Bioéthanol FRANCE
Activer les synergies du végétal

100% renewable E85 fuel
for petrol cars after 2035

Replacing the gasoline part of E85 with a renewable component

4e FORUM EUROPÉEN DES MOBILITÉS BAS CARBONE
Pau, 29 avril 2025

Why a fully renewable E85 fuel ?

Light Duty CO2 Regulation post 2035

100% Battery Electric Vehicles

Internal Combustion Engine Vehicles running exclusively on Carbon neutral fuels

E85

Carbon neutral fuels in LDV CO_2 Regulation

1) In recital 11 of CO_2 Regulation for light duty vehicles (UE) 2023/851 :

« Following consultation with stakeholders, the Commission will make a **proposal for registering after 2035 vehicles running exclusively on CO_2 neutral fuels** in conformity with Union law, outside the scope of the fleet standards, and in conformity with the Union's climate-neutrality objective. »

2) CO_2 neutral fuels = fuels that remove CO_2 from the atmosphere during its production phase and return CO_2 to the atmosphere during its combustion.

➔ Biofuels (biogenic CO_2) and synthetic fuels (captured CO_2)

3) Political situation : 8 Member States (Italy, Czech Republic, Slovakia, Romania, Hungary, Finland, Bulgaria, and Poland) are in favour of a **definition which includes e-fuels and biofuels as defined in Renewable Energy Directive**.

New German government coalition contract mentions: « promote alternative fuels including biofuels » and « promote PHEVs and cars with range extenders ».

European Commission President von der Leyen said in its conclusion of the Strategic Dialogue on Automotive (3rd March 2025) : « we will prepare to speed up work on the **2035 review** [start 2nd semester of 2025 instead of 2026, Commissionners A. Tzitzikostas and S. Séjourné] with **full technology neutrality as a core principle** ».

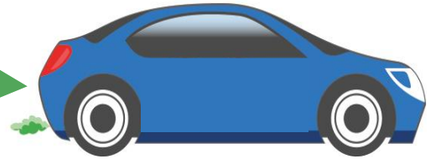
Technological neutrality: several technologies can help to achieve EU climate targets

INTERNAL COMBUSTION ENGINE CAR
RUNNING ON FOSSIL FUEL

60% - 80%

BATTERY ELECTRIC

20% - 40%
Hybrids
& Plug-in Hybrids
running on
renewable fuels



BIOETHANOL-E85
Ethanol + e-naphtha/bionaphtha

BIO LPG

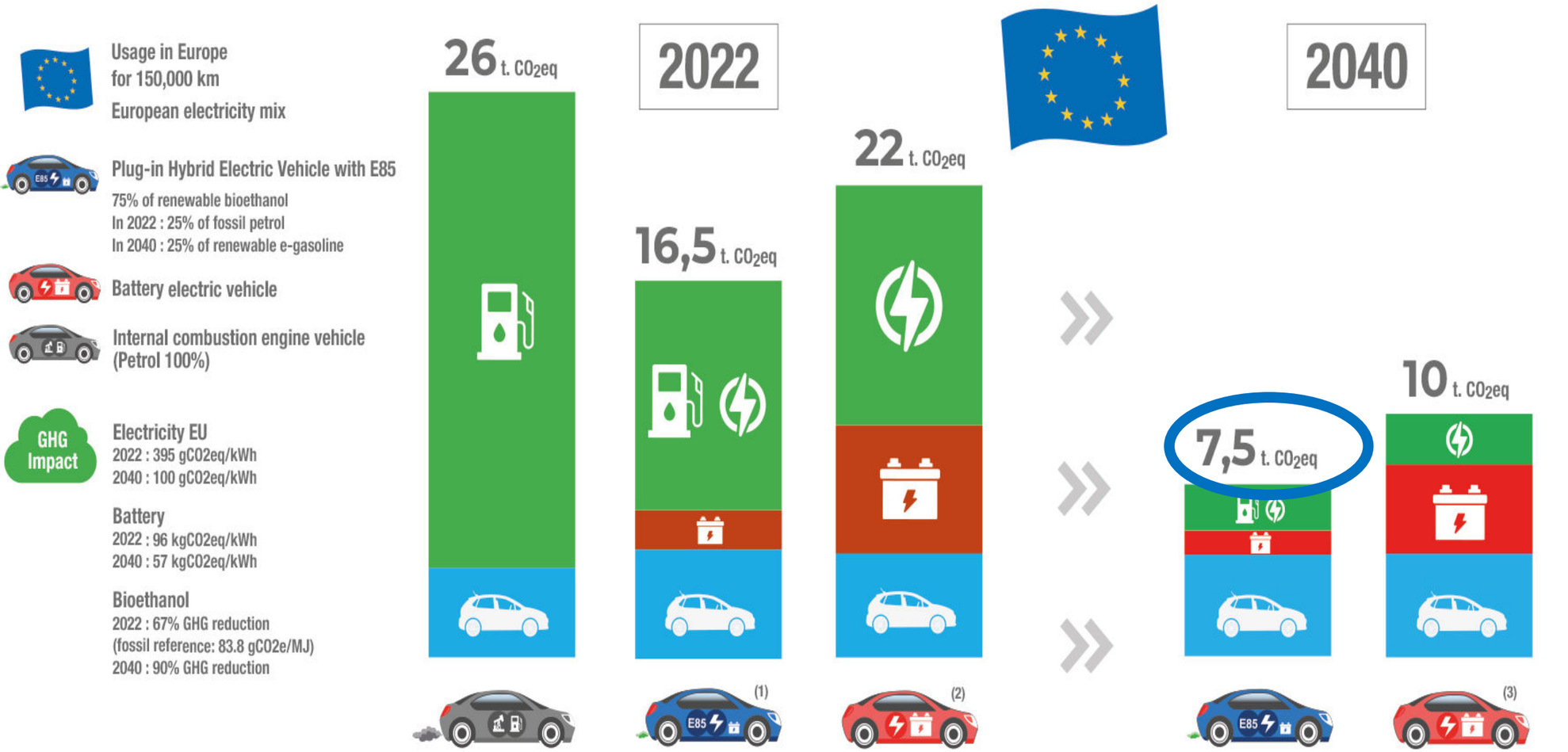
HVO 100
Mainly Heavy Duty Vehicle

BIOMETHANE
Mainly Heavy Duty Vehicle

BIODIESEL B100
Mainly Heavy Duty Vehicle

Bioéthanol FRANCE

What would be the CO_2 emissions of a PHEV running on fully renewable E85 compared to BEV in Europe ?



