Performance of Defra's Emission Factor Toolkit 2013 - 2019

February 2020

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1 Introduction

1.1 Air Quality Consultants Ltd (AQC) has historically published a number of CURED (Calculator Using Realistic Emissions from Diesels) emissions models that presented alternatives to Defra's Emissions Factors Toolkit (EFT). These have been intended as sensitivity tests to be used alongside the EFT. They were developed in response to observed under-predictions of emissions from modern vehicles in the EFT and the widespread perception that the EFT was likely to over-predict the rate at which NOx emissions would fall in the future.

1.2 Historically, Defra's EFT predicted large reductions in nitrogen oxides (NOx) emissions that were not borne out in measured roadside concentrations. However, recent analysis[1] carried out by AQC has demonstrated that measured NOx concentrations have reduced significantly over recent years at most UK sites, and that these reductions have been especially pronounced since around 2015/2016. The use of the 'deweather' function in the openair software[2] in AQC's latest trends analysis[3] highlighted the effects of inter-annual variability in meteorological conditions and demonstrated that, when these meteorological effects are accounted for, the reductions in NOx concentrations become more consistent.

1.3 This report considers whether the scale of reductions in NOx emissions predicted by the latest version of the EFT (v9.0) matches the reductions that have been observed at a large number of roadside monitors. It also considers whether there remains a need for a sensitivity test such as that historically provided by the CURED model.

1 Laxen, D., Gellatly, R., Richardson, T. and Marner, B. (2019) *Nitrogen Dioxide and Nitrogen Oxides Trends in the UK 2005 to 2018*, Available: https://www.aqconsultants.co.uk/CMSPages/GetFile.aspx?guid=feb92332-26f7-4989- b86a-21e5732a5404.

2 Carslaw, D.C. and Ropkins, K. (2012) 'openair - An R package for air quality data analysis', *Environmental Modelling & Software,* vol. 27-28, pp. 52-61.

3 Gellatly, R. and Marner, B. (2020) *Nitrogen Oxides Trends in the UK 2013 to 2019*, Available: https://www.aqconsultants.co.uk/CMSPages/GetFile.aspx?guid=af089039-6a2f-49b5-9533-fe31205f3134

2 Methodology

EFT Emissions Reductions

2.1 The analysis has begun by determining the "average" trend in emissions reductions in the EFT over time. The default parameters in EFT v9.0 have been overridden to enable predictions to be made for the years 2013-2030, rather than the default range of 2017-2030. EFT v9.0 does not contain complete fleet composition data for years prior to 2013 and so this report focuses on the period 2013 to 2019, which aligns with that considered in AQC's latest trends report[3].

2.2 The DfT database of Annual Average Daily Traffic (AADT) flows[4] has been downloaded and traffic flows for all roads with an AADT flow of greater than 2,000 and HDV proportion of less than 20% (to remove obvious outliers) for the years 2013 to 2018 have been extracted, which resulted in a total of 18,150 count points being relevant. The traffic flows for all relevant count points nationwide have been entered into the EFT for each year, with a speed of 50 kph. Traffic flows for 2019 were not available; flows for 2018 have been entered when calculating emissions in 2019, which is, on average, likely to result in a very slight under-prediction of NOx emissions from road traffic in this year, which will in turn very slightly over-state the reduction in emissions between 2018 (or any earlier year) and 2019. The EFT has then been run to produce NOx emissions for each year for ten different areas and road types[5] in order to consider the broad range of fleet compositions predicted across the country. The EFT road types used are:

- Area: England; Road Type: Urban (not London);
- Area: England; Road Type: Rural (not London);
- Area: Scotland; Road Type: Urban (not London);
- Area: Scotland; Road Type: Rural (not London);
- Area: Scotland; Road Type: Motorway (not London);
- Area: Wales; Road Type: Urban (not London);
- Area: Wales; Road Type: Motorway (not London);
- Area: London; Road Type: Central;
- Area: London; Road Type: Inner; and
- Area: London; Road Type: Outer.

2.3 The output NOx emission factors from the multiple EFT runs have been merged into a single dataset and outliers have been filtered out through the application of a Z-scoring algorithm (with a

4 https://roadtraffic.dft.gov.uk/downloads

5 these being the categories that appropriately describe the siting of the 131 roadside automatic monitoring sites considered in the 2013 to 2019 trends analysis and this subsequent analysis

Z-score of 3 applied)[6]. For each count point and area/road type, the emissions reduction in the years 2014 to 2019, relative to 2013, has been determined, resulting in a total of 90,750 values per year. These have then been averaged by year and by area/road type.

Measured Road-NOx Reductions

2.4 In order to determine the local road component of measured NOx concentrations ('road-NOx' concentrations) at the 131 roadside monitors considered in AQC's latest trends report[3], it has been necessary to subtract the concurrent local background concentrations from the measurements. In order to align with Defra's latest suite of tools (which includes EFT v9.0), all background concentrations have been derived using Defra's 2017-based background maps.

