

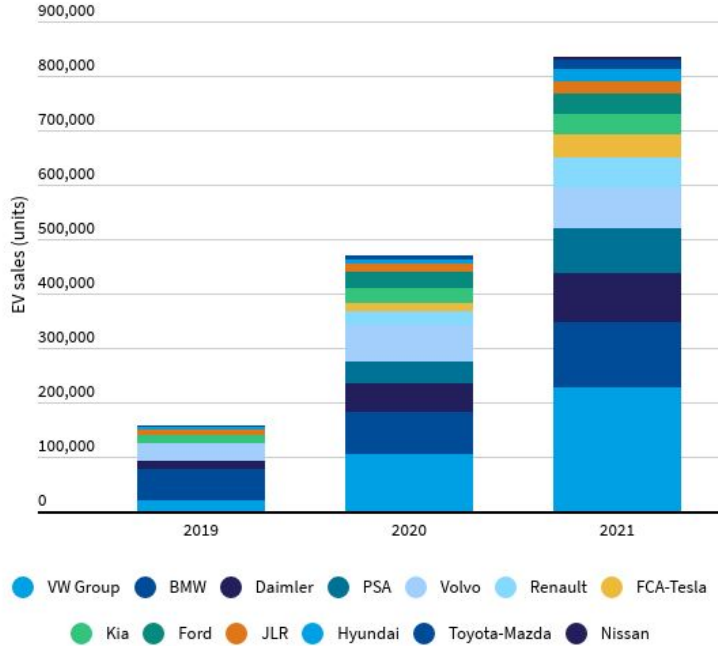
*ITF forum: International best practices to promote eco-friendly cars*

# Is Europe heading for another Dieselgate?



Julia Poliscanova, senior director, T&E

# European PHEV sales from 2019-2021



PHEV sales soared to comply with 2020 CO2 targets (50% EV share)

72% of PHEV sales are company cars

Strategy for Volvo, BMW, Daimler, JLR & Ford (even PSA & Renault produce in a compliance push)

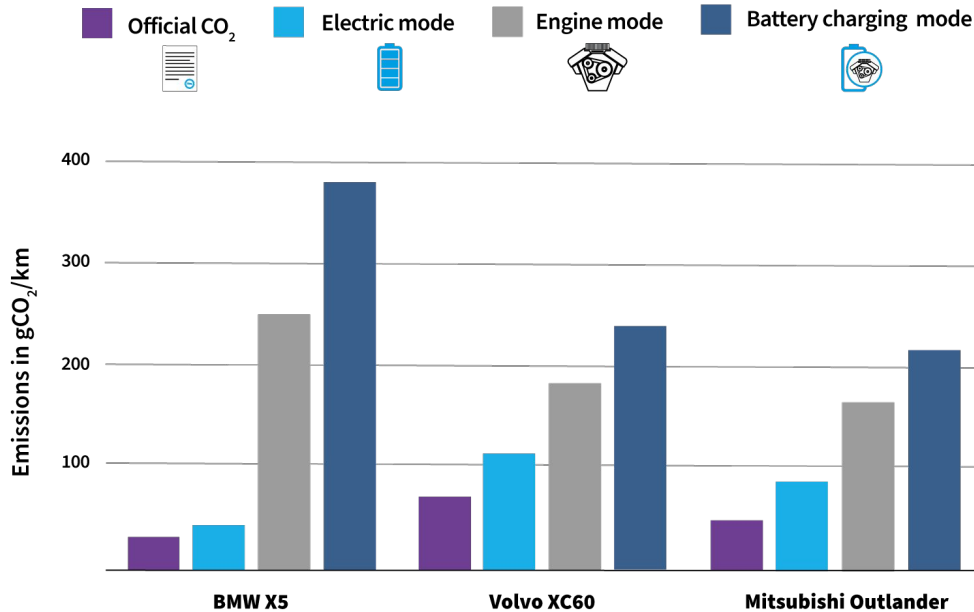
**Source:** EEA car registration data (2019) and T&E analysis of carmakers' compliance for 2020 and 2021 based on car registration data from the first half of 2020 from JATO Dynamics. 2020 total EU sales are assumed to be 25% lower in 2020 (vs. 2019) and 12.5% lower in 2021 (vs. 2019).

