

Briefing**Manipulation of fuel economy test results by carmakers:
further evidence, costs and solutions****Summary**

The current system of testing cars to measure fuel economy and CO₂ emissions is not fit for purpose. The gap between test results and real-world performance has become a chasm, increasing from 8% in 2001 to 31% in 2013 for private motorists¹ and without action is likely to continue to grow to over 50% by 2020. On average, only half of the improvement in emissions claimed in tests has been delivered on the road. Mercedes cars have the biggest gap between test and real world performance, and less than 20% of the improvement in emissions measured in tests of Opel/Vauxhall cars is realised on the road. Carmakers, not drivers, are the cause of the problem as obsolete official test results are manipulated and new technology is fitted to cars which largely improves fuel economy in laboratories rather than on the road.

Distorted test results deceive drivers who achieve much poorer fuel economy than is promised in glossy marketing, costing a typical motorist around €500 every year² in additional fuel compared to official test results. The more money drivers spend on fuel the less is available to buy other goods and services, reducing growth and employment. By 2030, the widening gap will require drivers to cumulatively spend €1 trillion more on fuel and the EU to import 6 billion extra barrels of oil, worsening energy security and the EU's balance of payments. The distorted test results cheat EU regulations, which are designed to reduce CO₂ emissions, adding 1.5bn tonnes of CO₂ to the atmosphere by 2030 and increasing the prospects of dangerous and uncontrolled climate change. They also reduce government car tax receipts, distorting sales in favour of the carmakers best able to manipulate tests rather than those making the most efficient cars.

Citizens and society need reliable test results to make informed choices and construct effective policies to reduce CO₂ emissions

Part of the solution is to introduce a new global test, the WLTP³ in 2017 as proposed by the European Commission and European Parliament. But EU Member States (under pressure from carmakers that want to continue to use the obsolete test that they can manipulate for as long as possible) continue to dither over when the new test should be introduced. Carmakers are also trying to ensure that current flexibilities in the existing test are recognized when targets for CO₂ emissions are revised with the introduction of the new test.

Using the WLTP test would be a step forward, but it will not resolve everything. The new Commission must ensure that the cars bought by drivers achieve the same test results on the road as the pre-production models tested in laboratories. It must also act to ensure drivers are given accurate information about fuel economy and update obsolete car labelling regulations. Finally the Commission must also ensure tests are genuinely independent and end the artificial market in which national testing services compete for business from carmakers by offering highly optimized tests.

The problems and solutions are known, but whether the new Commission and EU Member States have the courage and political will to address the current abuses remains to be seen.

¹ ICCT, 2014, *From Laboratory to Road*

² €1.35/l, 20k kmpa, gap 31/g/km 2013

³ Worldwide Harmonised Light vehicles Test Procedure

The widening gap between official CO₂ and fuel consumption data and performance on the road

The gap between official test results for fuel efficiency and CO₂ emissions and real world performance on the road is growing rapidly.⁴ The International Council on Clean Transportation (ICCT) analysed 8 different data sets to compare real-world fuel economy in Europe and official test results. For private motorists the gap has grown from 8% in 2001 to 31% in 2013. For company car drivers the gap is now even larger - 45%! The average gap is now 38% and has increased by 7 percentage points in the past year alone — by far the biggest increase to date in a single year.