2.5 Background NOx concentrations for 2017 have been derived directly from the maps. Values for other years have been derived from the 2017-mapped values as follows:

- The rural component of the 2017 background concentrations in Defra's background maps has been scaled using the predicted 'deweathered' annual mean concentration across all 15 rural monitoring sites used in AQC's trends analysis[3];
- The road traffic component of the 2017 mapped background concentrations has been scaled using factors derived from the EFT analysis described above, with emissions scaled by the average factor for the relevant area and road type for each site;
- The other components of the 2017 mapped background NOx concentrations have been scaled using emissions data derived from the National Atmospheric Emissions Inventory (NAEI). NAEI NOx emissions data for the years 2013 to 2017 have been compiled and grouped by sectors that were considered to best match the sectors in Defra's background maps. A rate of change over time has been determined for each sector and the individual ratios for each of the years 2013 to 2016, relative to 2017, were applied to the emissions from each sector in the background maps. The linear rate of change for each sector was then applied forwards from 2017 to predict the relevant sector contributions for 2018 and 2019; and
- All of these sectors were combined to produce a background concentration for each site for each year. This was then subtracted from the predicted 'deweathered' annual mean NOx concentration for each site for each year[7] to determine the road-NOx contribution. The use of the 'deweathered' annual mean concentrations removes the influence of inter-annual meteorological variability, which might otherwise mask any trends in NOx emissions. For each site, the year-on-year change in concentrations relative to 2013 has then been determined. These have then been averaged by year.

6 A z-score (also called a standard score) indicates how far from the mean a data point is, and a z-score of 3 (indicating a data point 3 or more standard deviations from the mean) is used to discount outliers.

7 The calculation of these 'deweathered' annual mean concentrations is described in detail in Paragraph 2.3 of Gellatly and Marner (2020)[3].

2.6 The normalisation to 2013 should not be taken as an assumption that values for this year are known with certainty. Normalisation is simply a means of describing trends. It should be recognised that the uniform national scaling applied to produce the background concentrations will be imprecise. In particular, some elements have been scaled based on NOx emissions reductions determined from the NAEI, which AQC's trends analysis[1] concluded are likely to be overly optimistic. There is thus the potential for the reductions in measured road-NOx to have been under-predicted (i.e. the reductions in the non-road component have been over-predicted).

3 Results

EFT Emissions Reductions

3.1 Figure 1 shows the average trend in emissions relative to 2013 in Defra's EFT, following the methodology described in Paragraphs 2.1 to 2.3. Average NOx emissions in 2019 are, on average, predicted to be roughly 70% of those in 2013, with Central London. in particular. predicted to have seen greater reductions. Average reductions are in the region of 4.4 - 5.4% per year, or 8.6% per year, on average, in Central London (although much of this reduction occurs between 2018 and 2019, presumably reflecting the introduction of the Ultra Low Emission Zone). As identified in Paragraph 2.2, the use of 2018 traffic flows when calculating 2019 emissions is likely to have resulted in a slight over-prediction of the reduction in NOx emissions between 2018 and 2019.

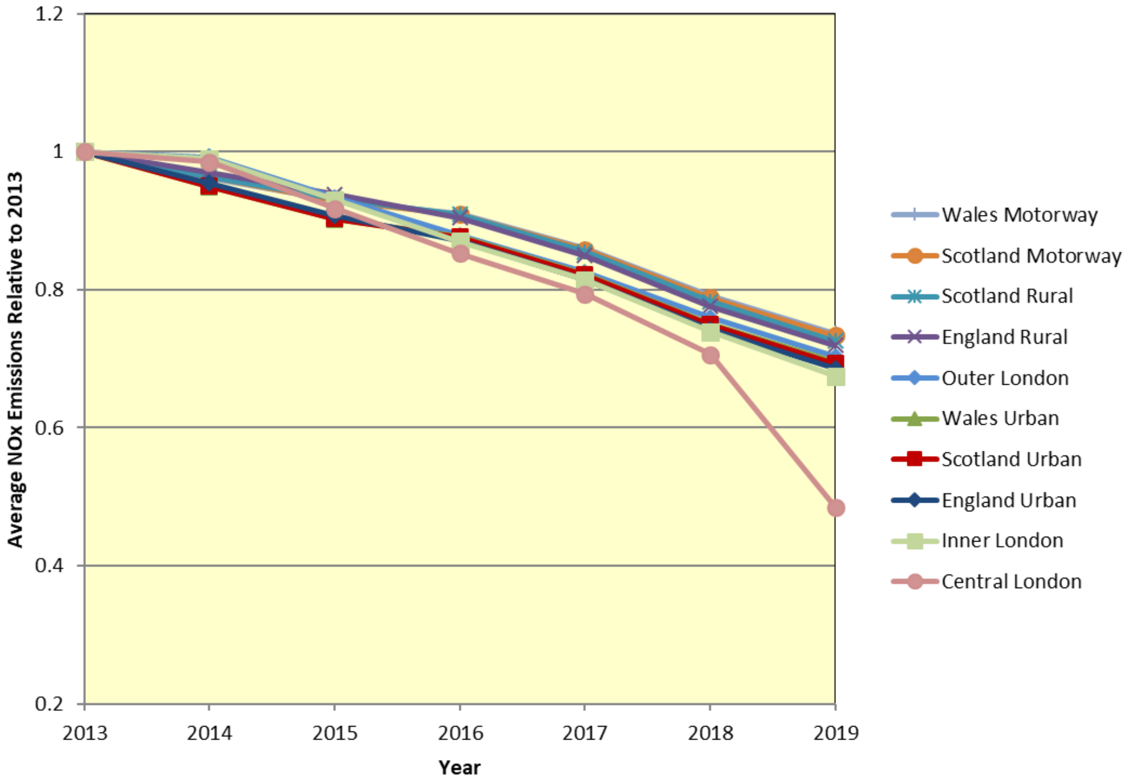

Figure 1: Average EFT NOx Emissions Normalised to 2013

Measured Road-NOx Reductions

3.2 Figure 2 shows the calculated average 'measured' road-NOx concentration relative to 2013 at the 131 roadside sites considered in the analysis, derived following the approach described in Paragraphs 2.4 to . Average road-NOx concentrations in 2019 were 72% of those in 2013. However, the trend is not one of a smooth and steady decline; there is no obvious trend prior to 2016, followed by a steady reduction to 2019.