# The Problem



# Results summary

## Official vs real-world emissions of plug-in hybrids

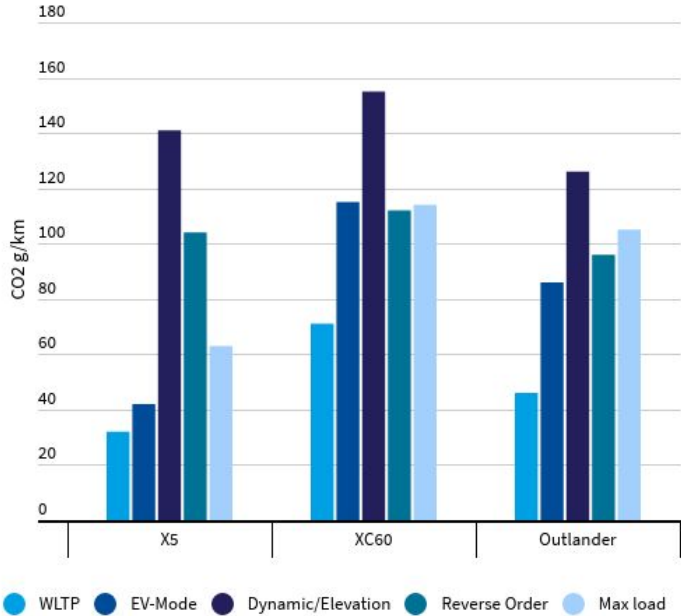


**Significant on-road CO<sub>2</sub> emissions, even with fully charged battery**

**30-80% more CO<sub>2</sub> in EV-more; and 3-4 time, even up to x12 in engine mode (likely used with geofencing)**

**Beyond driver charging, design is at fault: little electric power, no fast charging, grossly inefficient conventional engines**

# CO2 exceeds official values even when starting with a full battery



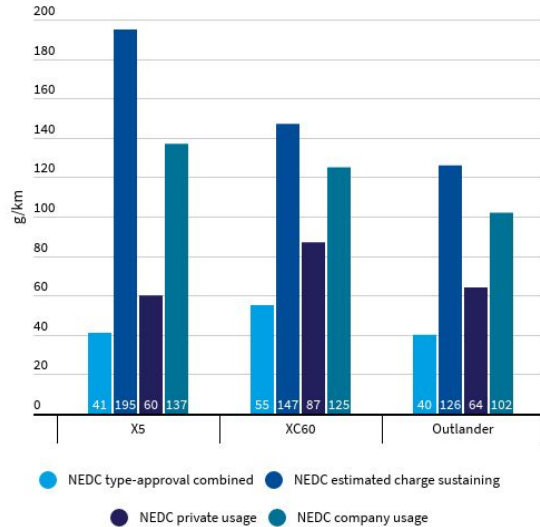
- Test length of 92-120km
- X5 & XC60: ICE on after battery down by just 14-26% on dynamic/elevation tests (insufficient electric power)
- Even under mild conditions T&E estimates that only 11-23km can be driven once ICE turns on (52-69% battery depletion) before official CO2 is exceeded.

Source: Emissions Analytics



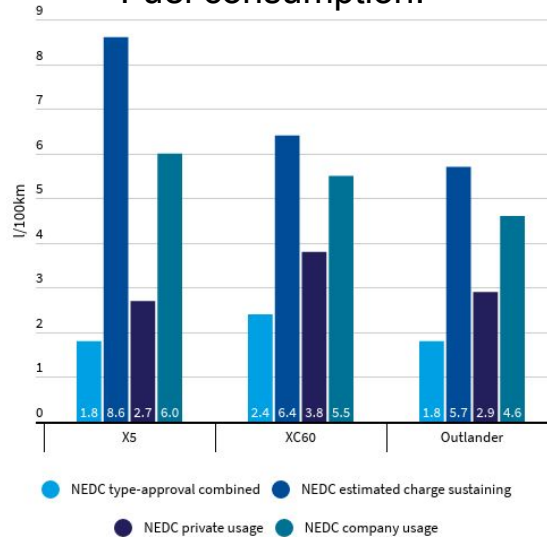
# Real world CO2 emissions and fuel consumption are greatly underestimated

CO2 emissions:



Source: T&E, type-approval NEDC CO2 values were obtained from the vehicle's certificate of conformity

Fuel consumption:



Source: T&E, type-approval NEDC CO2 values were obtained from the vehicle's certificate of conformity