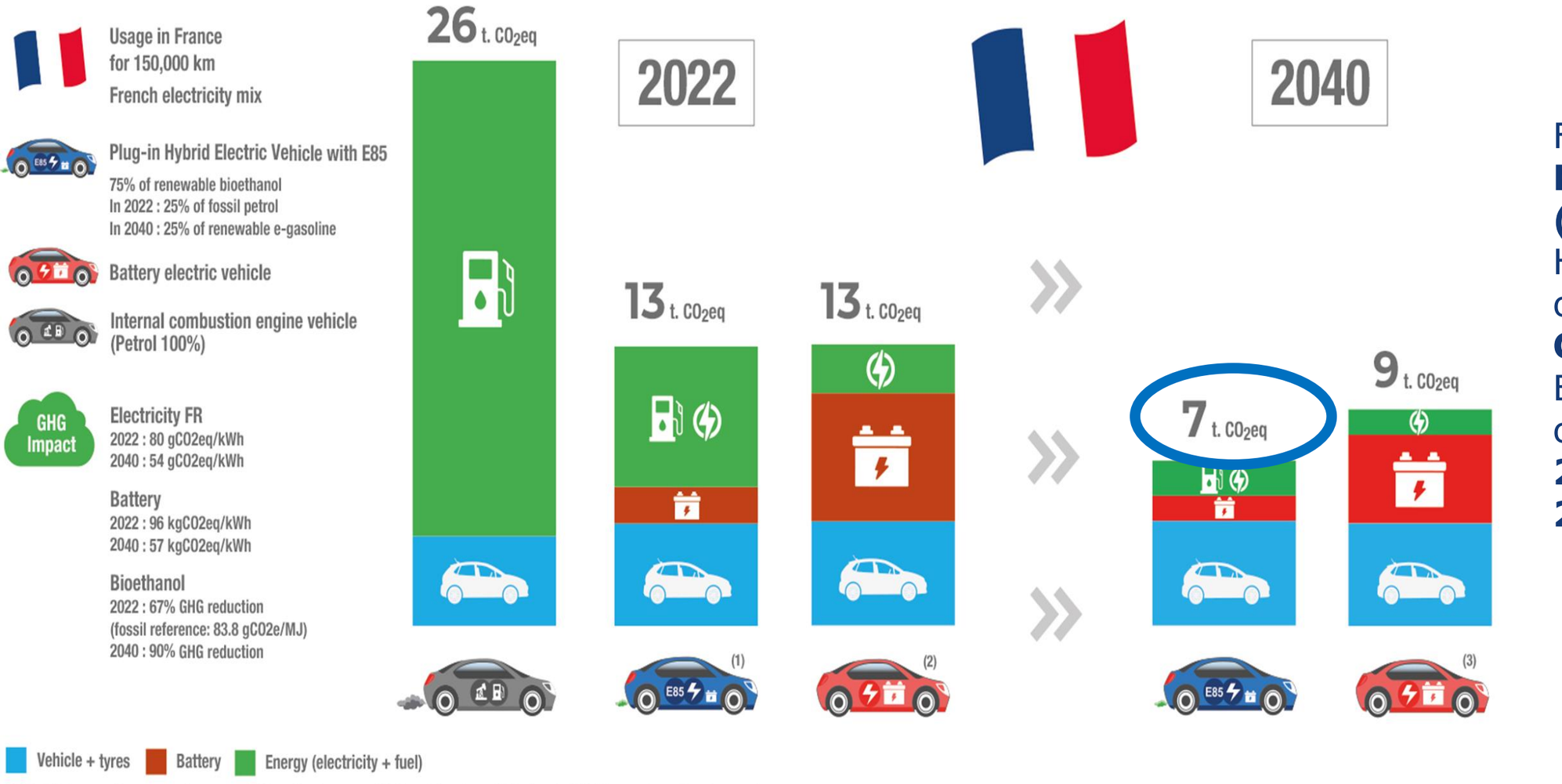
(1) 10 kWh battery for an electric range of 50km. Total range > 500 km. Mixed use 40% electric / 60% internal combustion engine.
(2) 60 kWh battery for a maximum range of 320 km in 2022.
(3) 60 kWh battery for a maximum range of 400 km in 2040.

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

IFPen study (2022): CO_2 emissions in LCA

For C-segment, with **European electricity mix**, a Plug-in Hybrid Vehicle running on E85 has **lower CO2 emissions** than a Battery Electric Vehicle on a life-cycle analysis both in 2022 and 2040.

What would be the CO2 emissions of a PHEV running on fully renewable E85 compared to BEV in France ?

