



# THE DIFFERENCE BETWEEN FUEL CONSUMPTION IN PRACTICE AND ACCORDING TO THE TYPE APPROVAL TEST

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- › Situation: fuel consumption gap
- › Consequences
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# TYPE APPROVAL TEST AND REAL WORLD FUEL CONSUMPTION

## Type approval CO<sub>2</sub> emission test

Lab test, part of certification for admission to EU market



- Standardized test trip on rolling road
- Controlled conditions

## Real world



- Variable conditions
- Variable use
- Driver behaviour

*September 2018 -*

New European Driving  
Cycle (NEDC)

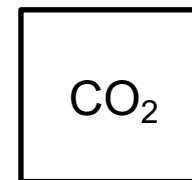
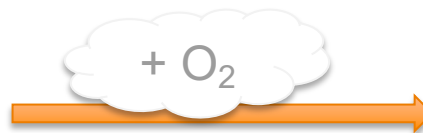


Worldwide Harmonised Light  
Vehicle Test Procedure  
(WLTP)

## RELATION FUEL CONSUMPTION AND CO<sub>2</sub> EMISSION



- C (~85%)
- H
- O
- N
- S
- ash
- ...



~2.37 kg/l petrol  
~2.65 kg/l diesel

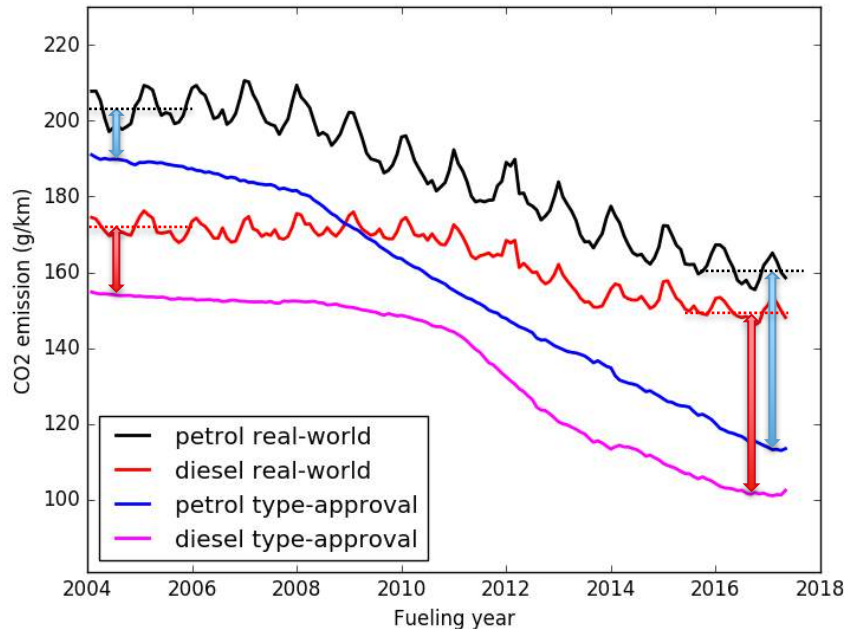
Actual ratio depends on:

- Fuel quality
- Biofuels admixture



# THE GAP (NEDC BASED)

Fleet: +41%



This graph is based on fuelling data for 443,000 vehicles

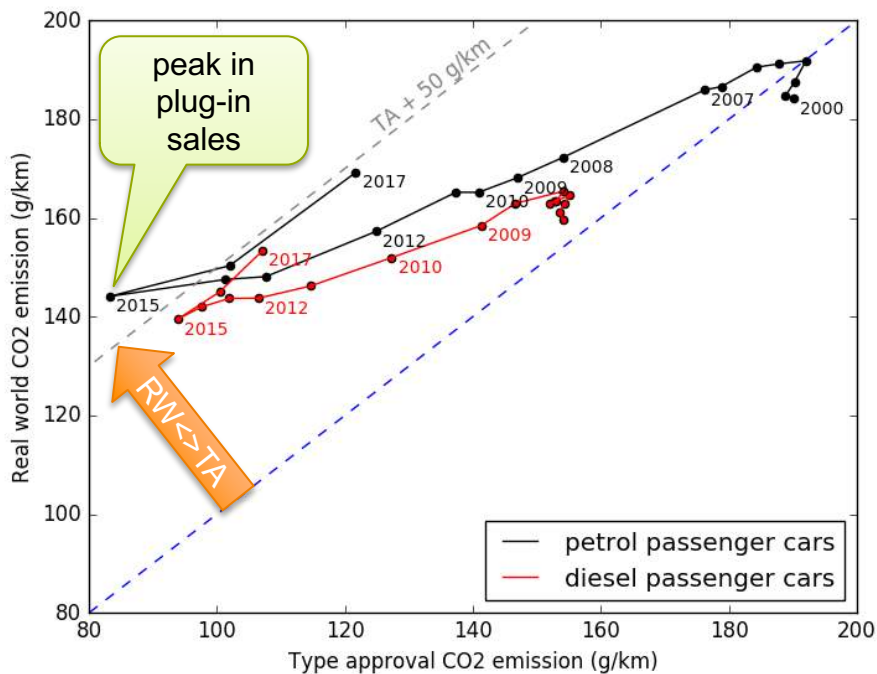
5 | The difference between fuel consumption in practice and according to the type approval test

200 g/km ~ 8.4 l/100 km (petrol)  
or 7.5 l/100 km (diesel)

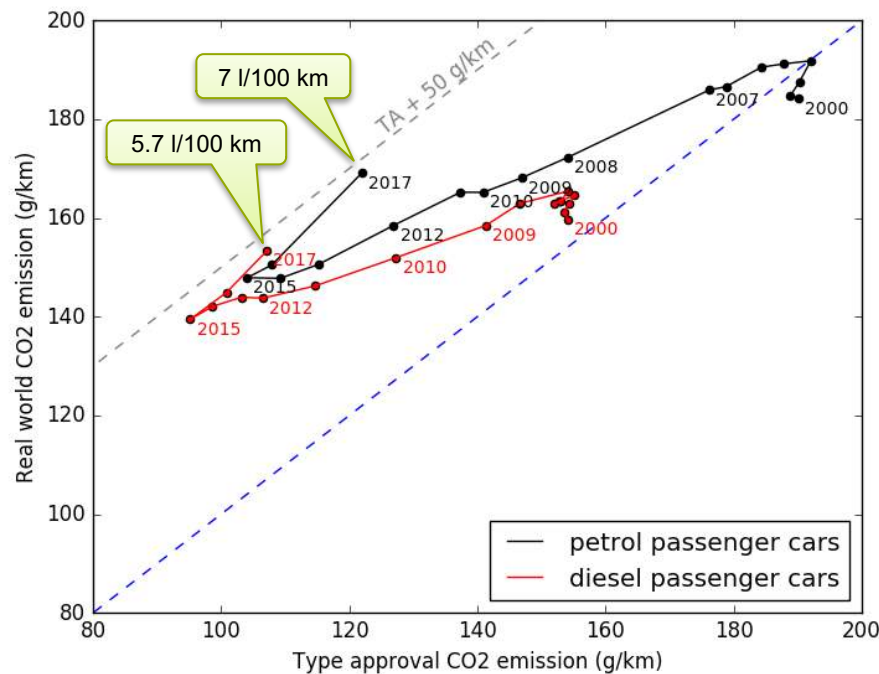
- › The actual average emissions of the fleet have decreased:
  - › petrol
  - › diesel
  
- › Blue and pink lines show that the type approval values have decreased a lot more:
  - › petrol: average from 190 down to 115 g/km
  - › diesel: average from 155 down to 100 g/km
  
- › This results in a growing gap (arrows)
  
- › Note that this is a fleet average. For new vehicles, the differences are more profound >>