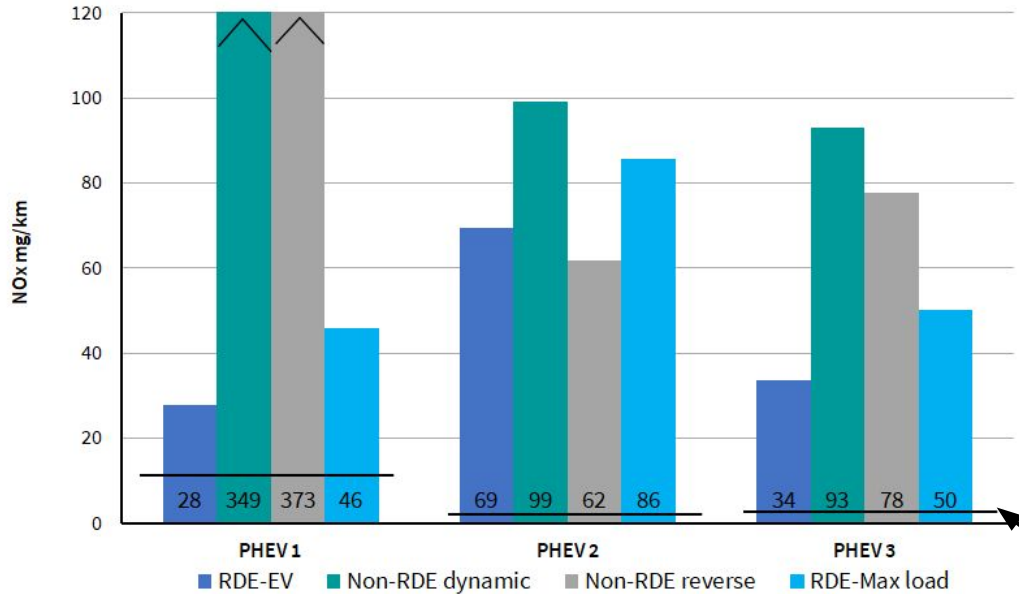
- When used privately PHEV test CO2 emissions are ~ **50%** higher than official values
- When used as a company car **2.2-3** times higher

PHEV CO2 emissions are much higher in the real world than official values



# Geofencing: impact on air quality from motor-engine switching

## NOx emissions at engine start



- Switching on the ICE often caused a large spike in NOx and PN emissions for 0.7-3.1 km.
- For NOx, emissions can be in excess x30 average test emissions

Maximum test average emissions measured



# Policy recommendations





# Over EUR 1bln spent on subsidising PHEVs in 2020

	Purchase subsidy Jan-Sep 2020 (EUR)	Reduced benefit in kind tax 2020 (EUR)
	38,278,000	7,262,640
	348,310,500	208,353,600
	27,999,500	N.A
	21,494,700	N.A
	N.A	339,068,984
<b>Total</b>	436,082,700	554,685,224

Source: Schmidt Automotive Research





# Policy recommendations: governments

1. **End purchase subsidies** for private or company car PHEVs - only zero emission (battery and H2) vehicles should be eligible for such subsidies.
  2. Ensure that only PHEVs with an electric range of >80km & **1:1 electric to engine power ratio** are eligible for various **tax support such as CO2-based registration taxes**. Access to charging at home or work must be a condition for getting public subsidies.
3. Use (& publish) **data from on-board fuel consumption meters** to determine manufacturer specific utility factors to calculate accurate CO2 values



# Policy recommendations: EU technical regulations

**Update utility factor calculation:** Use data from on-board fuel consumption meters to determine manufacturer specific utility factors for use for (WLTP) type-approval and CO2 compliance from 2025

**Improve the WLTP test procedure** used to determine PHEV type approval emissions, notably by including the use of auxiliaries, updating the definition of electric range and removing the current corrections.

**Remove the 0.7 multiplier** from the Zero and Low Emission Vehicle (ZLEV) credits as part of the 2021 EU review of car CO2 emission standards to make it harder for suboptimal compliance PHEVs to earn credits.



Thank you for listening!

Questions?



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This presentation includes icons from Flaticon

# Is it all driver's fault?

- **Power from electric motor is less than half (43%) that of engine**

>> not designed to be driven in ZE mode

- **Fast charging extremely rare**

>> 7h to charge X5 fully

- **Engine's CO2 can be worse than conventional equivalents**

>> inefficient engine propelling a very heavy car

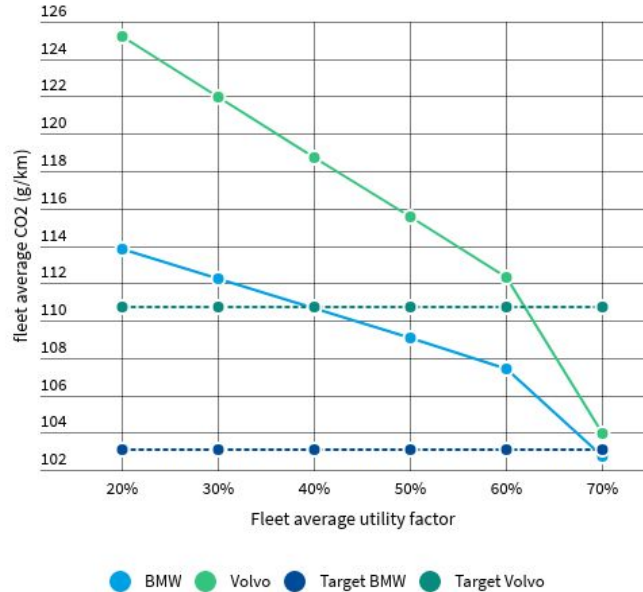
## Operation of gasoline engine

- Even when the vehicle is driving in EV drive mode, it may be automatically changed to series hybrid mode or parallel hybrid mode in the following cases:
  - The plug-in hybrid EV system is too hot or too cold.
  - Quick acceleration is applied.
  - The air conditioner is operating.
  - The accelerator pedal is depressed hard on an uphill road or expressway.
  - In cold weather.
  - The vehicle has not been refueled for a long time.
  - The drive battery level is low.