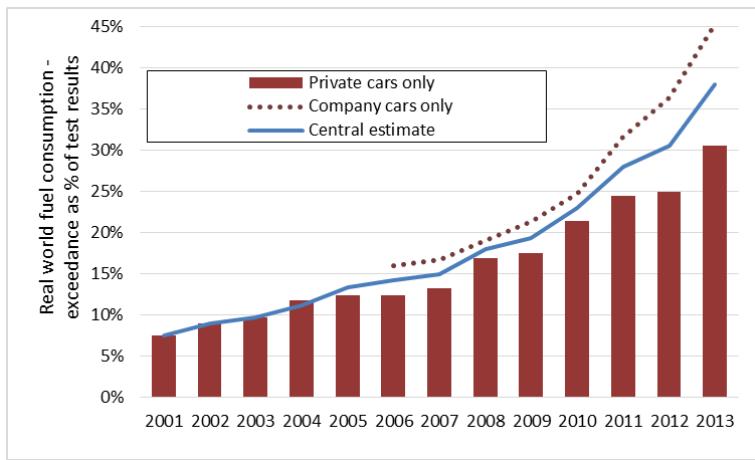


Fig 1: The gap between official fuel economy and CO₂ tests and real world driving 2013 (derived from ICCT, 2014)

The gap between official test results and real world performance has become a chasm.

The growing gap is largely caused by carmakers manipulating the test to achieve unfeasibly low official results; and fitting technology to the car that achieves far lower emissions in the test than on the road. The Spritmonitor data analysed by the ICCT showed that in 2001, 14% of drivers could match official test results for fuel economy. By 2011 this had fallen to just 2%, and by 2013, practically nobody could drive their car this economically.

Seven serious failings in the way cars are tested

Official CO₂ and fuel consumption are measured in the laboratory as part of the system of Type Approval – a range of checks that are usually performed on a pre-production car to demonstrate in advance that it will meet EU safety and environmental regulations. There are seven serious limitations⁵ with the current system of testing to measure emissions and fuel economy:

1. The test cycle is totally unrepresentative of the way modern cars are driven, having been designed 30 years ago. It involves gentle accelerations and only moderate speeds;
2. The test procedures are both obsolete and lax, and contain many loopholes that carmakers are increasingly exploiting to lower their test results. Modern engines are even able to detect when a test is being carried out and produce lower emissions as a result — a technique known as ‘cycle beating’;
3. The carmakers test prototype or pre-production cars that are unrepresentative of production vehicles and have been specially prepared to produce very low test results;
4. There are no effective checks to ensure that vehicles actually sold achieve similar results to those of the tested vehicles;

⁴ <http://www.theicct.org/laboratory-road-2014-update>

⁵ <http://www.transportenvironment.org/publications/mind-gap-why-official-car-fuel-economy-figures-don%E2%80%99t-match-reality>

5. Carmakers pay the Type Approval and Testing Services that oversee the test and usually perform these in their own laboratories. Since the organisations overseeing the test are in competition with other testing organisations they are not sufficiently independent or demanding in terms of scrutinising how the test is performed;
6. During the test, energy-hungry accessories such as air-conditioning, navigation and media systems, and heated seats remain switched off, thereby giving lower test results than would be found in real world conditions;
7. The test exaggerates the benefit of new technologies being fitted on the vehicles, such as stop-start, since the car is stationary for 20% of the current test time.

The Commission must be systematic in addressing the reasons for the growing gap

Why is this important?

Official figures on new car fuel economy and CO₂ emissions⁶ show steady progress year on year from 2008 (when regulations were introduced). This is represented by the solid blue line in Figure 2. If the gap between these official figures and real world results had remained as it was in 2008 there would have been a corresponding improvement from over 180 g/km to below 150 g/km in real world emissions as well (the dotted blue line in Figure 2).

