introduced in September 2017.

7.3 Further, the underpinning legislation for RDE will allow for independent, third party organisations to conduct their own RDE tests, to verify that vehicles conform to requirements. If a vehicle is found not to comply with the emissions requirements, then the validity of type approval for that vehicle will be open to challenge.

7.4 The second change is a new laboratory test cycle known as world-wide harmonized light duty vehicles test procedure (WLTP) and this is a more demanding assessment with many more periods of acceleration and higher speeds which tend to generate pollutants such as NOx. Flexibilities in the current test, often seen as loopholes, have been removed.

7.5 Despite the new test being more representative of real-world driving, and therefore more demanding, the regulatory emission limits will stay the same and manufacturers will have to improve the way they control emissions to

make sure they continue to comply on the new cycle. In general WLTP is expected to more than double the stringency of the NOx emissions limit.

8 Implications for the CAZ

8.1 It is unclear at this stage how the results of the ETP report will affect the UK position with regards to the Air Quality Plans and for Birmingham how this affects the mandated CAZ.

8.2 Discussions with Defra suggest that the EU are investigating the ETP and studies undertaken by a number of other Member States with a view to ascertaining if these are sufficiently robust and comparable from which to devise new emission factors. This is ongoing.

8.3 We have been advised to consider what may happen if the emission factors are updated and if the emissions from diesel cars are made worse; effectively to introduce a contingency for this within the scoping work being undertaken.

9 Implications for Resources

9.1 The resources employed in delivering air quality regulation are contained within this Committee's budget.

10 Implications for Policy Priorities

10.1 The management of air quality contributes to fulfilling the policies of Birmingham 2026: Our vision for the future and supports the strategic outcomes set out in the Council Business Plan for 2015+, specifically that of a Prosperous City - where local entrepreneurs can thrive; inward investment is attracted; there is a highly skilled workforce. A smart, green and sustainable city with excellent connectivity.

10.2 The work undertaken by Environmental Health also supports the Regulation and Enforcement Division's mission statement to provide 'fair regulation for all - achieving a safe, clean, green and fair trading city for residents, business and visitors'.

10.3 The investigation and delivery of a Clean Air Zone supports the 20 year transport strategy set out within Birmingham Connected, the goal of which is to create a transport system for everyone, one that puts people first and delivers better connections for citizens and businesses; one that improves daily lives by making travel more accessible, more reliable, safer and healthier.

10.4 A link between poor air quality and social deprivation has been established with the more inner city wards suffering the greatest amount of pollution. Consideration of CAZ to limit pollution within the city centre is a worthy endeavor, although care must be taken to ensure that the knock on effects of

any restrictions are considered so as to avoid transferring the vehicles and the associated pollution to other sensitive areas.

11 Public Sector Equality Duty

11.1 Air pollution has the potential to affect all members of society but can have specific impacts on pregnant women and the unborn child. The concerns about such are widely known and health advice is issued accordingly by relevant medical professionals.

11.2 The approach taken to address air quality is such as to protect all members of society and does not discriminate against any group.

ACTING DIRECTOR OF REGULATION AND ENFORCEMENT

Background Papers:
Vehicle Emissions Testing Programme, DfT, April 2016