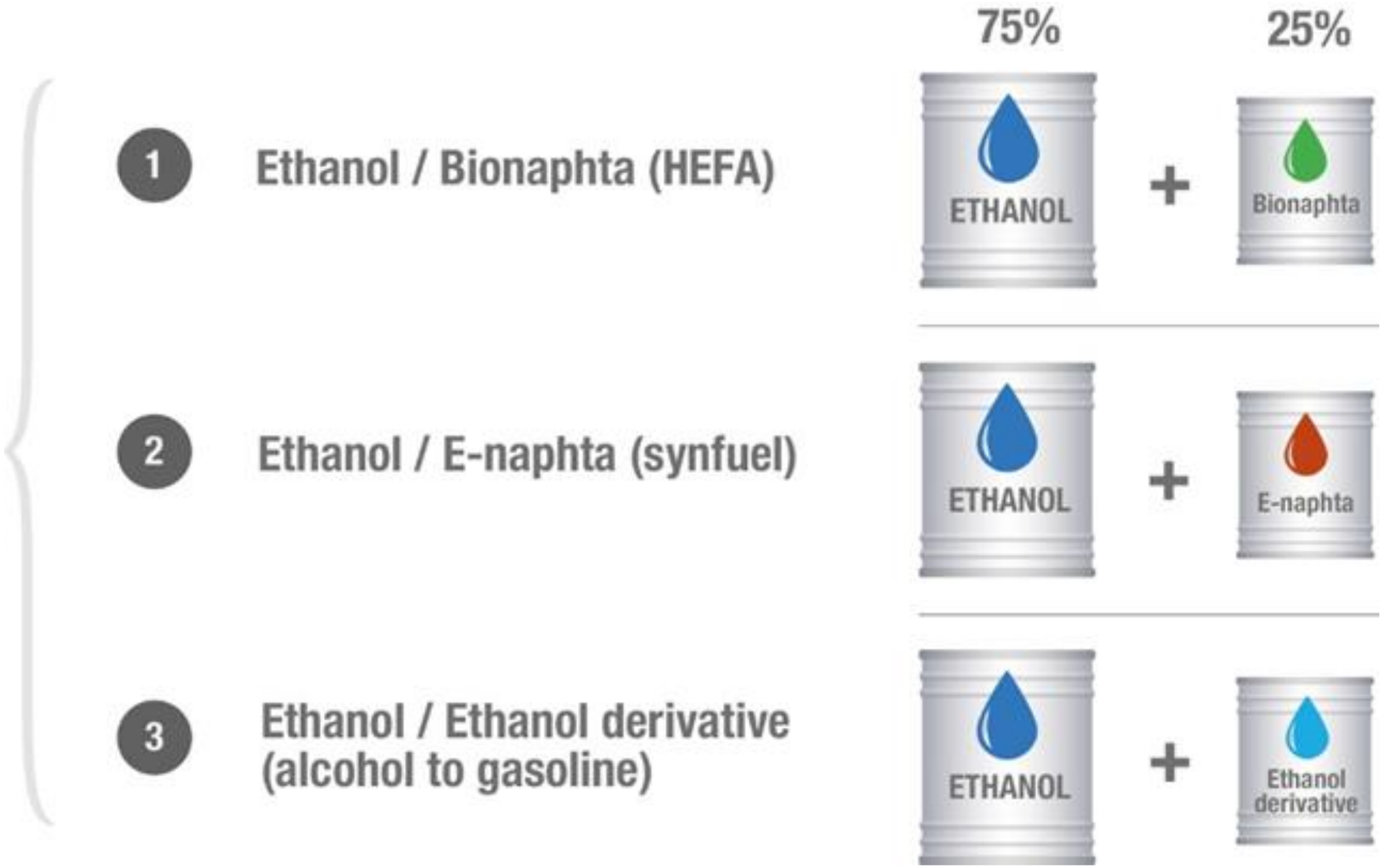


(1) 10 kWh battery for an electric range of 50km. Total range > 500 km. Mixed use 40% electric / 60% internal combustion engine.
(2) 60 kWh battery for a maximum range of 320 km in 2022.
(3) 60 kWh battery for a maximum range of 400 km in 2040.

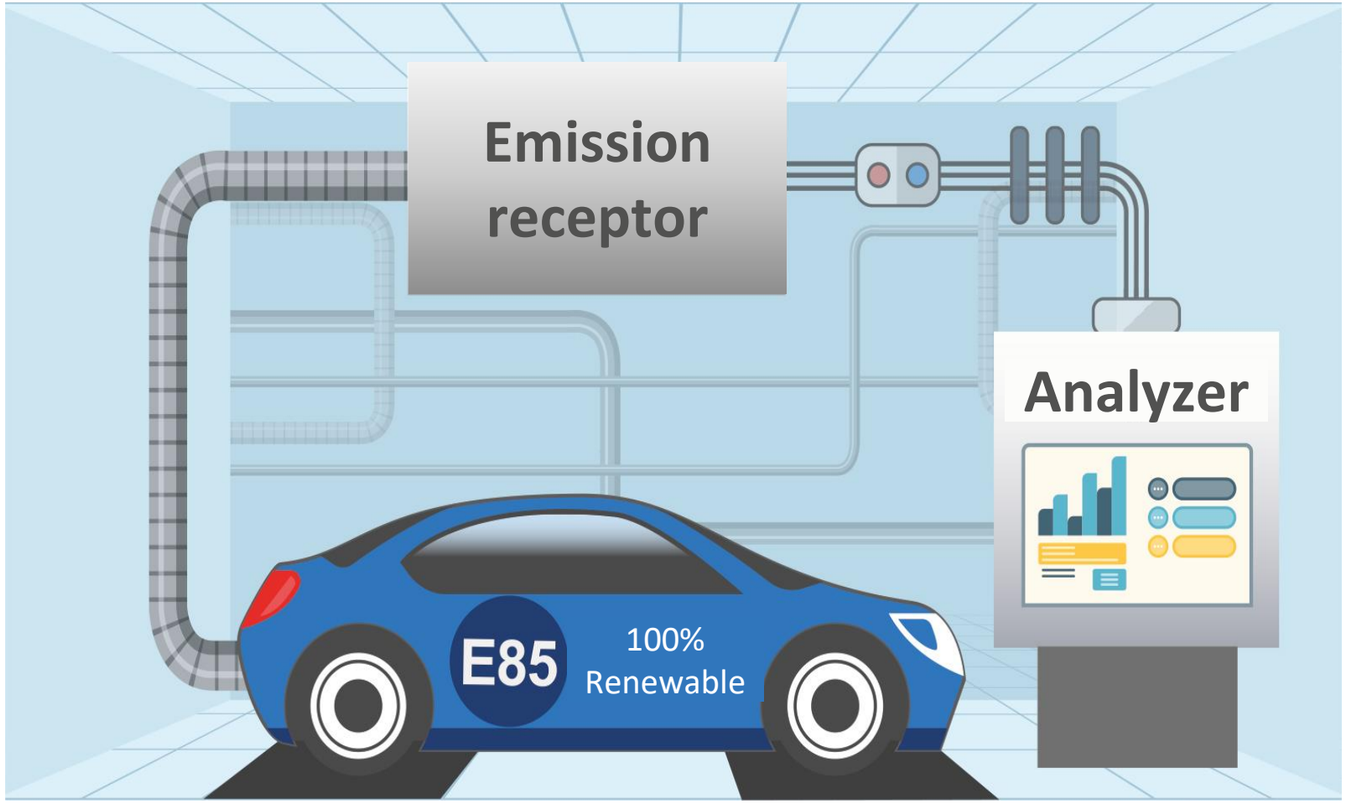
Source: IFPEN study for SNPAA, AIBS and Intercéréales (September 2022)