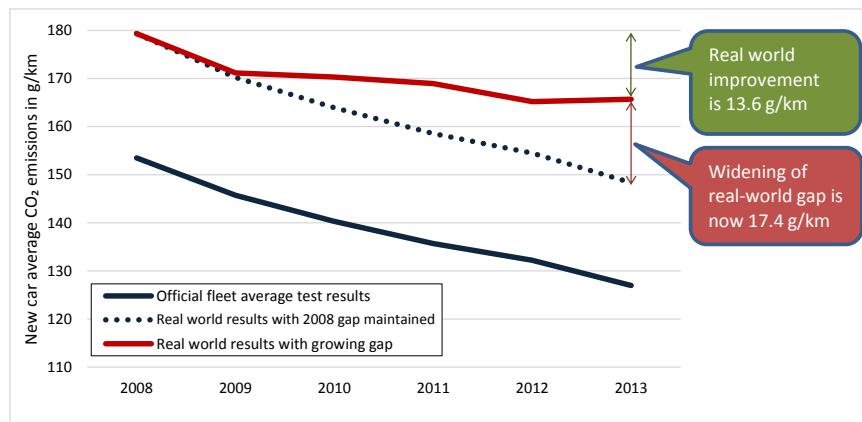


Fig 2: Official CO₂ test results versus the real world outcomes in 2013 for private motorists (derived from ICCT, 2014)

Instead, this progress on paper was accompanied by a marked and rapid increase in the size of the gap between test and real world emissions (see Figure 1). Combining these two trends using the ICCT data for private motorists (a more conservative estimate of the size of the gap) shows that a good improvement in 2009 has been followed by slowing progress ever since. The net result is that more than half of the gains claimed to have been made since 2008 have been purely theoretical ones, with only 13.6 g/km of real progress on the roads set against 17.4 g/km of 'hot air' caused by carmakers' manipulation of the test procedures. The lack of real progress is important for four main reasons:

- Fuel is the biggest cost of running a car and drivers are not getting the benefit of the fuel economy that they have been promised. Projecting forward to 2030 the cumulative additional fuel consumption arising from the widening gap will be nearly 600 billion litres⁷ costing motorists around €1 trillion.⁸
- More oil is imported into Europe — by 2030, because of the widening gap, 6 billion additional barrels of oil must be imported into Europe costing €540bn at current prices a large proportion going to Russia;⁹

⁶ <http://www.transportenvironment.org/publications/how-clean-are-europe%20%99s-cars-2014-%20%93-part-1>

⁷ 13k km pa; 2.481kgCO₂/l; assumes the gap grows to 50% by 2030 & 225k km lifetime mileage

⁸ €1.6/l

⁹ \$90 bbl; 55% road transport fuel per barrel.

- CO₂ emissions are significantly raised. The Car CO₂ Regulation is a major plank of the EU's climate policy, and has been rendered much less effective by the manipulation of the test procedure. As a result, by 2030 the widening gap will cause 1.5bn additional tonnes of CO₂¹⁰ compared to if the gap had remained at the 15% in 2008;
- If car buyers cannot get reliable information about fuel economy, they cannot make informed choices about the cars they buy. Drivers and the media are increasingly aware of the growing discrepancy between labelled fuel economy and what happens on the road, leading to a loss of credibility for the whole of the EU's car labelling and regulatory system. This is not in the interests of consumers, policymakers or the environment — and ultimately not of the car industry either.

Which carmakers are the best at manipulating the tests?

An expert study for the European Commission¹¹ and report by T&E¹² demonstrates the many ways carmakers are able to manipulate test results (Figure 5). By testing a 'golden vehicle' and creative interpretation of the test procedures carmakers are able to achieve multiple small improvements that lower the test results. Cars tested using the official procedure without utilising flexibilities or specially preparing the car produce results 19-28% higher than type approval values.¹³

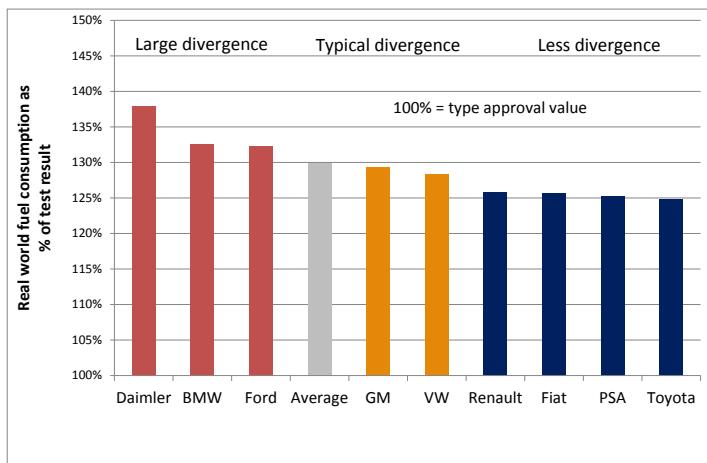


Fig 3: Difference between manufacturers test results and average real-world driving in 2013 (derived from ICCT, 2014)