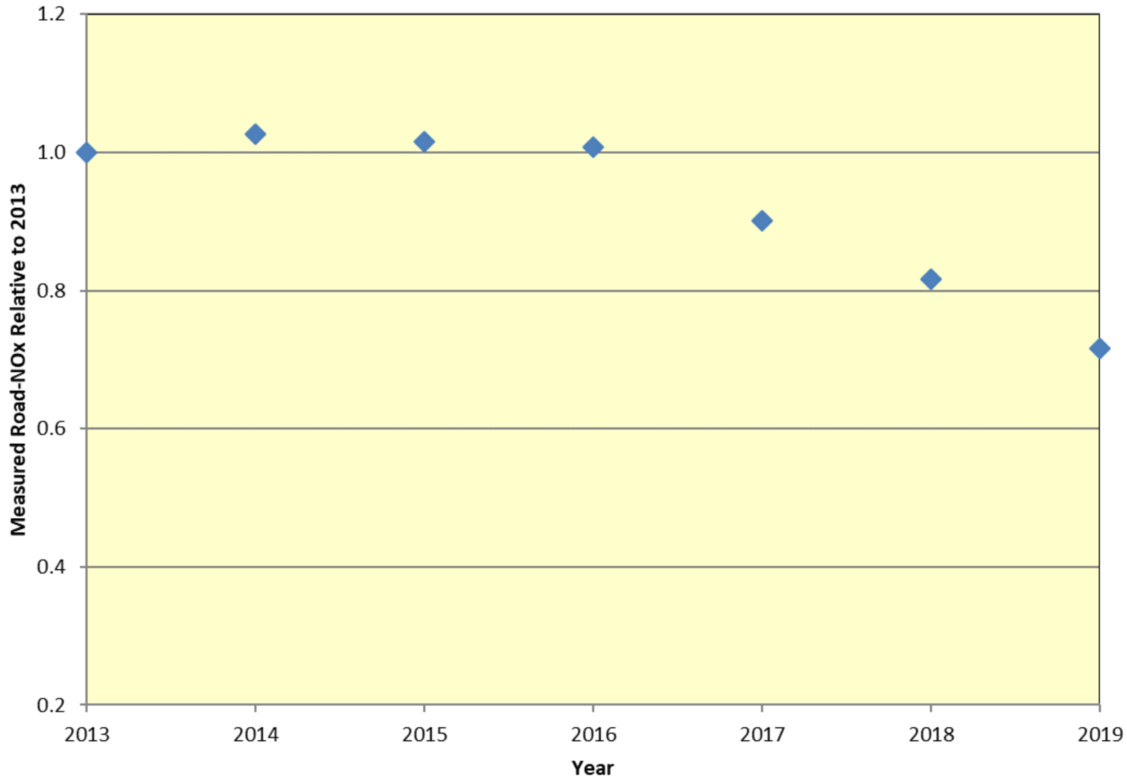

Figure 2: Measured Road-NOx Relative to 2013 – Averaged Across 131 Monitoring Sites

3.3 Figure 3 presents the measured road-NOx relative to 2013 for six different site types/areas. The 'Scotland Urban' data are averaged across 41 sites, 'England Urban' across 39, 'Outer London' across 20, 'Inner London' across 14, 'Wales Urban' across 10 and 'Central London' across 3. Lines for 'England Rural', 'Scotland Rural', 'Scotland Motorway' and 'Wales Motorway' are not shown, as there was only one site with each of these classifications.

3.4 It is again clear that there were no significant reductions in road-NOx concentrations prior to 2016. It is clear that reductions in London have been substantially greater than those elsewhere; urban reductions across England, Wales and Scotland are very similar. Within Central London, road-NOx concentrations in 2019 were just 32% of those in 2013, although it must be acknowledged that this is based on data from only three sites. Nevertheless, the reductions in Inner London, based on 14 sites, are almost as notable, with road-NOx concentrations in 2019 being 46% of those in 2013. The rate of reduction since 2016 appears linear for all site and area types, albeit at different rates.

