

Carbon-neutral fuel: 100% renewable Superethanol-E85 to replace fossil fuels – New findings from IFPEN –

100% renewable Superethanol-E85 could act as an alternative to fossil fuels to cut back on CO₂ emissions in road transport as well as emissions of regulated pollutants.

In the run-up to the European elections in which the environment is a key debating issue, new research is pointing to 100% renewable Superethanol-E85 as a viable replacement for fossil fuels to reduce carbon dioxide emissions produced by transport. While the European Union adopted a regulation in 2023 which is to effectively prevent the sale of new cars emitting fossil-based CO₂ from the exhaust as from 2035, against the backdrop of concerns regarding all-electric vehicles, a window of opportunity remains open to define carbon-neutral fuels. The French bioethanol industry hopes that the scope of carbon-neutral fuels will include sustainable biofuels, provided it can be demonstrated that these solutions are as climate-friendly as all-electric solutions.

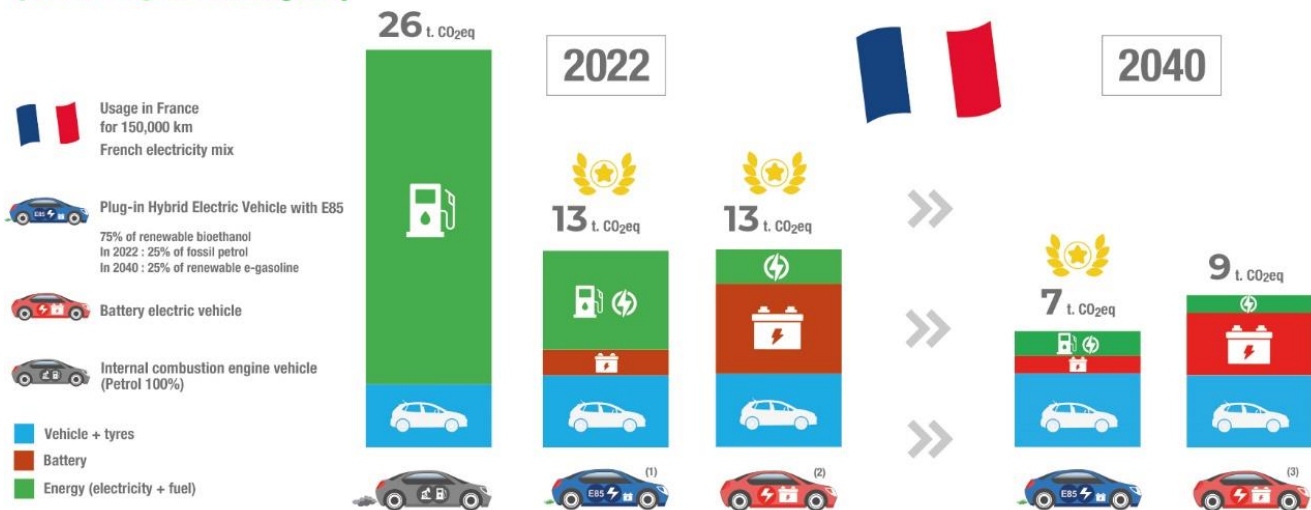
100% renewable Superethanol-E85, a new solution to reduce carbon dioxide emissions from transport, as beneficial as all-electric solutions

Research conducted by the Systems Simulations, Analyses & Experimentations Department within IFPEN's Mobility & Systems Division tested three types of 100% renewable Superethanol-E85 mixing bioethanol with three types of renewable fuel, in a flex-fuel commercial vehicle compatible with E85.

These new findings show that, compared to the limits specified in current Euro 6 light passenger and commercial vehicle emissions standard, Superethanol-E85's excellent performance was maintained and even improved with the new 100% renewable mixes. The research shows that Superethanol-E85 and these new mixes will meet the requirements of the new Euro 7 vehicle emissions standard, applicable as from late 2026.

An IFPEN paper published in 2022 showed that the environmental performance of plug-in hybrid vehicles running on 100% renewable Superethanol-E85 was at least equivalent to that of all-electric vehicles, especially for plug-in hybrid compact cars, depending on the type of use, in terms of total GHG emissions, when analysing the life cycle, both today and in 2040.

CO₂ EMISSIONS OF NEW COMPACT CARS IN FRANCE (in life-cycle analysis)