All carmakers have been exploiting more flexibilities in the current official tests during 2013

All carmakers optimise test results but data from Spritmonitor (Figure 3) show that cars produced by Daimler, BMW and Ford exhibit the largest real-world gaps — in excess of 30%. However, in the past 12 months *all* carmakers have become more adept at manipulating the tests such that all carmakers now have an average gap of 25% or more. Other datasets examined by the ICCT show an average gap of 38%, larger than that measured by Spritmonitor, since these datasets include more company car drivers, the figures are therefore conservative.

¹⁰225k km lifetime mileage; 2.481kgCO₂/l

¹¹ TNO 2012, *Supporting Analysis regarding Test Procedure Flexibilities and Technology Deployment for Review of the Light Duty Vehicle CO₂ Regulations: Note on options for reducing test cycle flexibilities*, Framework Contract No ENV.C.3./FRA/2009/0043, European Commission DG Clima, Brussels

¹² T&E 2013, *Mind the Gap*

¹³ TNO 2012a, *Road load determination of passenger cars*, TNO report TNO 2012 R10237, Delft

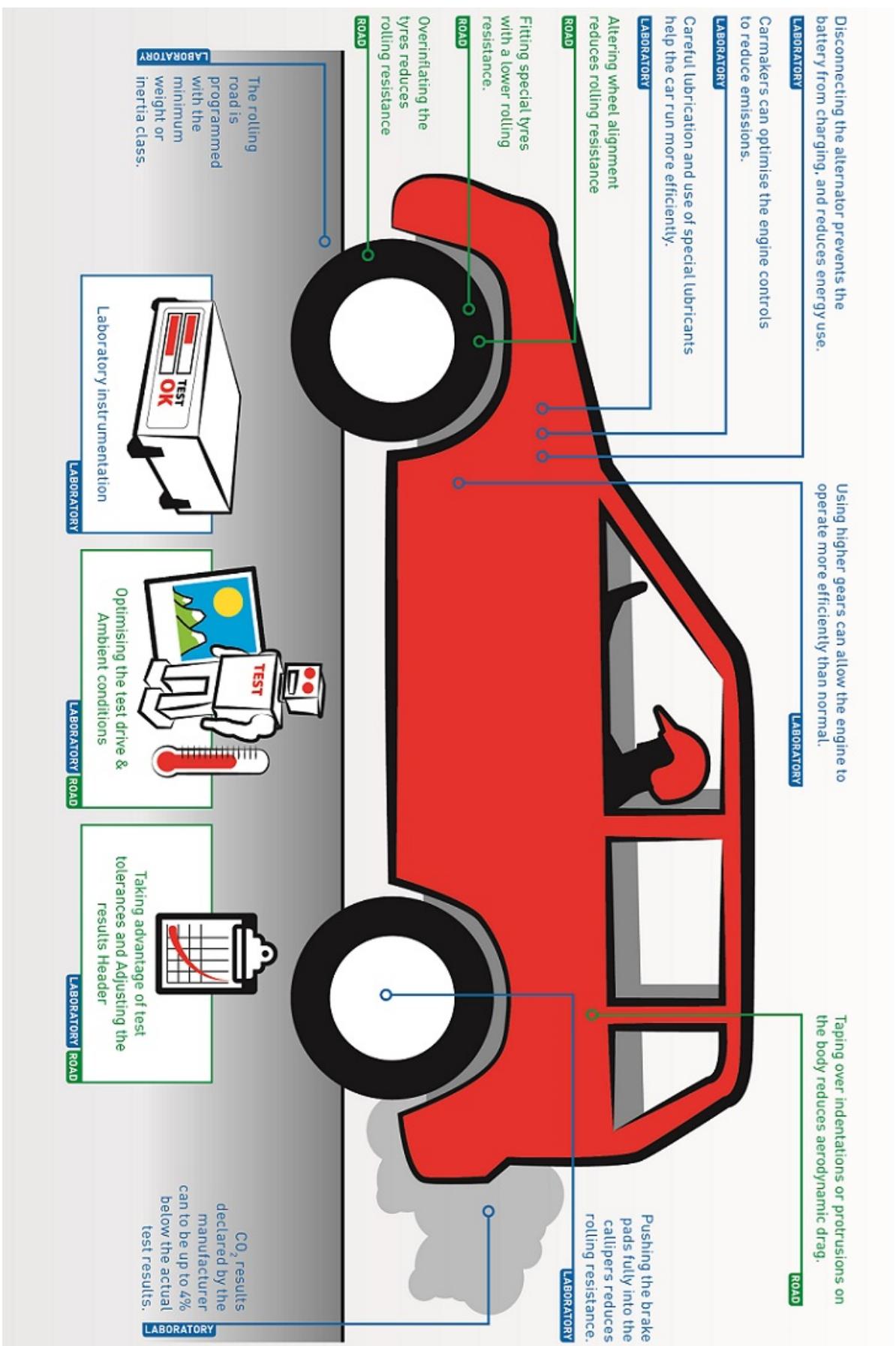


Fig 5: Common ways carmakers manipulate tests for CO₂ emissions and fuel economy

The gap for specific car models

ICCT analysed the gap between test and real-world performance of 8 different individual car models. This shows that carmakers appear to be manipulating test results in order to place cars in the lowest tax bands. For example, Renault sell a version of the Megane in the Netherlands achieving 88g/km