For C-segment, with **French electricity mix (low carbon)**, a Plug-in Hybrid Vehicle running on E85 has **equivalent CO2 emissions** than a Battery Electric Vehicle on a life-cycle analysis **in 2022** and **lower in 2040**.

Replacing the gasoline part of E85 with a renewable component: 3 formulas of 100% renewable E85 fuels



What would be the pollutant emissions of a car running on a fully renewable E85 fuel ?

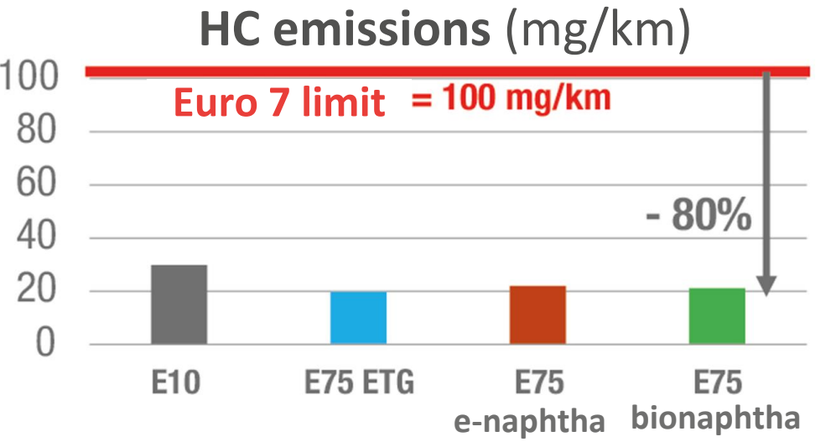


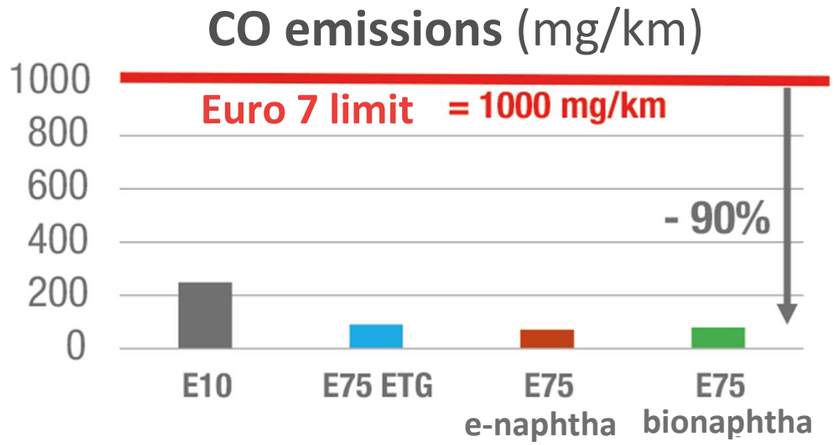
IFPen study (2024): pollutants emissions