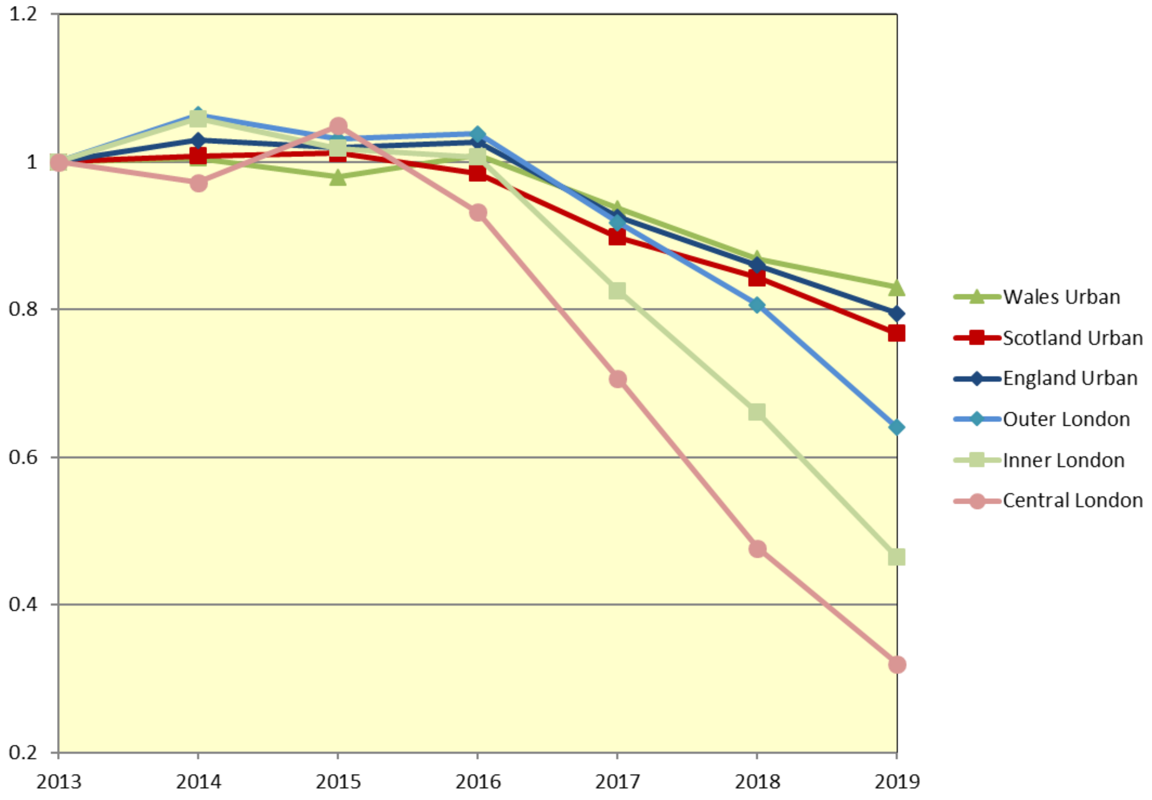

Figure 3: Measured Road-NOx Relative to 2013 – By Site Type/Area

Comparison of Reductions

3.5 It is clear from Figure 2 and Figure 3 that the reduction in road-NOx concentrations over time is non-linear at all sites. There was no reduction prior to 2016, and a steady reduction thereafter, being more significant for sites in London. Figure 4 presents the average reduction in road-NOx relative to 2013 alongside the reductions predicted by the EFT (from Figure 1). It further emphasises the non-linearity of the trend in measured road-NOx, but demonstrates that over the 2013 - 2019 period as a whole, the scale of reduction predicted by the EFT is similar to that measured; particularly at a national level.

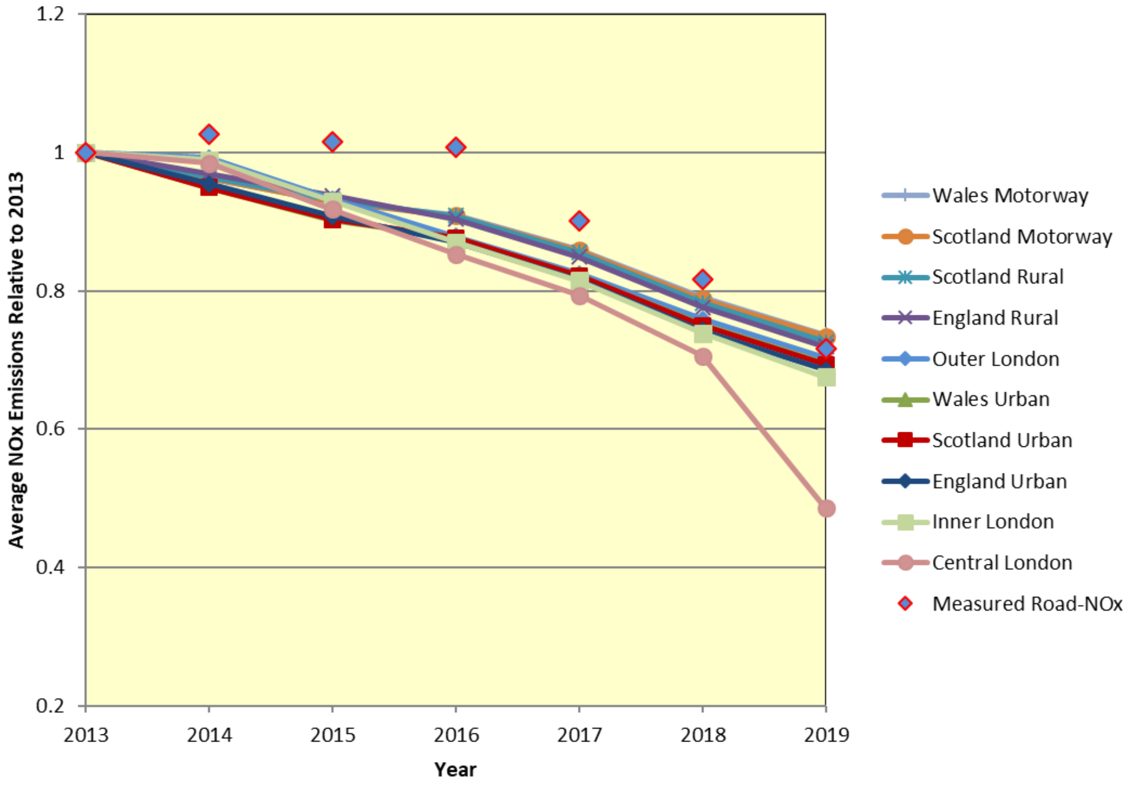

Figure 4: Measured Road-NOx and Average EFT NOx Emissions Relative to 2013

3.6 Table 1 presents a comparison of the linear rate of reduction predicted between the years 2013 and 2019, 2013 and 2016, and 2016 and 2019, using both the EFT and the measured road-NOx data. Trends are given separately for the six areas presented in Figure 3. The numbers presented for 2013 to 2016 and 2016 to 2019 are the gradient of the linear trendline fitted to each set of data, which is appropriate given the linearity of the trends for these two periods presented in Figure 3 and Figure 4 (perhaps with the exception of measured road-NOx in Central London). The numbers presented for 2013 to 2019 have been derived from a direct comparison of the 2019 and 2013 values, divided by six (for the six years); a linear trend line would not accurately represent the curvilinear nature of the trends in measured road-NOx over this period.

