Plug-in hybrids are less polluting than electric cars, study says

This study overturns those already published on the subject. The car that emits the least amount of CO_2, from its manufacture to its end of use, is not an electric vehicle but a plug-in hybrid vehicle. This can be explained by the much lower carbon footprint of its battery, which is much smaller but sufficient for most of the journeys.

Obviously, the sponsors of the study will be suspected of preaching to the choir. They are Concawe, the scientific research arm of FuelsEurope, the European Association of Fuel Manufacturers, and the French Petroleum Institute for New Energies (IFPEN).

Alain Mathuren, FuelsEurope's Communication Director, points out, however, that "European Fuel Manufacturers, in line with the European objective of carbon neutrality by 2050," already anticipate that by that date, "their production will have shifted from the current 600 million tons of fossil products to 160 million tons of renewable fuels."

A study based on real time measurements

In the face of what he considers to be "a form of dogmatism in Brussels" in favour of electric powertrains and against the internal combustion engine, even when using renewable fuels, he opposes the "very thorough and totally transparent nature of the data presented".

What is it? An online simulator, which will be available on November 8, based on measurements taken in real-life conditions, and which models the number of grams of CO_2 emitted per kilometre by three types of vehicles: battery-powered, non-rechargeable hybrid (this vehicle has a small battery that relieves the combustion engine), and the plug-in hybrid (with battery allowing about 60 kilometres of range before the combustion engine takes over).

The model was "fed" by careful measurements, in real-life conditions, of the consumption of two Mercedes plug-in hybrid vehicles, equipped with a 15kWh battery, one gasoline, the other diesel. At full load, the electric range is about 54 km. The data is available in a 159-page document.

On this basis, one can choose the values for a whole set of parameters such as: the capacity of each type of battery; the quantity of carbon emitted for the production of the battery; the total mileage of the vehicle over its lifetime; the number of recharges per day; the daily mileage; and, finally, the fuels used, with a choice of about ten different types, from pure fossils to 100% renewable (of bio or synthetic origin) with different intermediates.

The best performance of diesel

What does the study reveal? That under standard conditions of use, with 12,000 kilometres driven per year over 12 years (the average age of vehicles in Europe), the lowest carbon footprint is not that of an electric car with a 60kWh battery (barely higher than that of a Zoe). The choice is important, since the carbon footprint of an electric car is largely made up of the manufacturing of this battery. It was thus a battery with an average carbon footprint that was chosen, based on the data provided by the European organisation ICCT (International Council on Clean Transportation).

Furthermore, it is considered that the electricity used is completely decarbonised, as it should be in 2050 in Europe. In the same way, several 100% renewable fuels are proposed, as they should also be the norm in 2050.

Under the conditions described, the average carbon footprint of the electric car is 43 grams of CO_2 per km. This rises to 51 grams for a more powerful car with a 100 kWh battery.

The hybrid car has a higher carbon footprint with almost all fuels (from 102 to 61 grams, depending on whether it is a blend of bio ethanol, synthetic ethanol or cooking oil) except synthetic diesel (obtained by the Fischer-Tropsch process from green hydrogen and CO_2 captured from the air), which drops to 38 grams. With a very "green" fuel, the very small battery size works in favour of the hybrid vehicle.

"These data deserve to be examined before signing the end of the combustion engine"

The difference is even greater with a plug-in hybrid. Its battery, five to ten times less powerful than that of an all-electric car, requires less energy and materials to produce. But it still allows you to cover most daily trips without using the combustion engine. This is possible provided, however, that the battery is recharged every day. So, the balance is at most 63 grams for a fuel based on bio ethanol, 46 grams for synthetic ethanol, 45 grams for cooking oil and 35 grams, less than the electric, with synthetic diesel. We can observe here again the excellent efficiency of diesel engines.

These figures contradict most of the recent studies carried out by Ademe and ICCT, notably because the latter do not take into account the use of alternative fuels.

“These data, which are the result of a fully configurable simulator, deserve to be examined before we sign the end of the combustion engine," says Alain Mathuren. With the quantity of critical materials needed to manufacture the batteries for a single powerful electric car, we can make ten batteries for rechargeable hybrids. And these batteries do not pose any problems in terms of autonomy for long journeys.

It could be argued that the availability of 100% decarbonised fuels could be a problem, since they are first required by sectors where the switch to heavy electric batteries seems impossible, such as aviation, maritime transport and heavy-duty vehicles. The limit of agricultural land devoted to crops used for these fuels could be compensated by the development of synthetic fuels based on hydrogen produced from solar-powered electricity.

Please note that this is a translation from French to English.

You can find the original article here.