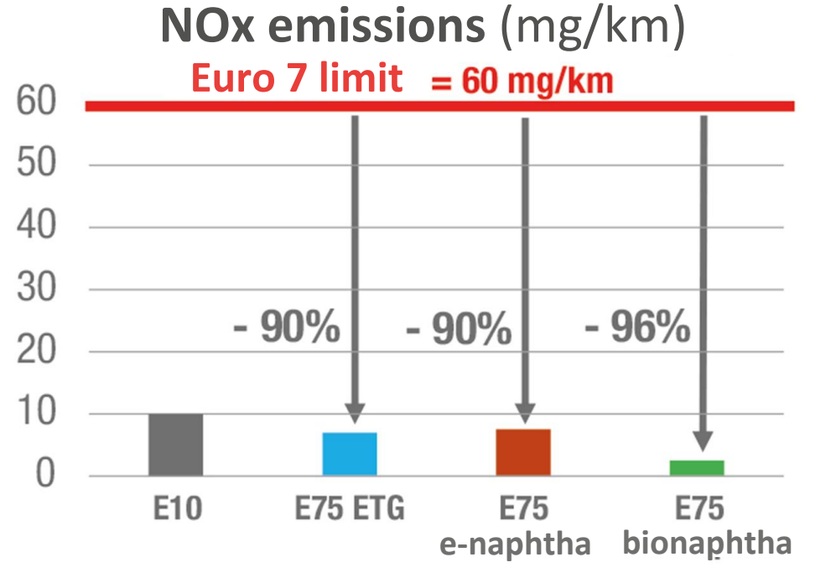
Laboratory test

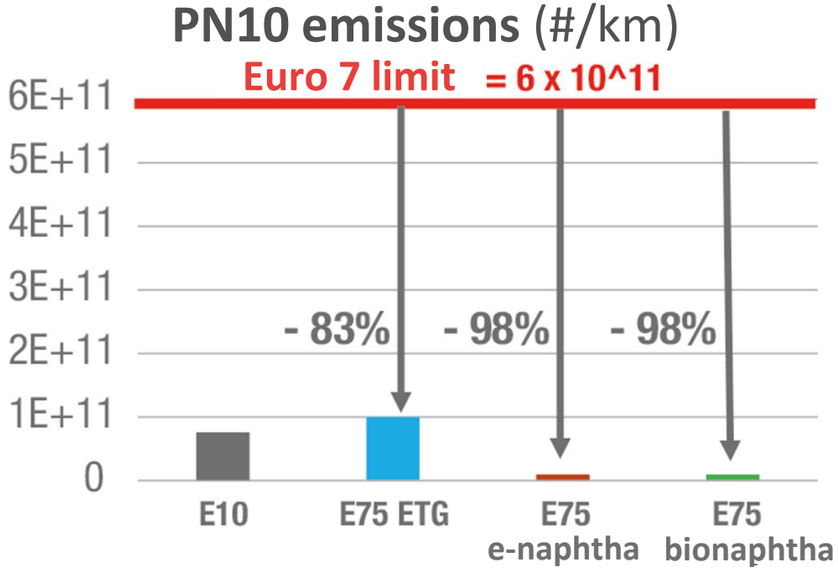
- On roller bench
- mHEV Euro 6d flexfuel car (Ford Focus)
- **WLTP homologation test at 23°C**
- Ethanol-E85 100% renewable fuel
  (75% bioethanol + 25% renewable gasoline)
- Pollutants measured : **HC, CO, NOx, PN10**

Pollutants emissions are well below Euro 7 limits







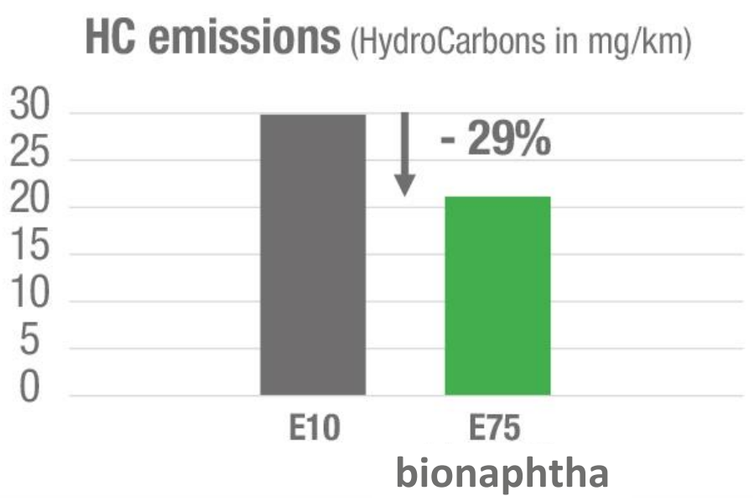


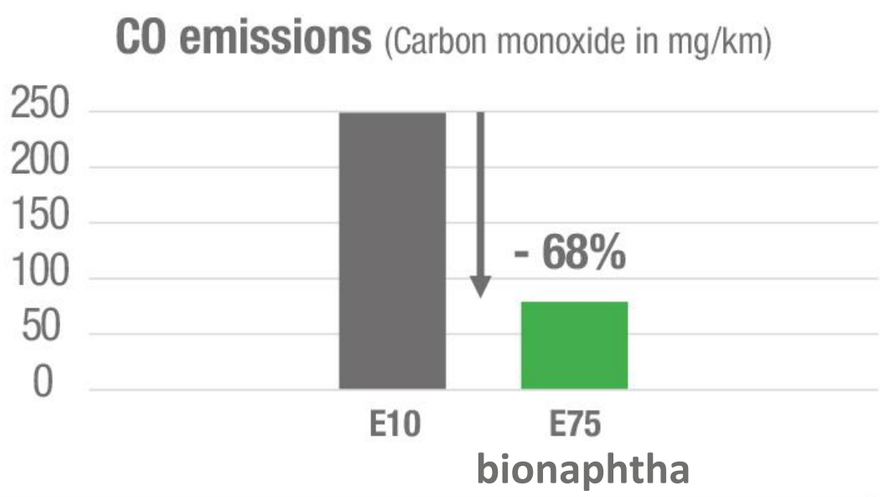
E75 bionaphtha
Very low PN10 and NOx emissions

