

UK briefing: The plug-in hybrid con

On the 5th anniversary of Dieselgate carmakers
new cheats exposed

September 2020

This briefing paper presents new evidence on the shocking real world CO₂ emissions of plug-in hybrid cars (PHEVs). An analysis of European studies of real world CO₂ emissions from PHEVs driven on the road by owners shows emissions are on average over **two and a half times** those of official test values.

Over the lifetime of the vehicle (including emissions generating the fuel or electricity) a new PHEV in 2020 will emit about 28 tonnes of CO₂, slightly less than a conventional hybrid car (33 tonnes).¹ In comparison a conventional petrol or diesel car emits 39 and 41 tonnes respectively. A new battery electric car will emit about 3.8 tonnes from the electricity it uses over its lifetime. Investigations also show PHEVs often switch on their engine even when driving with supposedly zero emissions. It is clear PHEV emissions are much more comparable to those of conventional cars than electric cars.

We urge the UK government to ensure the imminent decision on when to phase out cars with engines does not offer any encouragement to manufacturers to promote the sale of PHEVs in the UK. Furthermore, to ensure that the earliest feasible phase out date is chosen but crucially that the government also commits to introduce regulations, with penalties, to require the auto industry to progressively increase sales of genuinely zero emission vehicles until the phase out of cars with engines is complete. It should also raise vehicle taxes on PHEVs.

¹ Figures include upstream emissions to enable a fair comparison with a battery electric car

The growth of PHEV sales

This briefing paper collates new evidence on the shocking real world CO2 emissions of plug-in hybrid cars (PHEVs).

Plug-in hybrid cars have both an engine and a battery and are being sold as zero emission capable electric cars by carmakers. Most PHEVs claim to have an electric range of 30 to 40 miles, and are being strongly promoted by carmakers that are required to reduce their CO2 emissions.

Sales are rising exponentially, year to date [3.3% of new cars sold](#) in the UK was a PHEV - nearly three times sales last year. The top selling model in 2019 was the Mitsubishi Outlander and this year, nearly [50 new PHEVs](#) are being launched in Europe taking the total number on sale to 100 models. Sales are being driven in particular by excessively generous rates of company car tax. This year a company car owner will typically pay 10% benefit in kind tax compared to 25% for a new car with average emissions.²

Real world PHEV emissions

Analysis of databases of real world emissions of PHEVs by T&E shows rather than emitting on average 44 g CO2 per kilometer (measured using a flawed laboratory test) most PHEV are actually emitting **over two and a half times**³ this level of CO2 emissions when driven on the road. This is because the cars are frequently not charged by their owner or the car does not drive using only the battery and electric motor **even when in the supposed zero emission mode**. The data on real world emissions from PHEVs has been collated from a wide range of sources (see Annex 1) representing around 20,000 PHEVs in fleets or private use.

The CO2 emissions from a typical PHEV are about 117g CO2/km⁴ on the road only slightly better than from a conventional hybrid car like a Toyota Prius 135g CO2/km.⁵ A conventional new ICE car has emissions of 164-167g CO2/km on the road⁶ (diesel and petrol respectively).

Over the lifetime of the vehicle a new PHEV in 2020 will emit about 28 tonnes of CO2, slightly less than a conventional hybrid car (33 tonnes).⁷ In comparison a conventional petrol or diesel car emits 39 and 41 tonnes respectively. A new battery electric car will emit about 3.8 tonnes from the electricity it uses

² <https://www.gov.uk/tax-company-benefits/tax-on-company-cars>

³ Annex 1 shows an average factor of 2.86

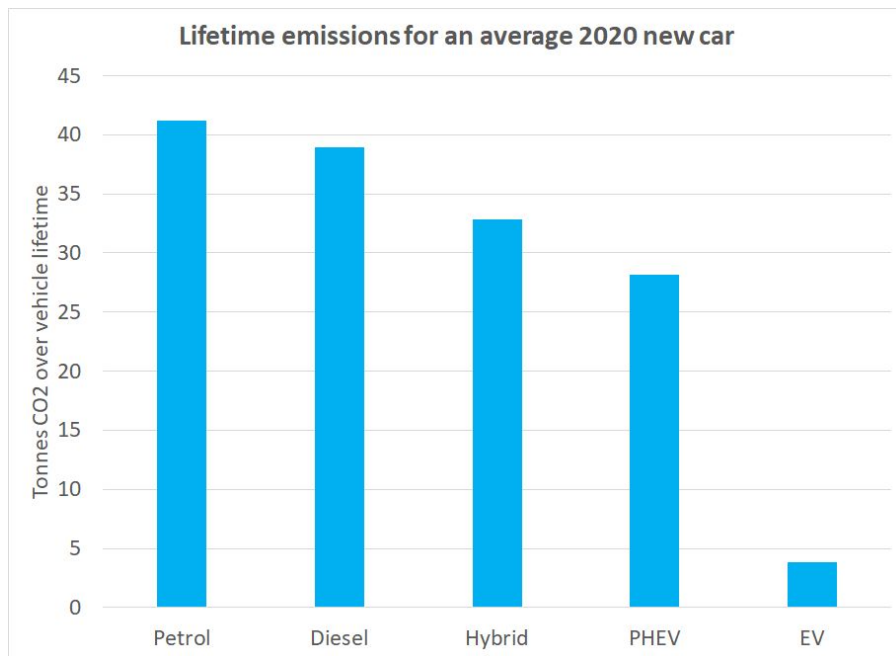
⁴ Average PHEV emits 44g CO2/km NEDC test and real world uplift of 2.65

⁵ Average hybrid emissions 92 gCO2/km and uplift 1.48 for real world emissions

⁶ Average diesel 118 CO2/km and petrol 120 gCO2/km uplift 1.39

⁷ Figures include upstream emissions to enable a fair comparison with a battery electric car

over its lifetime. (Assumptions are detailed in the annex.) It is clear PHEV emissions are much more comparable to those of conventional cars than electric cars.