3.7 Table 1 demonstrates that the EFT substantially over-predicted the reduction in road-NOx emissions over the period 2013 to 2016. However, over the full period 2013 to 2019 the picture is more varied, with the EFT under-predicting the reduction in London but over-predicting the reduction at urban sites outside London. Over the period 2016 to 2019 the EFT has substantially under-predicted the reduction in NOx emissions in London and has, on average, also under-predicted the reduction at urban sites outside London[8]. On balance, it is concluded that the EFT is currently under-predicting the rate of reduction in vehicle NOx emissions (based on the most recent period - 2016 to 2019) on average across the UK.

[8] 80 urban sites have been incorporated into the analysis across England and Scotland, where the EFT has under-predicted the reduction in NOx emissions, and only 10 in Wales, where the EFT appears to have very slightly over-predicted it.

Table 1: Linear Rates of Reduction of Road-NOx (%/year) [a]

Site Type	EFT-Modelled Road-NOx	Measured Road-NOx
2013-2019		
Scotland Urban	-5.1%	-3.9%
England Urban	-5.2%	-3.4%
Wales Urban	-5.1%	-2.8%
Outer London	-5.0%	-6.0%
Inner London	-5.4%	-8.9%
Central London	-8.6%	-11.3%
2013-2016		
Scotland Urban	-4.2%	-0.4%
England Urban	-4.3%	+0.7%
Wales Urban	-4.2%	0.0%
Outer London	-4.2%	+0.8%
Inner London	-4.5%	-0.2%
Central London	-5.1%	-1.3%
2016-2019		
Scotland Urban	-6.2%	-7.0%
England Urban	-6.3%	-7.6%
Wales Urban	-6.2%	-6.1%
Outer London	-5.9%	-13.1%
Inner London	-6.6%	-17.9%
Central London	-11.9%	-20.7%

[a] Orange = Overall Increase; Blue = <5%/yr Reduction; Green = 5-10%/yr Reduction; Brown = >10%/yr Reduction

Summary

3.8 The performance of the EFT, when compared with the average trend at all of the monitoring sites considered, appears to be bi-modal; with the EFT over-predicting improvements up to 2016 and under-predicting improvements since 2016. Over the 2013-2019 period as a whole, the rate of improvements predicted by the EFT does not appear to be unreasonable, although it may under-predict reductions in London and over-predict them elsewhere. Based on the most recent period, 2016-2019, the EFT has tended to under-predict the reduction in Road-NOx in all geographical areas and road settings, especially London. The more rapid changes in London may relate to interventions to accelerate fleet change.

4 CURED

Purpose of CURED

4.1 In 2016 there was a pressing need for an alternative emissions calculator which took account of evidence from real-world emissions tests showing that COPERT, and thus Defra's EFT, were incorrect. CURED provided a solution to this. Later, COPERT and the EFT were updated to effectively reflect the same car and van emissions which were already used in CURED (V1A and V2A). The focus of CURED V3A thus turned to uncertainty surrounding emissions from future (at that time untested) Euro 6d light-duty diesel vehicles.

4.2 Since CURED V3A was published, the non-regulatory emissions testing of passenger cars which informed the first iterations of CURED[9] has continued. Online data from ADAC in Germany and Emissions Analytics in the UK show large numbers of current-model (Euro 6d-TEMP) diesel cars emitting less than 80 mg/km of NOx as a drive-cycle average. This is much lower than the emissions assumed even from the post-2020 Euro-6 diesel cars in the current EFT, which range from 150 mg/km to 300 mg/km depending on speed (see Appendix 1). As such, it does not seem appropriate to continue to apply the uplifts in CURED V3A, which are specific to Euro 6 diesel cars and vans.

Future Fleet Compositions

4.3 A key source of uncertainty regarding emissions in the future is the composition of the future vehicle fleet; both as a national average and in terms of local variability. As explained in Appendix 1, emerging evidence is that the EFT makes potentially pessimistic assumptions regarding the vehicle fleet in the future with respect to NOx emissions.

4.4 Within London, it is also noted that the EFT does not take account of the improvements that will be driven by the implementation of the stricter LEZ standard from October 2020 and expanded ULEZ from October 2021. Thus, on balance, the assumed vehicle fleet is likely to result in precautionary estimates regarding the rate at which NOx emissions in London reduce in the near future. The same may be said for those cities that implement Clean Air Zones.

4.5 While there is a high degree of uncertainty regarding future fleet composition projections, particularly when using national or regional statistics to represent individual roads, the evidence appears to suggest that the EFT will make precautionary predictions regarding the rate at which NOx emissions reduce in the future. There is thus no clear requirement for a sensitivity test regarding fleet turnover.

9 Emissions of Nitrogen Oxides from Modern Diesel Vehicles. https://www.aqconsultants.co.uk/CMSPages/GetFile.aspx?guid=a13b63aa-02ff-4bf1-8bbb-aa0e86aad4dc

Need for a Revision to the CURED Model

4.6 The balance of evidence suggests that the EFT is unlikely to over-state the rate at which NOx and NO_2 concentrations decline in the future at an 'average' site in the UK. In practice, average NOx and NO_2 concentrations are most likely to decline more quickly in the future than predicted by the EFT. This does not mean that there will be no locations where the EFT under-predicts emissions, but the most likely situation at most locations, based on current evidence, is that the EFT will over-predict NOx emissions in the future. On this basis, there seems no need to either update, or continue to use, the CURED model.