compared to 90g/km in the rest of Europe. This is in order to attract customers who would otherwise pay an additional €600 in tax. The gap between test and real world performance for this model is 60%! Recent model upgrades have also led to a large increase in the gap between test and real world performance. The average gap for the VW Golf jumped from 20% to 30% in 2013 and the Ford Fiesta from 22% to 38%.¹⁴

Further evidence that the models with the lowest test emissions are being subjected to extreme test manipulation is provided by Emissions Analytics.¹⁵ They have tested over 500 models on the road using a highly reproducible testing procedure that better reflects real world driving conditions. The data clearly show models with an engine size below 1 litre have, on average, slightly higher emissions than those with an engine of 1-2 litres and a far larger real-world gap than for any other engine class. This is because:

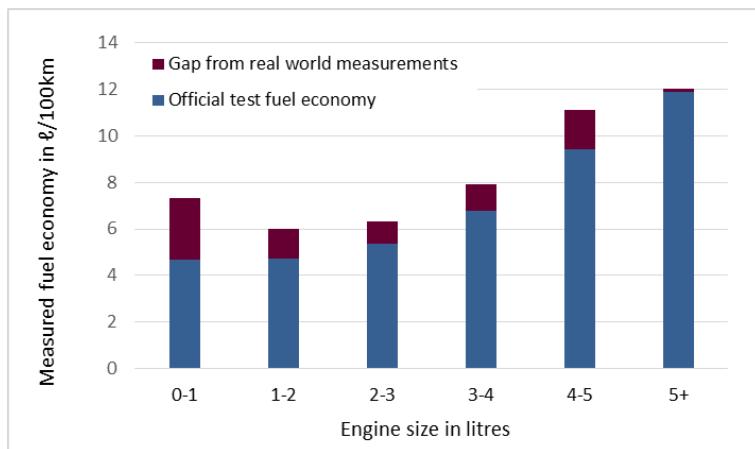


Fig 4: On-road fuel economy of different engine sizes
(derived from Emissions Analytics, 2014)

- The test results in these small engine vehicles are heavily manipulated in order that the vehicles qualify for lower tax rates or exemptions for low carbon models, which are very appealing to customers;
- The technology used to improve fuel economy and CO₂ emissions in these vehicles performs much better in the test than on the road. For example, stop-start and gasoline direct injection with turbocharging (such as the Ford Ecoboost engine) are common on these small cars.

