EUROPEAN UNION CO_2 STANDARDS FOR NEW PASSENGER CARS AND VANS

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Regulatory design elements: Compliance credits for alternative fuels

Some stakeholders support a scheme in which the purchase of alternative fuels could be counted towards compliance with EU CO_2 standards for passenger cars and vans. While it is true that alternative fuels are available to contribute to passenger vehicle decarbonization, the potential supply of low-carbon biofuels made from wastes and residues is low. At the same time, synthetic fuels, such as e-fuels, are inefficient and expensive.

E-fuels are made from electricity and CO_2. Around half the energy in the input electricity is lost as heat during the fuel conversion process. Because there are also high energy losses in internal combustion engine vehicles, **only about 16% of the original electric energy used to produce e-fuels ends up being used for propelling a vehicle**. This compares to a total efficiency of about 72% when instead using the electricity directly in a battery electric vehicle (Figure 1).

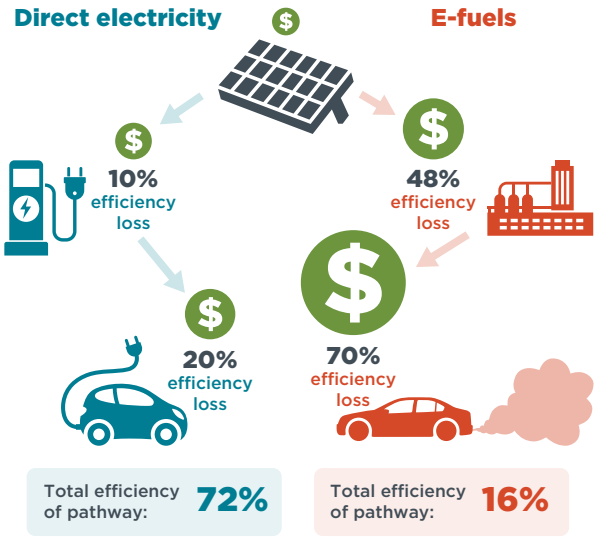

Figure 1. Schematic illustration of the energy efficiency of using electricity directly in a battery-electric vehicle versus transforming the electric energy into liquid e-fuel and using it in a combustion engine vehicle.

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The climate performance of e-fuels depends largely on the input electricity. If zero-carbon renewable energy sources, such as solar and wind, are used in e-fuels production, the resulting e-fuels are nearly zero-carbon as well. However, if fossil fuels are used to produce the electricity for e-fuels, the greenhouse gas emissions from electricity production are magnified by the inefficiency of the e-fuels production process and the high energy losses during their combustion. Hence, using **e-fuels is about five times dirtier than directly using the electricity from which they are made.** If e-fuels are produced using electricity from fossil fuels, **the lifecycle greenhouse gas emissions of the e-fuel are much higher than for conventional diesel and gasoline**.

The Renewable Energy Directive (RED II) requires e-fuels to be produced from **additional renewable electricity**. Without a requirement such as this in the CO_2 standards, e-fuels could divert renewable electricity from other uses, and it is possible that e-fuels produced from fossil electricity could be credited.

As for the cost of e-fuels, with technology improvements and declining cost of renewable electricity generation, e-fuel production cost in Europe are expected to fall, but would still cost around **€3 per liter more than petrol by 2030, or about twice as expensive as diesel is at the pump now.** For 2030 and 2035, a compliance scenario relying strongly on e-fuels is expected to require about **twice as much investment per vehicle** compared to a scenario relying primarily on electric vehicles. **Savings for consumers and for society would be much lower in the e-fuels scenario** than in the electric vehicle scenario (Table 1). Furthermore, e-fuels will not be an economical strategy for complying with the vehicle CO_2 standards because is unlikely that e-fuels will cost less than the non-compliance penalty of 280-600 euros per tonne of CO_2.

Table 1. Comparison of two scenarios in 2030 and 2035, one with an increasing share of electric vehicles and one with an increasing proportion of eFuels.

Scenario	Average new car CO_2 level	Additional manufacturing costs	Consumer payback period	Net consumer savings years 0-8	Societal savings vehicle lifetime
2030					
Moderate ambition - EVs	-70%	1,380 €	3	1,889 €	3,422 €
Moderate aminition - eFuels	-70%	2,163 €	>8	-364 €	1,142 €
2035					
Moderate ambition - EVs	-100%	1,079 €	1	4,250 €	6,856 €
Moderate aminition - eFuels	-90%	2,663 €	>8	-1,079 €	-1,073 €

In the near term, **waste-based biodiesel, which is already commercially mature, is the only type of alternative fuel that would be cheaper than the non-compliance penalty.** However, there is a limited amount of waste oil available for fuel production. The amount of waste oil-based biodiesel that counts towards the RED II's targets is capped at 1.7% of transport energy. This cap helps reduce fraud, where virgin vegetable oil is disguised as waste oil. There are already several documented cases of fraud in the used cooking oil market. Allowing waste-based biodiesel to count towards vehicle CO_2 standards would increase the strain on the used cooking oil supply, likely increasing fraud, unless the 1.7% cap is also adopted in the vehicle CO_2 standards.

In light of these factors, ICCT recommends considering the following policy action:

» The CO_2 standards for new vehicles should retain their focus on tailpipe emissions and **not provide any credits for alternative fuels**.

FOR MORE INFORMATION

» E-fuels won't save the internal combustion engine
https://theicct.org/blog/staff/e-fuels-will-not-save-ice

» How is alternative fuels crediting in the EU vehicle standards a bad idea? Let me count the ways...
https://theicct.org/blog/staff/alt-fuels-crediting-eu-standards-may2021

» Decarbonization potential of electrofuels in the European Union
https://theicct.org/sites/default/files/publications/Electrofuels_Decarbonization_EU_20180920.pdf

» Pathways to decarbonization: The European passenger car market, 2021–2035
https://theicct.org/publications/decarbonize-EU-PVs-may2021

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