5 Summary and Conclusions

5.1 Analysis of trends in roadside NOx concentrations has demonstrated that they have reduced significantly over recent years. The performance of the EFT when compared with the average trend at all of the monitors considered in this analysis appears to be bi-modal, with the EFT over-predicting improvements up to 2016 and under-predicting the rate of improvement since 2016.

5.2 Wider consideration of the assumptions built into the EFT suggest that, on balance, the EFT is unlikely to over-state the rate at which NOx emissions decline in the future at an 'average' site in the UK. In practice, the balance of evidence suggests that NOx concentrations are most likely to decline more quickly in the future, on average, than predicted by the EFT. This does not mean that there will be no locations where the EFT over-states the rate of decline, but the most likely situation at most locations appears to be that the EFT will under-predict the rate at which NOx emissions fall in the near future.

5.3 On the basis of the analysis set out in this report, there seems to be little value in continuing to use, or updating, the CURED model. It is considered that the EFT may be relied upon to predict the most likely, or potentially conservative, situation in the future, provided that the assessment is verified against measurements made in the year 2016 or later.

Appendix 1 Specific Observations Regarding Future Emissions Projections

Euro 6d

Fleet Composition Projections

A1.1 The Euro 6 standard for diesel cars and vans is being delivered in a number of stages (Euro 6a/b, Euro 6d-TEMP and Euro 6d). The EFT includes different NOx emissions factors for three different phases of Euro 6 for diesel cars and vans, but it is important to note that the emission factors built into the EFT are not intended to align with specific stages of the Euro 6 standard. Instead COPERT, from which EFT emission factors are derived, breaks down Euro 6 diesel car emissions, for example, into three classes, these being "Euro 6 up to 2016", "Euro 6 2017-2019" and "Euro 6 2020+". These categories reflect a general expectation that NOx emissions will reduce over time rather than an explicit attempt to align with individual steps in the Euro 6 regulation. The EFT (as distinct from either COPERT or the NAEI) applies the names "Euro 6", "Euro 6c" and "Euro 6d" to these three COPERT classes and modellers often treat the three categories in the EFT as representing specific type-approval emissions categories, but this is not their purpose.

A1.2 This distinction is important when interpreting the rate at which each EFT-subcategory is assumed to populate the national fleet. For example, The EFT assumes that ca. 58% of Euro 6 diesel car kilometres in 2018 were driven by "Euro 6 2017-2019 vehicles", when the total number of Euro 6d-TEMP vehicles (the type-approval category which most closely aligns with this grouping) on UK roads was unlikely to be greater than a few hundred. The fleet assumptions underpinning the EFT take account of detailed annual mileage data based on Department for Transport (DfT) Automatic Number Plate Recognition (ANPR) and roadside survey data and there is no reason to consider that these are incorrect on a national-average basis. However, if the mistaken assumption is made that the EFT subcategories align with the type-approval subcategories then the fleet assumptions will almost certainly be incorrect.

A1.3 'RDE2' is a term used to refer to Euro 6d vehicles, with the earlier 6d-TEMP standard, which applied a higher conformity factor to the RDE test data (thus effectively allowing higher emissions), sometimes referred to as RDE1. These two terms are primarily used in relation to company cars; the vast majority of which are diesel-fuelled due to operating cost benefits. Changes to the taxation rules for company cars mean that RDE2 compliant (or Euro 6d) vehicles benefit from the removal of a 4% benefit-in-kind tax diesel surcharge. This means that a Euro 6d company car is cheaper to put on the road than earlier models (including RDE1 or Euro 6d-TEMP models); something which has driven manufacturers to introduce them for sale earlier than they otherwise might. There are thus numerous Euro 6d compliant vehicles currently on sale in the UK[10], despite the fact that newly registered vehicles are only required by law to achieve this standard from January 2021.

NOx Emissions

A1.4 The sensitivity test presented in CURED V3A focussed entirely on the EFT's assumptions regarding emissions from diesel vehicles registered in 2020 or later, because at the time of production of CURED V3A there was little evidence that diesel Euro 6d vehicles in the real world would achieve the low emission rates incorporated into EFT v9.0. However, the latest real-world monitoring data[10] suggests that diesel vehicles are capable of achieving the emissions limits required under the Worldwide Harmonised Light Vehicle Test Procedure (WLTP) and Real Driving Emissions (RDE) tests not only for Euro 6c and Euro 6d-TEMP vehicles, but also for Euro 6d. In fact, drive-cycle average NOx emissions from the latest RDE2 vehicles appear to be well below those required for Euro 6d type approval. For example, over the Emissions Analytics test cycle, many of these vehicles have delivered emissions in the 20-40 mg/km range[11], compared with the type-approval standard of 80 mg/km (the Euro 6d standard allows a measurement tolerance of 50%, meaning that a drive-cycle average emission below 120 mg/km would be compliant).

A1.5 Figure A1.1 shows the speed emissions curves in COPERT (and thus the EFT) for the three categories of Euro 6 diesel cars, and compares these with the type-approval emissions standards (after allowing for measurement tolerance factors). It can be seen that EFT assumes Euro 6d diesel car emissions to be above the RDE standard they are required to achieve at all speeds. The EFT assumptions are thus also well above the values which are routinely measured.

Conclusion

A1.6 Based on the above, it appears that the EFT is most likely to over-predict drive-cycle average NOx emissions from Euro 6 diesel cars in the future. This is contrary to the assumption made in CURED V3A. There thus no longer appears to be a justification for applying the adjustments made in the CURED V3A model.

