

How Fuel Consumption Meters can be used to deliver real-world CO₂ improvements as part of post-2020 CO₂ standards

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This briefing updates a previous [analysis](#) (published in August 2018) summarising how carmakers can manipulate future WLTP tests, and presents a detailed solution to stop test manipulation using fuel consumption meters.

1. Past and future test manipulation

Whilst new car CO₂ emissions measured using the NEDC laboratory test have fallen by 31% since 2000, on the road the reduction is just 10%. The problem stems from using laboratory tests that are unrepresentative of real world driving and allow too much interpretation of how the test should be conducted. Whilst the new WLTP test addresses some loopholes, its introduction also creates new flexibilities that the car industry are exploiting to undermine the stringency of post 2020 regulations. Specifically, the industry plans to double test cars using the old NEDC test (for compliance with 2020/1 targets) and the new WLTP test (to establish the baseline for proposed 2025 targets in 2021). This will enable them to optimise both tests to produce low NEDC values whilst inflating the 2021 WLTP baseline. By raising the WLTP lab results by 10g/km, more than half of the fuel savings benefit of the Cars CO₂ regulation to 2025 will be lost.

Given the failure of the current regulation to deliver the expected emissions reductions on the road, it was disappointing that the European Commission proposal for post-2020 standards missed its opportunity to finally tackle the issue since its own [Scientific Advisory Mechanism](#) recommended they do so. The Commission proposal for in-service conformity tests (new Article 7.8), will only check that the initial type approval laboratory tests have been correctly performed and is unlikely to be able to prevent the gap between test and real-world emissions growing, as test manipulation is [only part of the reason](#) for the growing gap. The Commission also proposes to monitor the gap between the new test and real-world performance using fuel consumption meters, but will only consider the data in a 2024 review - too late to act to address any issues which emerge from the analysis and undermining the 2025 target. The Commission has also proposed additional measures to be incorporated into the Car CO₂ regulation following the recent revelations of baseline manipulation - but these are only partial solutions:

1. Basing the post-2020 car and van regulations on the measured and not declared WLTP values. This addresses the issue of manufacturers declaring higher values but not those associated with test procedure manipulation, e.g. the use of defeat devices to detect the test or deploying technologies that work better on the WLTP laboratory test than on the road.
2. Amending the correlation legislation to collect additional data. The Commission propose to do this to increase transparency and monitoring. But the Commission does not say in the non-paper how it will use the additional information to actually prevent test manipulation. Rather it seems to want to monitor but not reform how the legislation works in practice.
3. Monitoring the correct implementation of the WLTP by member state type approval authorities. But it does not say how it will do this or what powers it will use to ensure correct interpretation.

Whilst the Commission proposals will limit manipulation of the WLTP test, it will not prevent this as it fails to address how carmakers prepare and conduct the test to derive low or high CO₂ values. It will also do nothing to stop the future real-world gap increasing.

2. Solution using Fuel Consumption Meters

The proposals from the European Parliament to Article 12 of the new Cars CO₂ regulation can stop all cheating. The modified Parliament proposal introduced ahead of the 2nd trilogue introduces a correction procedure into the regulation if the gap between the WLTP test and real world performance grows after 2021. In doing so it effectively stops the current manipulation of the WLTP test and any future abuses, as test manipulation would serve no purpose when the CO₂ targets are corrected if the real-world gap grows. The real world performance is measured using fuel consumption meters that will be equipped to all cars after 2020 with strict accuracy requirements. The Commission has already proposed to use these for monitoring of the gap, and plans to put in place the data gathering and processing procedure. The Parliament amendments therefore simply use the information the Commission already proposes to compile. The procedure is also similar to the correction factor used every two years to adjust company CO₂ targets to account for changes to the average mass of cars. Below is a possible compromise amendment:

The Commission shall every two years collect data on the real-world CO₂ emissions and energy consumption of passenger cars and light commercial vehicles using fuel consumption meters. Starting with the data from new vehicles sold in 2021, this dataset shall be used to calculate the average percentage difference between the manufacturer's specific CO₂ emissions measured during type approval and their real-world CO₂ values in a given year. The Commission shall ensure that the difference does not increase beyond that measured in new passenger cars and light commercial vehicles registered in 2021.

From 1 January 2023 where a manufacturer's specific CO₂ emissions exceed the 2021 limit value set for the given manufacturer, the specific CO₂ emissions target for that manufacturer set for 2025 shall be adjusted by the exceedance identified, and shall further be adjusted in 2028 to correct the specific CO₂ emissions targets for 2030.

