



# The role of E-fuels in meeting future transportation decarbonization targets

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# Meeting decarbonization targets using e-fuels

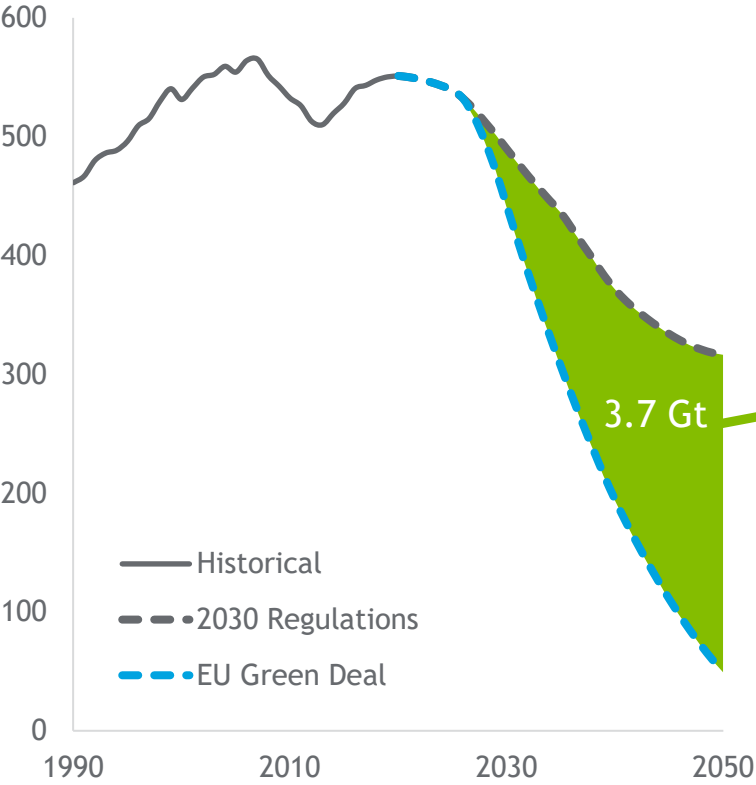
Increasingly more stringent CO<sub>2</sub> aspirational targets

		-10%	-20%	-30%	-40%	-50%	-60%	-70%	-80%	-90%
90% by 2050		ICE efficiency Hybridization			BEV e-fuel/FCEV					
		ICE efficiency Hybridization	Mobile Carbon Capture				NG/BEV e-fuel/FCEV			
50% By 2050		Biofuels e-fuel								
		Mobile Carbon Capture				NG H2ICE e-fuel				

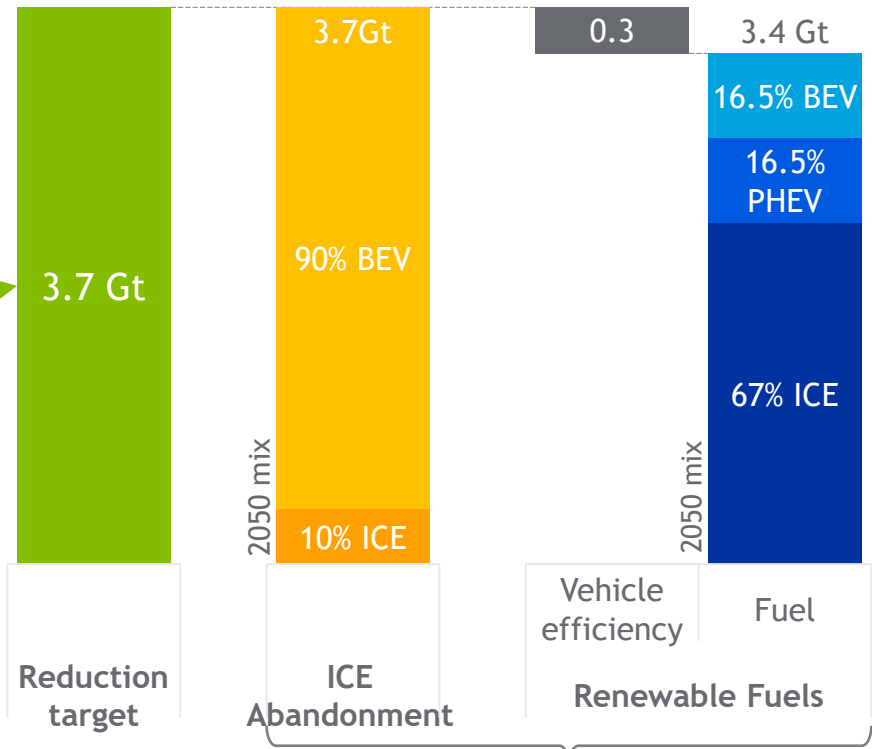
Light Duty Vehicles and Aviation sectors will likely lead the way given the impending mandates