10 https://www.acea.be/publications/article/access-to-euro-6-rde-monitoring-data; https://www.fleetnews.co.uk/news/fleet-industry-news/2019/05/01/rde2-compliant-cars-help-diesel-to-hit-back; https://comcar.co.uk/emissions/euro6d-rde2-diesels/.

11 https://www.fleetnews.co.uk/news/fleet-industry-news/2019/05/01/rde2-compliant-cars-help-diesel-to-hit-back

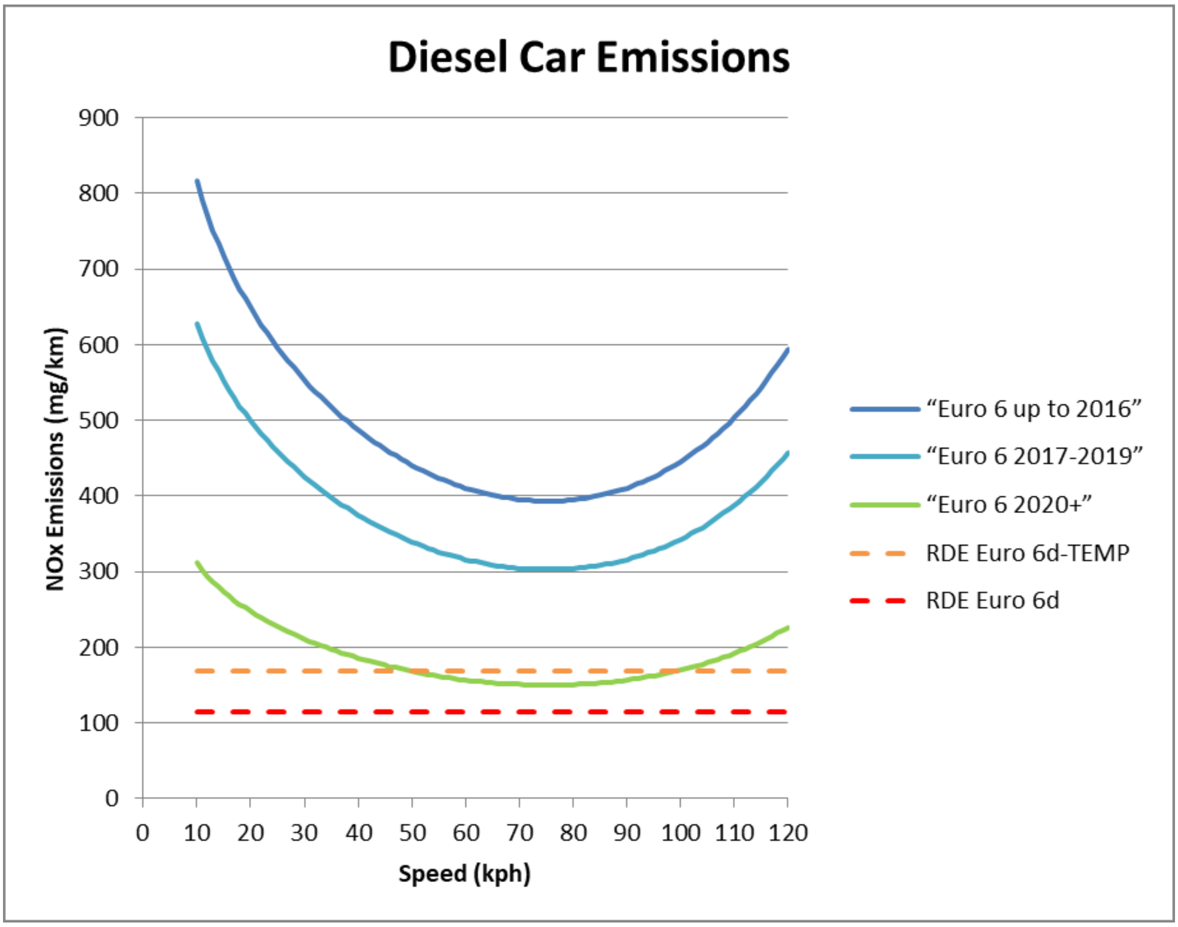

Figure A1.1: Diesel Car Emissions in EFT v9.0[12]

Petrol/Diesel Split

A1.7 Another reason why the EFT might understate NOx emissions reductions into the future is the assumptions regarding the proportion of diesel cars in the future. The EFT assumes that the proportion of diesel cars in the fleet has risen consistently since 2013, and will continue to do so until at least 2022. By contrast in September 2019 diesel sales were reported to have declined for the 29th month in a row[13]. Given that diesel car NOx emissions are assumed, in the EFT, to be higher than those of petrol cars, the EFT is likely to over-predict car NOx emissions in the future.

Electric Vehicles

A1.8 The EFT also predicts very slow battery-electric vehicle uptake. For example, it predicts that only 2.1% of cars on England's urban roads will be electric in 2030, with 0% assumed to be electric on rural roads and motorways. By comparison, the National Grid's Future Energy Scenarios (FES) predictions[14], which allow for the Government's Road to Zero strategy[15], suggest that up to 34% of

12 The orange dotted line represents the RDE test limit for a Euro 6d-TEMP diesel car, which is the Euro 6 standard of 80 mg/km multiplied by a conformity factor of 2.1. The red dotted line represents the RDE test limit for a Euro 6d diesel car, for which a lower conformity factor of 1.43 applies. Conformity factors are primarily applied to allow for measurement error.