The gap is widest for the smallest engine vehicles that on the road are no more efficient than those with an engine size of 1-2!

The Emissions Analytics results add to the urgency of providing reliable consumer information reflecting real world emissions. The official test results are now so unrepresentative that drivers can no longer even rely upon the ‘rule of thumb’ that the smaller-engined vehicles will be the most efficient. This is likely to increase confusion in the market and undermine the shift to more efficient models.

How much of the claimed improvement is actually achieved on the road?

T&E has reanalysed the 2014 Spritmonitor data to compare how much of the improvement in emissions claimed by manufacturers between 2008 and 2013 has actually been delivered on the road (Figure 6).

¹⁴ Based upon Spritmonitor data

¹⁵ <http://emissionsanalytics.com/beware-the-danger-of-downsizing/>

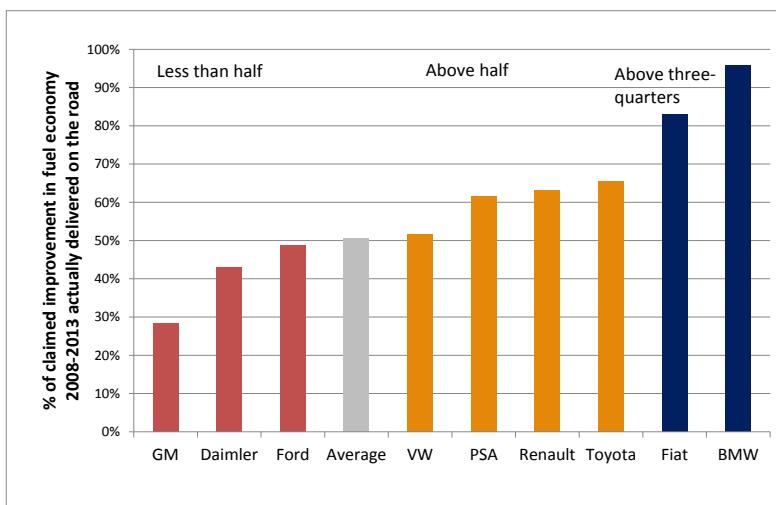


Fig 6: Percentage of the actual improvement in emissions 2008-2013 realised on the road

On average only about half (50%) of the improvement claimed in tests resulted in lower emissions and fuel consumption on the road. There are substantial differences between carmakers, with GM delivering less than 30% and Daimler barely 40% of the progress measured in the test on the road. Fiat and BMW have improved their real world performance in recent years and both now appear to deliver more than 80% of the test result savings on the road relative to a 2008 baseline. Toyota, Renault and PSA also deliver more than

60% of the claimed improvement in efficiency and fuel economy on the road.

How much progress would be made towards 2015 targets without test flexibilities?

T&E has also analysed whether carmakers would still be on track to achieve their 2015 targets on the road *without exploiting test flexibilities*. This involves calculating what their progress towards targets would be if their real-world gaps had remained as they were in 2008 as against what they actually achieved on the road.

As Figure 7 illustrates, there is a clear split between some that are on track or better, and others making inadequate progress on the road. The record of Toyota and PSA in particular shows it is entirely possible to achieve regulatory targets on the road without manipulating test results excessively – but some companies, for example GM and Daimler, appear to have chosen to achieve their targets mainly in the laboratory.