# THE GAP (NEDC BASED): BY YEAR OF ADMISSION

## Including plug-ins +46%



## Without plug-ins



# WHY DOES THE GAP EXIST, AND WHY DOES THE GAP INCREASE?

Improvements in WLTP (see slide 10)

- › Performance of the test
  - › Road load: low resistance during type approval testing.  $\sim 1/3^{\text{rd}}$
  - › Emission test: optimization of the dynamometer test.  $\sim 1/3^{\text{rd}}$
- › Representativeness of the test.  $\sim 1/3^{\text{rd}}$ 
  - › Different conditions in real driving: corners, wind, slopes, lower ambient temperatures
  - › Different use in real driving: lights, airconditioning, accessories, roofbox, start-stop system
- › Test mass and tyre label
- › Battery charging no longer allowed
- › Temperature correction (ATCT)



# CONSEQUENCES

The background of the slide is a close-up, low-angle shot of the undercarriage of a car. It shows various mechanical components like the suspension, steering knuckle, and exhaust system, all in shades of grey and black. The lighting is dramatic, with some bright highlights and deep shadows, giving it an industrial and technical feel.

- ▮ Evaluation of (effectiveness of) reduction of CO<sub>2</sub> emissions of passenger cars is based on type approval values. The real reduction of CO<sub>2</sub> emissions is less than half.
- ▮ The target of 95 g/km fleet average in 2021 (next slide) can be met with vehicles with a real world emission average of 140 g/km.
- ▮ Differences in gap among vehicles makes it more difficult to choose a vehicle with low real world fuel consumption / CO<sub>2</sub> emission (it is only suitable for ranking of vehicles of the same age)



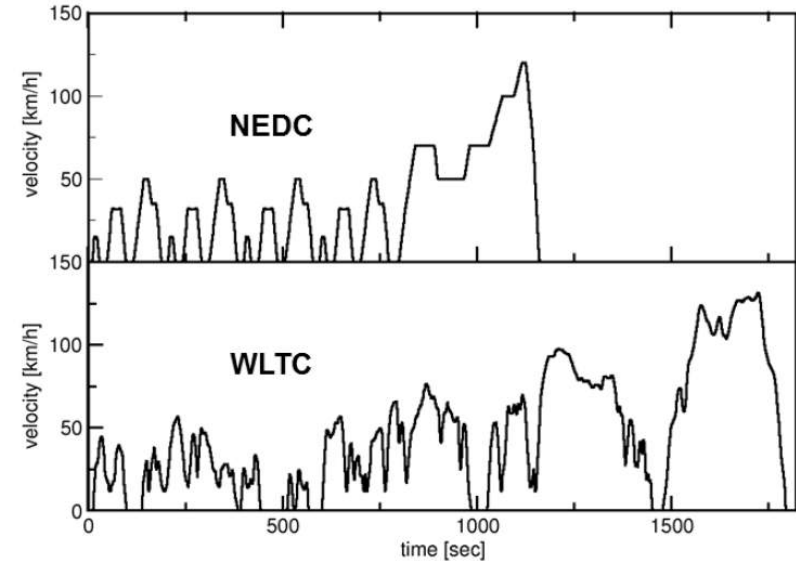
## ACTIONS TAKEN BY EC

- › Introduction of WLTP
- › Targets for 2015, 2021 and 2030
- › Improved verification of compliance with WLTP (work in progress)