Claims PHEVs drive in zero emission mode are a con

Information obtained by T&E shows even when a PHEV is driven in the supposed zero emission mode most continue to use their engine, burning fuel and emitting CO2. The zero emission or eco mode should be able to be used on short trips when the battery is charged to drive like a battery electric car.

One PHEV, the Kia Niro plug-in hybrid that claims to operate with a 'battery only, zero emission mode' switches on the engine (in this mode) when the windscreen demister is turned on. Kia claims the Niro PHEV has an electric range of 55km (34 miles). But a Kia owner has informed T&E that despite selecting the Eco+ zero emissions mode, in which the car should only use its battery, the car continued to operate with its engine on. During short trips with the battery fully charged and in zero emissions mode the car recorded a fuel economy of 28 - 52mpg (234 - 126 g(CO2)/km). This means the car is also using a substantial amount of fuel increasing its operating cost as well as causing emissions. The car has been checked by a Kia engineer who confirmed it was operating correctly. In correspondence obtained by T&E, Kia explains that, "When the coolant temperature is lower than 14 °C, and you turn the climate control on for heating, the vehicle will automatically switch to HEV mode as the engine is required to provide heat for the passengers.

Conversely when the coolant temperature is higher than 14 °C, or you turn the climate control Off, the vehicle will automatically return to EV mode.”

The UK’s ten top selling PHEVs all behave in a similar way. This [includes](#) cold external temperatures triggering the engine to switch on in the Volvo’s XC90 SUV, the Mercedes-Benz E Class executive car, as well as the Kia Niro. The Mitsubishi Outlander SUV has an “EV” button but the engine switches on with the adaptive cruise control or with high or low external temperatures. Jaguar Land Rover’s Range Rover and Range Rover Sport plug-ins will start their internal combustion engines if more power is required than the electric engine can provide alone, as will Porsche’s Cayenne. The Mini Countryman switches on the engine if you drive faster than the electric mode allows as do BMW’s PHEVs.

Manufacturers of PHEVs advertise the range of the car driven on the battery only and advertise the car as being capable of zero emissions in urban driving. The reality is it is almost impossible for the car to drive in zero emission mode even for short distances on a regular basis.

Ban on cars with engines not as it seems

The UK government is presently [consulting](#) on whether to phase out the sale of all new cars with engines and announced its intention to do so at the latest by 2035. This announcement included ending sales of hybrid and PHEV cars at the same time. But T&E has learned that under intense pressure from carmakers, the government may continue to allow the sale of PHEVs after the ban on the sale on new cars with only an engine comes into force. This is despite the average PHEV emitting far more CO₂ than a battery electric car. The government should not be treating PHEVs as in any way special as in real-world conditions (rather than lab tests) they have CO₂ much more comparable to a modern conventional cars and for PHEV that are not charged, significantly worse. **There should be a single date to end the sale of all cars that have an engine including PHEVs.**

A phase out date alone is not sufficient. Alongside a date the government must announce its intention to regulate the car industry to increase sales of zero emissions cars to lower CO₂ emissions. This regulation must include penalties for failing to meet targets. For this purpose a zero emissions vehicle target should be introduced requiring vehicle manufacturers to progressively raise sales of zero emission vehicles until the phase out is met. Sales of PHEVs should not count towards this target. A date without a supporting regulation is greenwash. It will not be met as carmakers will not supply sufficient electric cars to meet the goal.

The evidence presented on real world CO2 emissions also shows that the government should raise the low rate of vehicle taxation being applied to PHEVs. The available evidence suggests that this is entirely unjustified based upon the way PHEVs are typically used by their owners. Whilst for diligent drivers that regularly charge their PHEVs, low emissions are the exception rather than typical behaviour. By raising the tax it would also encourage higher sales of battery electric cars.

Further information

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Annex

Sources of real world PHEV data

Source	Gap between test and real world emissions CO2
Netherlands Travel Card data 2017 in ICCT Lab to Road report	242%
Netherlands Cleaner Car Contracts data 2017 in ICCT Lab to Road report	270%
Spritmonitor data - Germany	256%
Miles Consultancy data - UK	281%
Fisches-Auto France - France	294%
Netherlands Travel Card data 2018 in ICCT Lab to Road Report	256%
AutoCentrum - Poland	306%
Netherlands Travel Card data 2019 in ICCT Lab to Road Report	221%
Automotor and Sport (Sweden) in ICCT Lab to Road Report	255
Average	265%

Real world car CO2 emissions

	Average current CO2 (NEDC test)	Uplift for real world emissions ⁸	Real world CO2 emissions	Emissions CO2 / year tonnes 2020	Emissions CO2 lifetime
PHEV	44	2.65	117	3.6	28
Hybrid	92	1.48	136	4.3	33
Diesel	118	1.39	167	5.2	40
Petrol	120	1.39	164	5.1	41
Battery Electric Car	0	-	0	0.7	3.8

Current NEDC CO2 obtained from data from Jato Dynamics supplied to T&E

Uplift for real world emissions from this paper for PHEV and [ICCT](#) for other vehicles

Uplift for upstream oil emissions from [Hoekestra](#)

Lifetime emissions for 190,000 Km from [Ricardo](#)

Grid intensity for electricity of 100g CO2/KW based upon the projected average UK electricity over the next 18 years

1st year use 24k km; lifetime use 190k km

⁸ https://theicct.org/sites/default/files/publications/Lab_to_Road_2018_fv_20190110.pdf