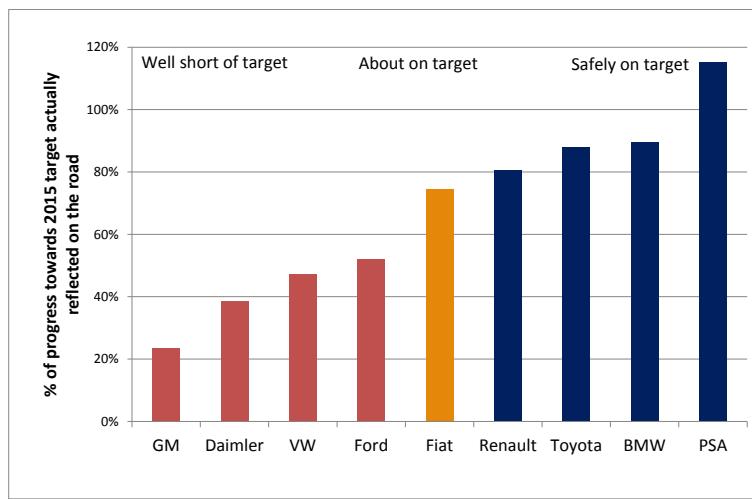


Fig 7: Progress (in 2013) towards meeting 2015 regulatory targets on the road (derived from ICCT 2014)

The costs of the growing gap

Since regulations were introduced in 2008 to improve fuel economy and reduce car CO₂ emissions the ICCT estimate that the gap between test and real world emissions has more than doubled from 15% to 31% for private motorists. The regulation has already been cheated by the equivalent of more than 17 g/km of CO₂. If the gap is allowed to grow to 50% by 2021, as seems entirely likely based upon current trends, the 95 g/km will only be equivalent to around 142 g/km in the real world - barely better than it is now. The finalisation of the 95 g/km regulation was recently the subject of intense negotiations, and policymakers certainly did not

intend that these fraught discussions would effectively be rendered irrelevant by companies cheating the regulation by manipulating test results.

VW recently claimed¹⁶ each gram of CO₂ emissions it is required to reduce costs it €100 million.¹⁷ On this basis VW alone has saved around €1.7 billion by test manipulation and by extrapolation, the entire car industry has saved at least €7 billion. This cost is met by carmakers' customers who as a result are paying an average around €2,800¹⁸ for additional fuel that is being burned over the lifetime of the car. In one year the cumulative cost of additional fuel consumed by newly manufactured cars is around €35 billion¹⁹ – five times more than has been saved by carmakers (based upon VW's own figures). Carmakers are effectively cheating their own customers.

VW's own figures show the costs of making cars more efficient is 5 times less than the cost of the additional fuel that will otherwise be burned

Assuming by 2021 the gap has grown to 50%, the cumulative additional cost of fuel that motorists are required to buy as a result of test manipulation will amount to nearly a trillion euros in 2030 in extra oil the EU must import, damaging balance of payments and lowering growth as the expenditure on oil reduces spending and jobs in other domestic sectors. Carmakers' manipulation of tests is therefore also damaging the EU economy.

Society also pays a price for carmakers achieving targets by manipulating tests. The cumulative CO₂ emissions arising from test manipulation by 2030 are estimated to be about 1.5 billion tonnes. Test manipulation is increasing the risk of dangerous climate change.

The solutions

A new global testing system (the World Light Duty Test Cycle and Procedures - WLTP/P) has been under development at the United Nations Economic Commission for Europe (UNECE) for many years and will be finalized in Spring 2015. This test cycle is more representative of real-world driving and the test procedures are more robust when compared to Europe's NEDC.²⁰ The European Parliament²¹ and European Commission have proposed this new test be introduced in 2017. Carmakers oppose the introduction of the new test and want to see a long delay because it will reduce their ability to manipulate test results in the future.²²

EU Member States must support the 2017 implementation date for WLTP. If not, the 2021 CO₂ target will be largely delivered in laboratories rather than on the road.