In addition to the above, there are more cases where EV drive mode is automatically changed to series or parallel hybrid mode.

# PHEVs & Cars CO2 compliance

## Fleet average CO2



If UFs seen in Germany are used:

- **BMW's fleet-wide CO2 should be 8-11g/km higher**
- **Volvo's - 8-14g/km higher**

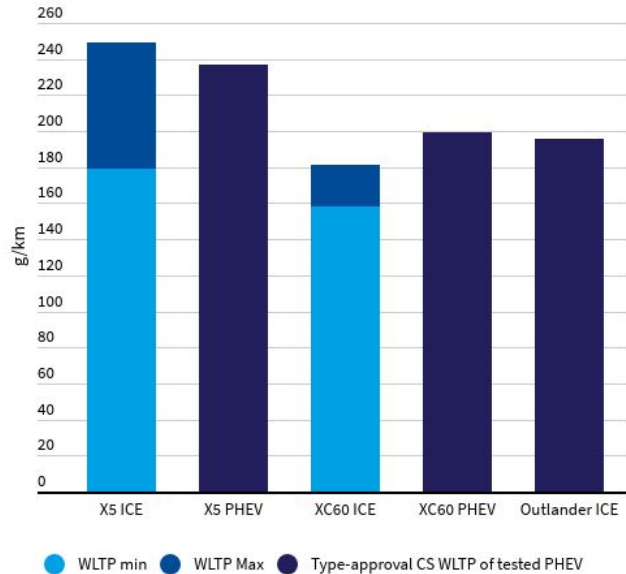
Driving in **EV mode of 60-70%** required to comply with the CO2 target

**When real-world utility factors used - highly unlikely that BMW or Volvo would comply with CO2 targets**

Source: T&E



# PHEVs are not better than ICE's when not charged



Source: Charge sustaining PHEV CO2 emissions were obtained directly from the manufacturer by Emissions Analytics, Mitsubishi did not provide a value for the Outlander. CO2 emissions of ICE models were obtained from the respective manufacturer's website

Bases on official WLTP data the gap is:

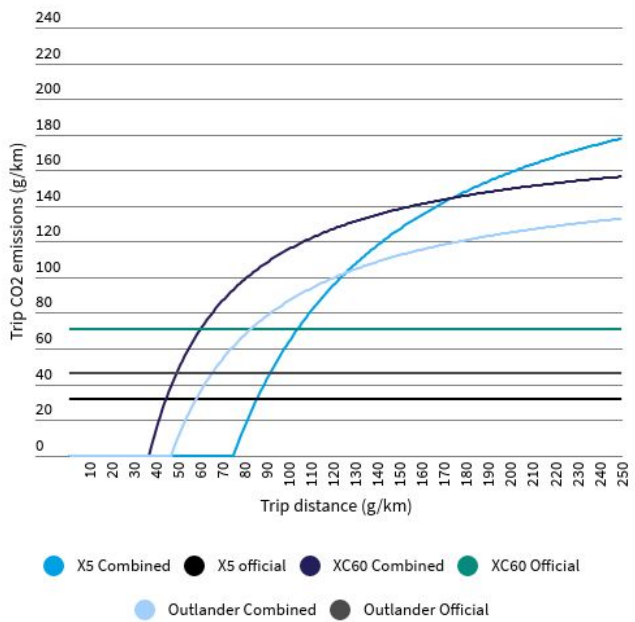
- X5 is **22-55g/km** higher than diesel models and middle of the range for comparable petrol (**231-249g/km**)
- For the XC60 there is a gap of **17-41g/km**

When only the ICE is used to power the PHEV CO2 emissions are higher or similar to comparable ICE models





# How far can PHEVs drive before exceeding official values?



- CO2 emissions increase rapidly once ICE turns on
- The X5 can drive an estimated **86km** before exceeding official emissions, the XC60 **61km** and the Outlander **67km**.
- A 100km trip on one charge would emit an estimate **x2** the official value for the X5, **x1.6** for the XC60 and **x1.9** for the Outlander

PHEVs are not suited for long journeys, they are suited for short journeys where the majority of km can be driven electrically

Source: T&E