# Viable pathways to meet EU 2050 aspiration targets | two extreme scenarios

CO<sub>2</sub> emissions of EU passenger cars (MtCO<sub>2</sub>)



Emissions reduction 2030-2050 (GtCO<sub>2</sub>)

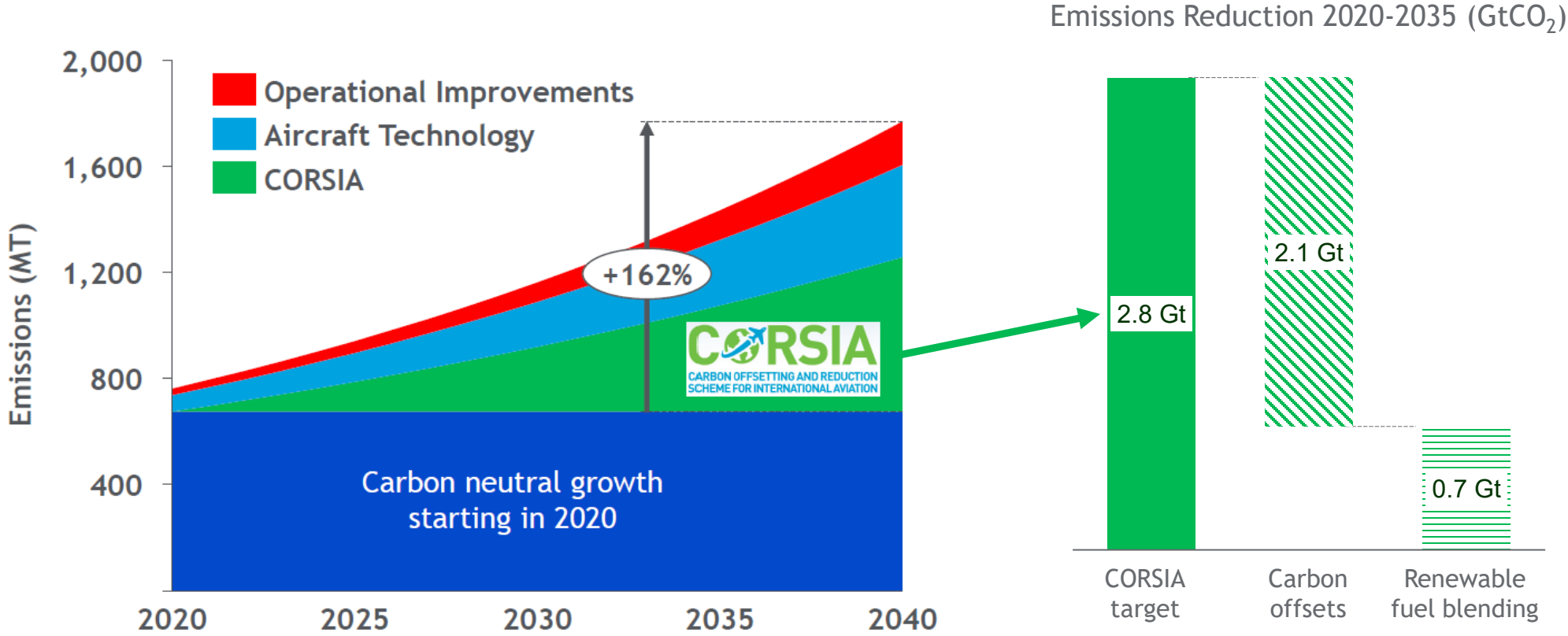


Both scenarios to meet EU Green Deal target in 2050\*

Renewable fuel blending, in addition to ICE efficiency improvement and hybridization, presents a pathway to meet EU Carbon neutrality by 2050, and can yield a larger impact if used in existing fleet