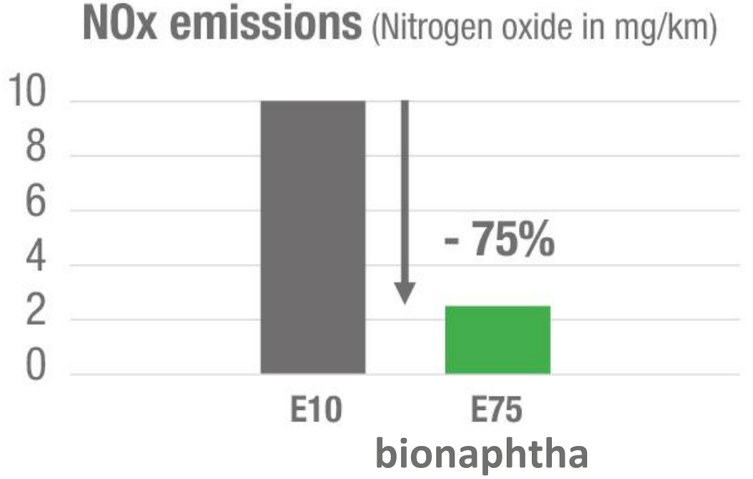
E75 e-naphtha
Very low PN10 emissions

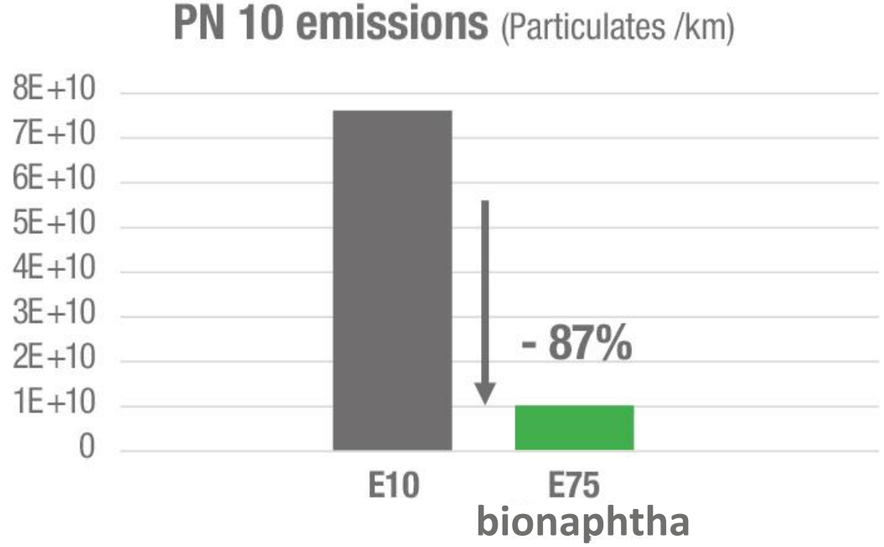
ETG = ethanol derivative

E75 with bionaphtha: Very low emissions compared to E10 fuel









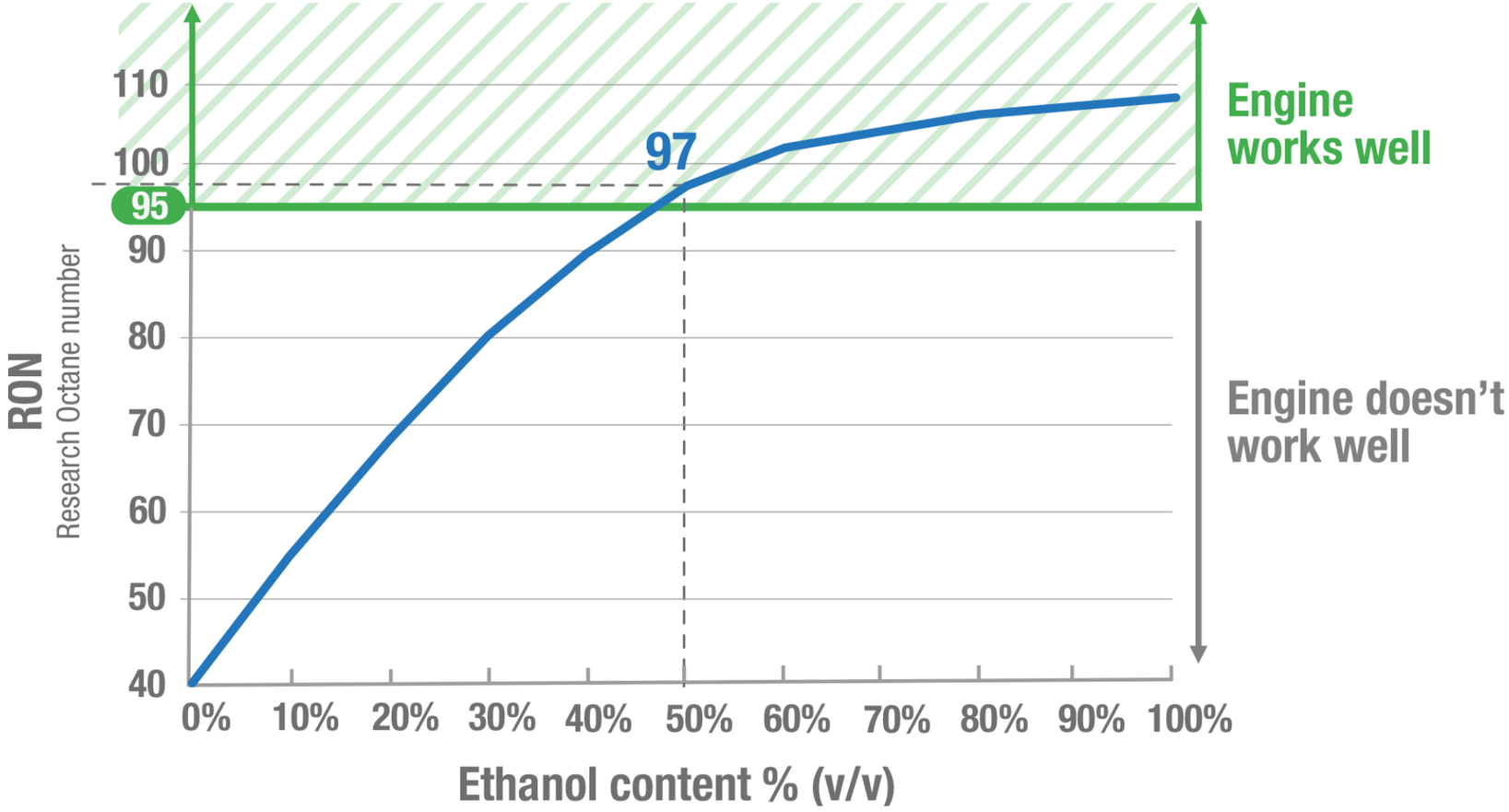
E75 with bionaphtha
Very low PN10 and NOx emissions

Renewable gasoline needs an octane booster like bioethanol to burn well in the engine

e-naphtha and bionaphtha cannot work alone in a petrol engine because of their too low octane (RON around 40)

In Europe, the ethanol content of E85 is between 50% (winter period) and 85% (summer period).

A fully renewable E85 (blend of bioethanol and e-naphtha or bionaphtha) has always a RON above 95.