The Parliament amendment in effect fixes a percentage gap between test (WLTP) and real world performance (FCM) data from new cars registered in 2021. The Commission will then check in 2023 whether the gap has changed for each pool of manufacturers. If it has, the fleet-wide CO₂ target for the pool is adjusted. The adjusted target will apply in 2025. The same procedure will be followed in 2029 to adjust the 2030 target. The following correction formula can be used:

$$\begin{aligned} \text{Corrected specific CO}_2 \text{ emissions target in year } 20xx &= \\ &= \text{Specific CO}_2 \text{ emissions target in year } 20xx \times \frac{\text{WLTP}_{20xx} \times \text{RW}_{2021}}{\text{WLTP}_{2021} \times \text{RW}_{20xx}} \end{aligned}$$

Where:

WLTP₂₀₂₁ – specific emissions target set in 2021

WLTP_{20xx} – the WLTP-based CO₂ specific emissions target as agreed for manufacturer for a given year

RW₂₀₂₁ – averaged real-world CO₂ emissions from new vehicles sold in 2021 as measured by fuel consumption meters

RW_{20xx} – averaged real-world CO₂ emissions from new vehicles sold in a given year as measured by fuel consumption meters

In doing so companies know in advance the target that they need to reach. The approach ends the practice of test manipulation and also encourages fitting of eco-innovations that deliver emissions reductions on the road. It ensures that the agreed percentage reduction targets are delivered on the road. The legislators may also agree to have a monitoring phase in the beginning whereby the FCM data is collected but not used for compliance, e.g. in 2022 – but it is important that 2021 is set as the baseline year from which gap monitoring begins.

3. Primary CO₂ law vs comitology

The car CO₂ legislation would detail the overall approach as in the Parliament amendment above. EU comitology procedure via implementing acts would then need to detail precisely how the correction procedure would apply in practice.

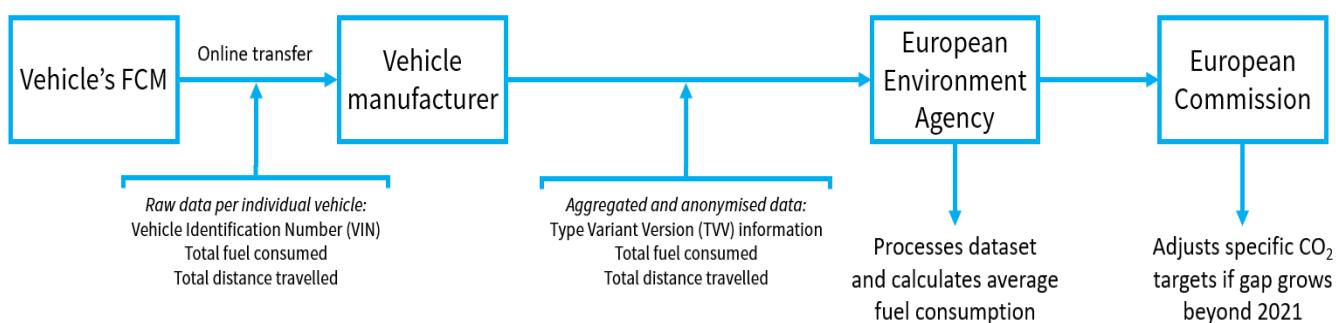
The underlying FCM aspects have already been agreed in the WLTP 2 implementing regulation voted in May 2018, notably:

- All new cars will be fitted with FCMs from January 2021 (so in time for the data collection in the same year)
- Data accuracy requirements are mandated, including relevant technical standards, to ensure accuracy and interoperability of the data
- It is specified which data is to be collected and made accessible (via on-board diagnostics, OBD), including instantaneous/lifetime fuel consumption & instantaneous/lifetime distance travelled

A detailed implementing act is needed to put in place a formal procedure how to collect, compile and analyse the data for the compliance purposes. The upcoming implementing act by the Commission and national experts shall detail:

1. What data is to be provided (distance travelled and fuel used is enough for the calculations)
2. Over what period the data should be compiled at a vehicle level (it should not be necessary to compile a full year of data to acquire a statistically significant sample)
3. The intervals at which the data is to be collected/sent to the relevant authority by the manufacturers
4. Statistical approach on how to deal with outliers in dataset, such as erroneous data
5. System of checks against tampering with the data
6. How to deal with plug-in hybrids, hybrids and electric vehicles
7. Who is in charge of processing and storing the dataset securely (e.g. the EEA who is collecting the cars CO₂ data today already)
8. Adjustment formulas to correct the CO₂ emissions targets if the gap grows (as suggested above)

The diagram below illustrates how the procedure would work in practice. **Via online data transfer** vehicle's FCM will send lifetime fuel consumption (for a particular year) and distance travelled, which the manufacturer will then collate (without processing or amending) by their vehicle models and types and send on to the EEA who would be in charge to securely process the data (calculate the gap) and create anonymised datasets.



It is important to note that the Commission already proposes to use FCM data for monitoring so they need to elaborate the data collection and processing procedure under its (and Council's) **current proposals** already. Whereas carmakers already today obtain all the diagnostics and performance data from their vehicles, usually via internet using connected vehicle technology. The only additional requirement is therefore to use the compiled FCM data to regulate the real world improvement and adjust the CO₂ targets.

of those carmakers whose gap grows after 2021. In the absence of this procedure the emissions targets will be seriously undermined.

Further information

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