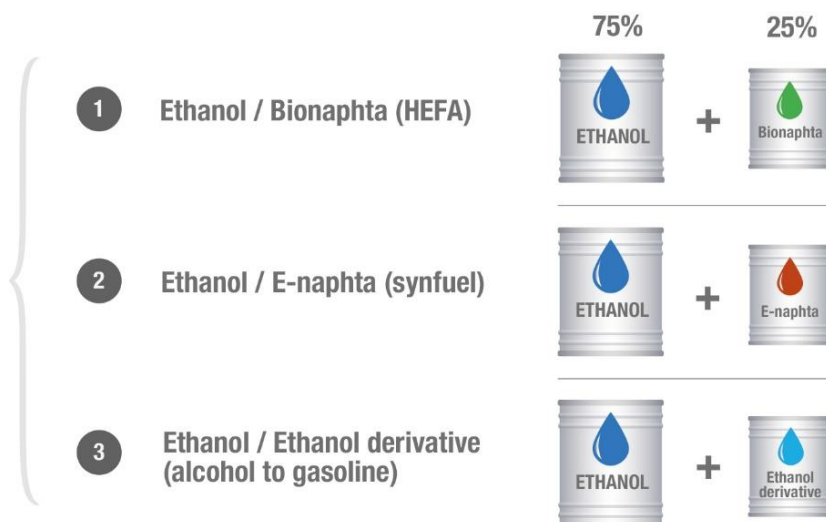


(1) 10 kWh battery for an electric range of 50km. Total range > 500 km. Mixed use 40% electric / 60% internal combustion engine.
(2) 60 kWh battery for a maximum range of 320 km in 2022.
(3) 60 kWh battery for a maximum range of 400 km in 2040.

Source: IFPEN study for SNPAA, AIBS and Intercéréales (September 2022)

In this 2024 study, the 25% share of fossil fuel was replaced by one of three renewable petrol-based fuels, either pure or in mixes:

- a petrol-type fuel obtained via the chemical transformation of ethanol: Ethanol To Gasoline (ETG)
- a base reproducing synthetic petrol which is a co-product of the future e-kerosene (at a ratio of 1 for 2) obtained via Fischer-Tropsch (FT, combining CO₂ and renewable hydrogen)
- a base reproducing petrol type hydrogenated vegetable oil (HVO), a co-product (at a ratio of 1 for 4) of the existing aviation fuel HEFA biokerosene.



Given concerns regarding all-electric solutions and in synergy with mobility needs in various industries (aviation, shipping and haulage), 100% renewable Superethanol-E85 is an additional solution helping to eliminate the need for fossil fuel in new vehicles post 2035. Combining bioethanol and petrol type hydrogenated vegetable oil (HVO), 100% renewable Superethanol-E85 is already available in California where it accounts for a third of the volumes of E85 sold. It could be deployed in France ahead of the 2035 deadline.

The Collective du Bioéthanol: *“Aiming for net zero by 2050 for automotive transport is possible but the equation absolutely must include solutions for cars on the roads today and for new vehicles. Even after 2035, French and European motorists should be able to choose from a range of solutions and technologies, provided they have all been proven climate friendly. Bioethanol is the main alternative to fossil fuels to reduce carbon dioxide emissions from thermal injection and hybrid cars on the roads today, which will continue to run for several years after 2035, and as fuel for new vehicles sold after 2035, in 100% renewable Superethanol.”*

Reminder of the EU regulation governing CO₂ emissions from light-duty vehicles

The new regulation governing CO₂ emissions from light-duty vehicles voted in the European Council on 28 March 2023 allowed for the continued registration of combustion engines running on carbon-neutral fuels beyond 2035.

Germany had agreed to the regulation on condition that carbon-neutral fuels (or CO₂ neutral fuels) would still be possible, while limiting this to synfuels only.

Other member states had teamed up, pointing out that this definition needed to be technologically neutral, i.e. open to all technologies providing the same benefits. In this coalition, Italy especially requested the inclusion of sustainable biofuels and biogas. Some states backed Italy's position, pointing to the principle of technological neutrality, as a side deal alongside the Euro 7 Regulation agreement.

To maintain technological neutrality, carbon-neutral fuel must include processes whereby CO₂ is extracted from the air, including via photosynthesis, and from facilities that emit CO₂, and is recycled to produce fuel, with a highly positive outcome in terms of GHG savings. This includes sustainable biogas and biofuel as well as e-fuel. Moreover, the CO₂ emitted by alcoholic fermentation in ethanol production plants (at a ratio of 1 for 1), which is very pure and very concentrated, could be processed as synfuel by combining it with renewable hydrogen.

Maintaining the availability of hybrid vehicles fitted with combustion engines will be an indispensable outlet for renewable fuels generated by the production of sustainable aviation fuels (HEFA already available and future synfuels), required by EU regulations. The mixing of these renewable fuels with ethanol in Superethanol-E85 will help to consolidate the economic viability of sustainable aviation fuels.

The definition of carbon-neutral fuels is being discussed in Brussels. The French bioethanol industry is appealing to political decision-makers for the scope of carbon-neutral fuels to include not only synfuel as requested by Germany but also biogas, biodiesel and bioethanol, for which France is the top producer Europe-wide.

IFPEN paper, a fossil-free Superethanol-E85 fuel

[Click here to download the presentation \(in French only\)](#)

About the Collective du Bioéthanol

The Collective du Bioéthanol is represented by AIBS, the French Inter-branch Beet and Sugar Association and Bioéthanol France, the trade association representing the interests of French producers of bioethanol for fuel and traditional alcohol. It aims to raise awareness of the bioethanol industry among professionals and the general public. Up to 7.5% bioethanol (pure or as a derivative, with 5% pure ethanol maximum) is currently incorporated in Unleaded 95 and Unleaded 98 petrol sold in France, while up to 10% is incorporated in Unleaded 95-E10 and up to 85% in Superethanol-E85.

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