Source: Tien Mun. Foong, Kai J. Morganti, et Michael J. Brear« The octane numbers of ethanol blended with gasoline and its surrogates », 2013

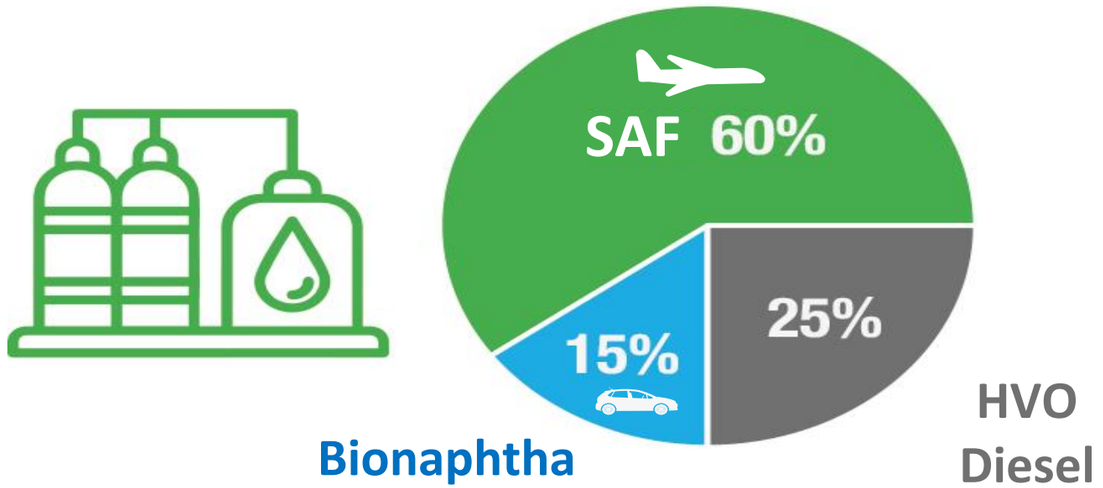
Bioéthanol FRANCE

Bionaphtha/e-naphtha: co-products of SAF production

The outlet of road transport for bionaphtha and e-naphtha is crucial to the economic viability and future development of Sustainable Aviation Fuels.

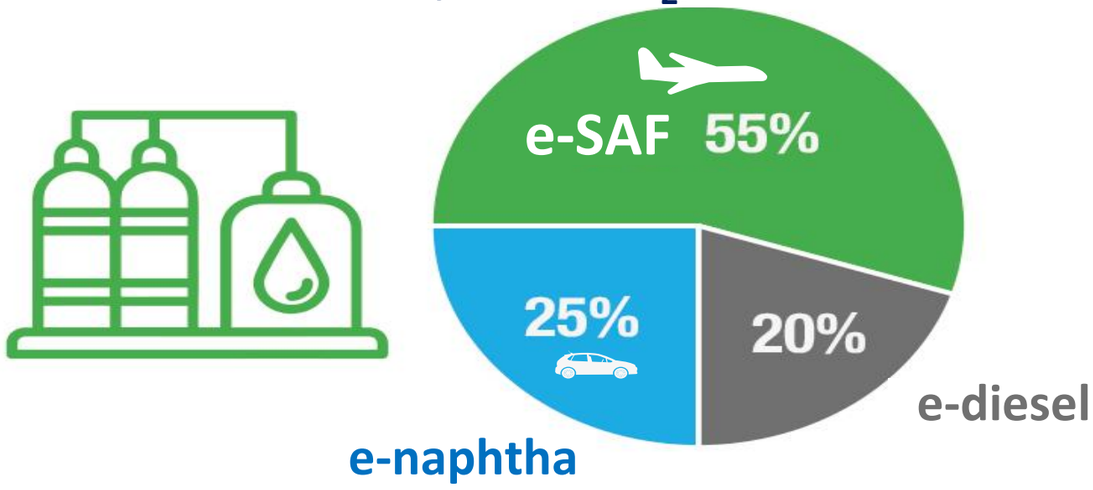
Already available

Hydrotreated Vegetable Oil pathway



Available tomorrow

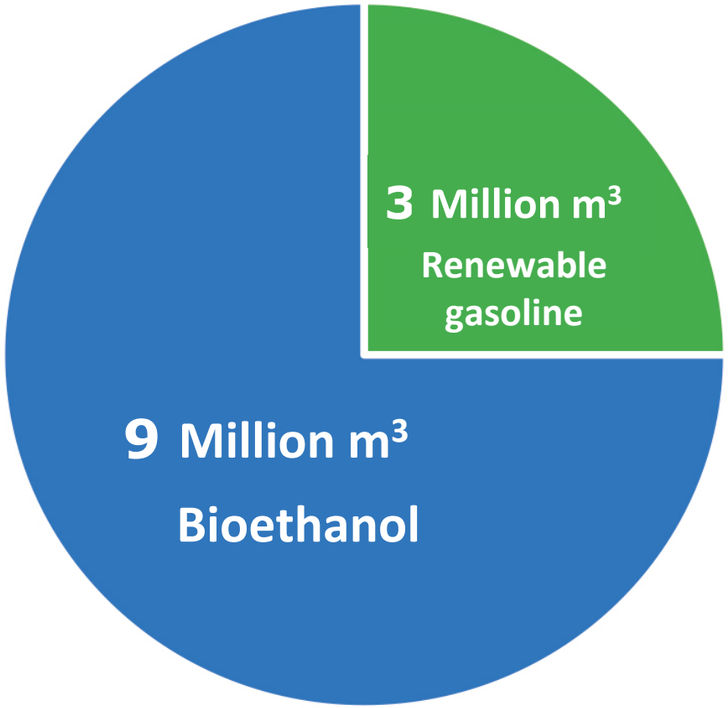
e-fuel pathway (H_2 from water electrolysis and from captured CO_2)