## WLTP

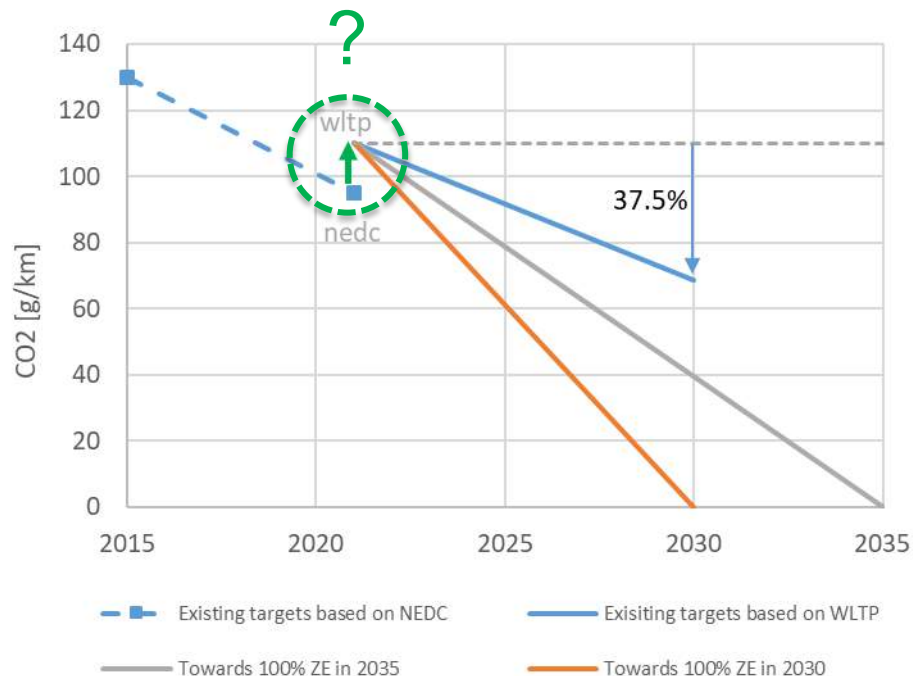
Compulsory from September 2018 for new cars (ex. stock)

- › Trip ('cycle') closer to real-world driving
  - › However, real differences on CO<sub>2</sub> emission are expected to be small (cold start/gear strategy/battery)
- › Addresses three weaknesses of NEDC:
  - › vehicle test mass (+ approx. 10%)
  - › rolling resistance (+ approx. 20%)
  - › state of charge of starter battery
- › Appears to close the gap by 25 g/km, judging from recent WLTP declared values
- › Based on physical principles and the previous contribution of the three factors, the expected difference would only be 8-10 g/km though >> room for further WLTP optimization by manufacturers, increasing the gap again
- › Lights, aircon etc. are all outside the test. Innovations that have a real world effect are not credited



# TARGETS

- › 130 g/km in 2015 (NEDC)
- › 95 g/km in 2021 (WLTP values converted into NEDC)
- › 37.5% reduction in 2030:
  - › compared to 2021 levels
  - › this is a moving target and gives an incentive to inflate levels in 2021
  - › WLTP procedures give some room to do that\*
  - › Cost effective fuel efficient ICEVs or more BEVs? Any combination is possible, so who decides....



*\*With WLTP, the type approval CO<sub>2</sub> value is not a measured value, but a value that the manufacturer declares as not being exceeded if independent tests are done on random new vehicles, under the 'Conformity of Production' agreement.*

# IMPROVED VERIFICATION OF COMPLIANCE WITH WLTP

DG Clima is working on different way of verifying compliance to WLTP.  
There are three options on the table:

- › RDE-CO<sub>2</sub>
- › In-service conformity testing over WLTP trip (TNO project)
- › On-board fuel monitoring (accurate monitoring and logging functionality is compulsory from 2020)



# CONCLUSIONS

- › Present communication about fuel consumption and CO<sub>2</sub> emission from official type approval tests is not realistic (although 'everybody' knows that by now)
- › Control over real CO<sub>2</sub> emissions by policy is less than is desirable
- › Recent improvements to the test procedures (WLTP) can turn out to be less effective than first results indicate; changes to the test trip cancel each other out, room for manufacturers to utilize margins has reduced only to a small extent, and present results seem inflated
- › TNO continues to monitor real world fuel consumption of passenger cars in the Netherlands, and helps DG Clima to improve the WLTP compliance verification



› **THANK YOU FOR YOUR  
ATTENTION**

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# BONUS: PLUGINS