The introduction of WLTP will require the 95g CO₂/km average target for new cars in 2021 to be modified because this is based upon the NEDC test. The European Commission has embarked upon an exercise to do this using a combination of testing under both NEDC and

¹⁶ <http://www.reuters.com/article/2014/10/02/autoshow-paris-carbon-idUSL6N0RX5S520141002>

¹⁷ VAG sells about 3 million vehicles in Europe each year. A cost of €100 million is therefore equivalent to an average of €30 per gram per vehicle. Reducing emissions by 35g/km to meet 95g/km will therefore cost about €1050 — very similar to the estimate of the European Commission.

¹⁸ Assumes the gap remains at current levels; fuels costs €1.6/l; 250,000km vehicle lifetime.

¹⁹ Assumes 13 million sales per year

²⁰ New European Drive Cycle – the current obsolete test

²¹ [http://www.europarl.europa.eu/oeil/popups/ficheprocedure.do?reference=2012/0190\(COD\)&l=en](http://www.europarl.europa.eu/oeil/popups/ficheprocedure.do?reference=2012/0190(COD)&l=en)

²² ACEA 2013, ACEA views on COM paper "Options for Correlating CO₂ Emission Targets"; WLTP TWG Correlation, 18 December 2013

WLTP systems and computer modelling. It is essential that this analysis does not reward carmakers for manipulating tests by refusing to take account of the flexibilities that are being exploited in the NEDC procedure. This is the only way to ensure the stringency of the target is maintained.

The introduction of the WLTP test will be an important milestone. But in parallel the Commission must bring forward proposals to provide more robust information to consumers since the WLTP test results for fuel consumption are still likely to be about 15% lower than are typically achieved in real world driving. This must include proposals to account for emissions arising from the use of auxiliary energy sources on the vehicle such as lights, air conditioning and heating and to provide a 'real-world' WLTP test value that can be used for consumer information such as labelling and as the basis for national vehicle taxation where EU member states wish to use it. An update to the obsolete Car Labelling Regulation²³ to encompass online information and ensure that information is easily understandable for car buyers is also needed.

Accurate consumer information is a prerequisite for shifting the market to lower carbon, fuel efficient models.

In the US, Hyundai-Kia, Ford, Mercedes and recently BMW-Mini have all been caught by the US Environmental Protection Agency (EPA) providing incorrect fuel economy information. Some have been required to compensate drivers. The US system works because there is a proper system of checking test results and accurate fuel economy information. But the EPA is still strengthening its system and plans to issue revised guidelines clarifying how automakers should conduct the testing, and to continue more intensive audits of the carmakers' own tests. It may also require manufacturers to verify their own pre-production test results using production models²⁴. The EPA response is proactive and comprehensive in contrast to the slow and piecemeal progress in the EU. In addition to better consumer information and the implementation of WLTP in 2017 the European Commission must:

- Establishing a European Type Approval Authority to ensure tests are performed consistently and independently, and end the market in which testing services compete to offer carmakers the most highly optimized service;
- Strengthening the system of conformity of production checks to ensure production cars match emissions measured during type approval. This should include tests performed on the road using Portable Emissions Monitoring Systems (PEMS) to extend the air pollution emissions tests;
- Requiring increased surveillance and in-service conformity checks to ensure new vehicles continue to perform on the road in a similar way to models being type approved.

The EU must learn from the US and strengthen the systems of testing vehicles

The current systems for measuring fuel economy, CO₂ and also air pollution emissions are utterly discredited. Actions to address the problem have been repeatedly delayed and weakened through car industry lobbying. The effect is higher oil imports into the EU; higher fuel bills for drivers; less growth and fewer jobs; and higher car CO₂ emissions.

The solutions are known. The new Juncker Commission is coming in with a promise to do everything possible to restore the trust of people in the EU and boost growth. Fixing the car testing mess is a very concrete way of turning that promise into action.

²³ http://ec.europa.eu/clima/policies/transport/vehicles/labelling/docs/directive_en.pdf

²⁴ <http://www.autonews.com/article/20141018/OEM11/310209867/epa-plans-more-scrutiny-of-mpg-tests>

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