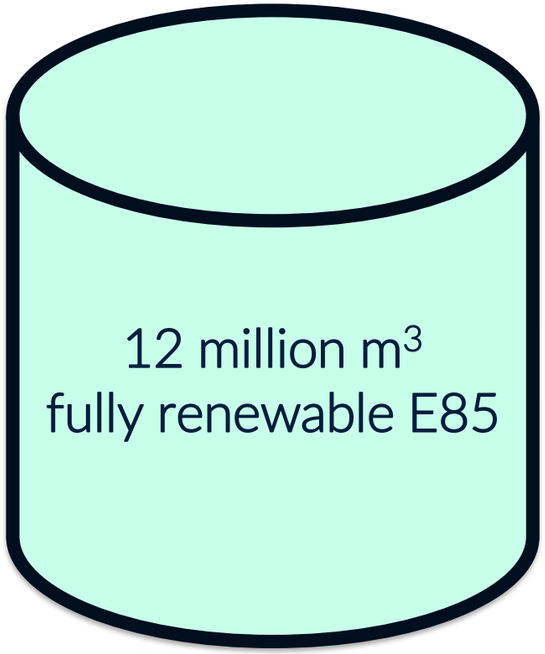
SAF = Sustainable Aviation Fuel

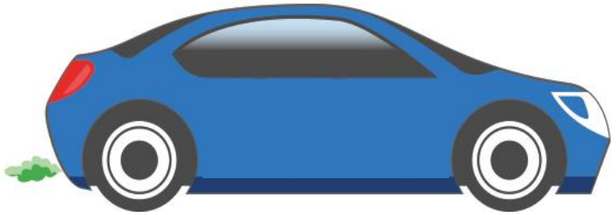
Source: Fuels Europe; plants with maxi Jet Mode

Potentially 26 million Plug-in Hybrid Vehicles running on fully renewable E85 in 2035 in Europe



EU ethanol production capacity in 2024





26 million flex-E85 PHEV

(3,5 l/100 km and 13 000 km/year)

~10% of the European passenger cars fleet

100% renewable E85 fuel exists today in California

100% renewable E85 fuel in California:

➔ For 1/3 of volumes of E85 in 2022

➔ Blend of 83%v/v of **bioethanol** and 17%v/v of **bionaphtha**.

➔The 100% renewable E85 fuel works in practice.

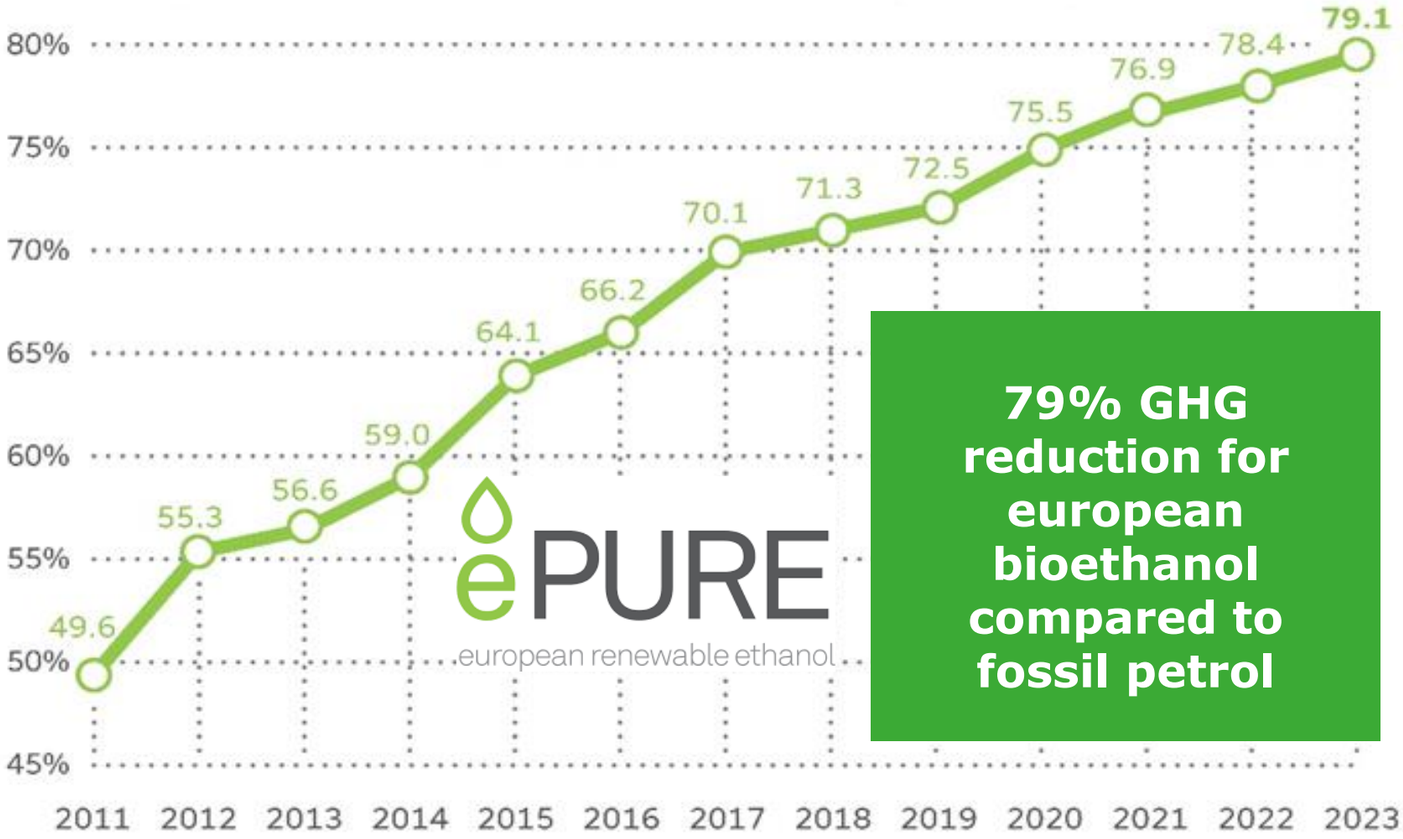
➔In Europe, logistics to be developed and E85 standard to be adapted.

Annexe

Average European bioethanol GHG emissions savings keep improving

Average certified GHG emission savings in %

Since 2011 the average certified greenhouse gas emission savings of renewable ethanol against fossil fuel have increased continuously, reaching 79.1% in 2023.



79% GHG reduction for european bioethanol compared to fossil petrol

Source: Aggregated and audited data of ePURE members for volumes certified under RED I or RED II methodology

- Decarbonizing the boilers (biomass)
- Methanisation of effluents
- Capturing fermentation CO2 from ethanol production and replacing fossil CO2 in other sectors

ReFuel EU Aviation : increasing SAF and e-SAF targets until 2050