13 https://www.am-online.com/news/market-insight/2019/09/05/uk-new-car-sales-dropped-in-august-as-diesel-orders-continued-decline

14 http://fes.nationalgrid.com/media/1363/fes-interactive-version-final.pdf

cars could be electric by 2030 (11.8m of 32.9m), and as much as 97% by 2040 (31.9m of 32.9m). Even the lower-uptake scenarios presented in the FES report forecast over 5% of cars to be electric in 2030, and 48% in 2040. These predictions pre-date the UK Government's February 2020 announcement of a desire to phase out the sale of all new petrol and diesel vehicles by 2035. This suggests that the EFT's assumptions on future vehicle emissions in the medium to long-term may be pessimistic, over-estimating NOx emissions.

A1.9 In the shorter term, the EFT suggests that, on England's urban roads, 0.167% of cars would be electric in 2018, with this increasing to 0.210% in 2019, so a 26% year-on-year increase over an already very low proportion. By comparison, the Society of Motor Manufacturers and Traders (SMMT)[16] report battery electric car sales of 28,259 in January to October 2019, while for the same period in 2018 sales were 12,555. This represents a 125% year-on-year increase. SMMT data indicate a battery electric car market share of 0.6% in January to October of 2018 and 1.4% in January to October of 2019. While these figures are not directly comparable to the vehicle-km based proportions in the EFT, they would seem to suggest that the EFT may be underestimating the current uptake of electric vehicles.

A1.10 Figure A1.2 provides a useful visualisation highlighting the above two issues relating to diesel and electric car proportions in the EFT.

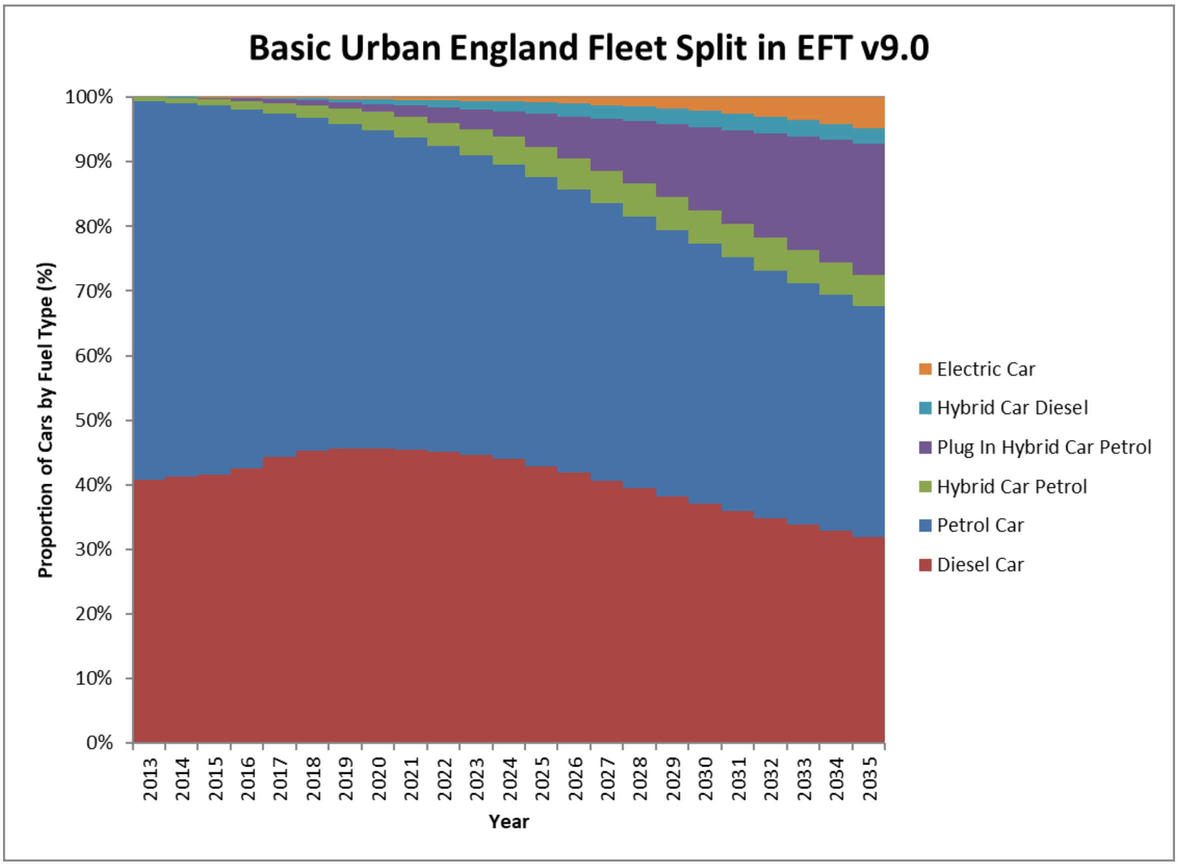

Figure A1.2: Basic Fleet Split for Passenger Cars in Urban England in EFT v9.0

15 https://www.gov.uk/government/publications/reducing-emissions-from-road-transport-road-to-zero-strategy

16 https://www.smmt.co.uk/vehicle-data/car-registrations/

Local and Regional Differences in Fleet Turnover

A1.11 The UK-wide fleet composition projections in the EFT are based on the NAEI's fleet turnover model, which is informed by DfT's vehicle licensing statistics, annual mileage data (showing how mileage changes with age of vehicle) and information from a network of ANPR cameras. Details on the London fleet are provided by Transport for London. There is, however, increasing evidence that different areas, and even different roads on a very local level, may be characterised by fleets of very different ages[17], and this may be exaggerated further by the introduction of Clean Air Zones. This, in turn, means that the rate of fleet turnover can be very different on different roads. There is currently no simple and robust way to account for this variability.

17 e.g. https://www.racfoundation.org/assets/rac_foundation/content/downloadables/MOToring_along_Dr_Sally_Cairns_et_al_November2017.pdf