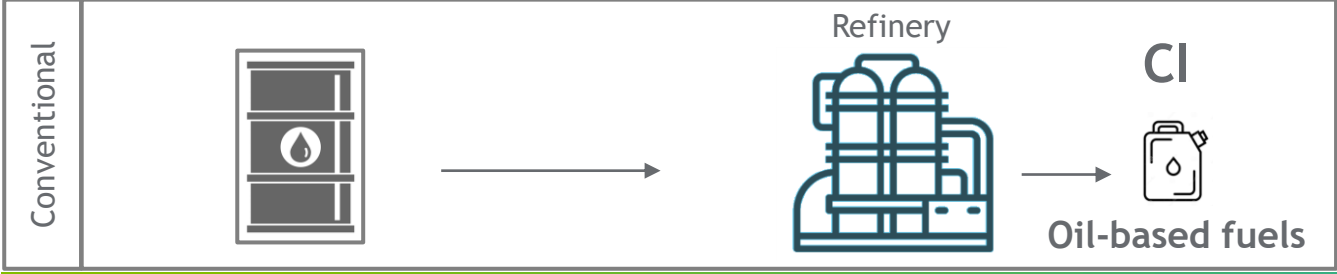
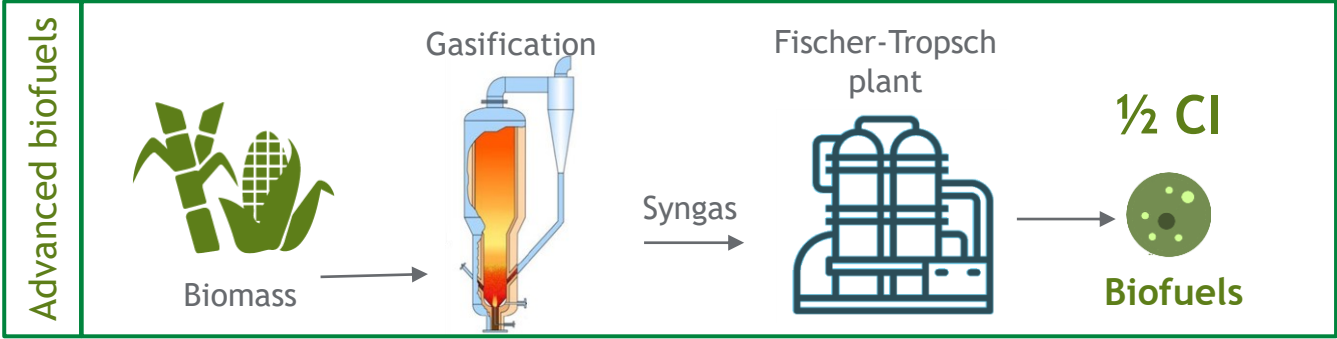
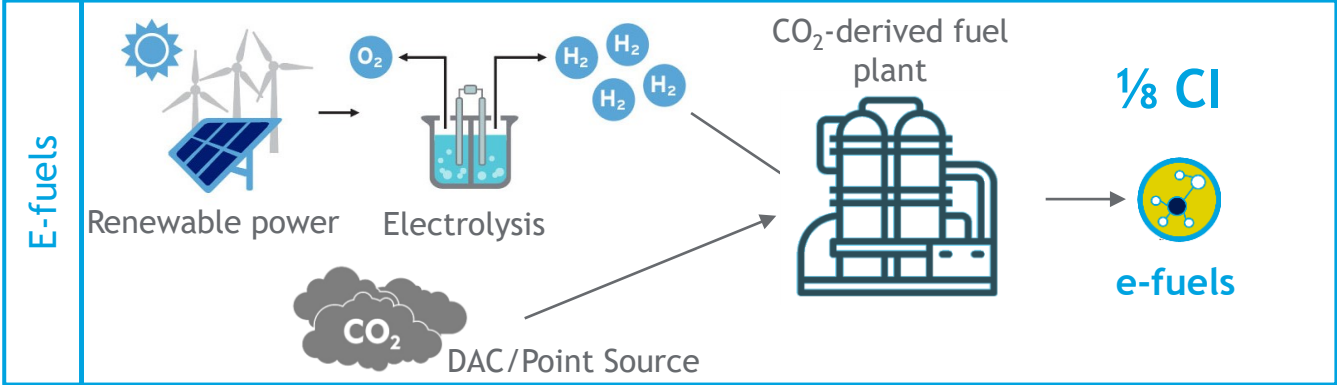
3 \* % indicates share of total vehicle fleet on the road in 2050, not contribution to CO<sub>2</sub> reduction

# Viable pathways to meet aviation 2035 decarbonization aspirational target



Carbon offsets will mitigate 75%, leaving 25% for biofuels and e-fuels blending

# e-fuels - A complementary solution to mitigate GHG emissions



Fully compatible with the conventional base, and vehicle fleet - can be tailored to reduce criteria pollutants

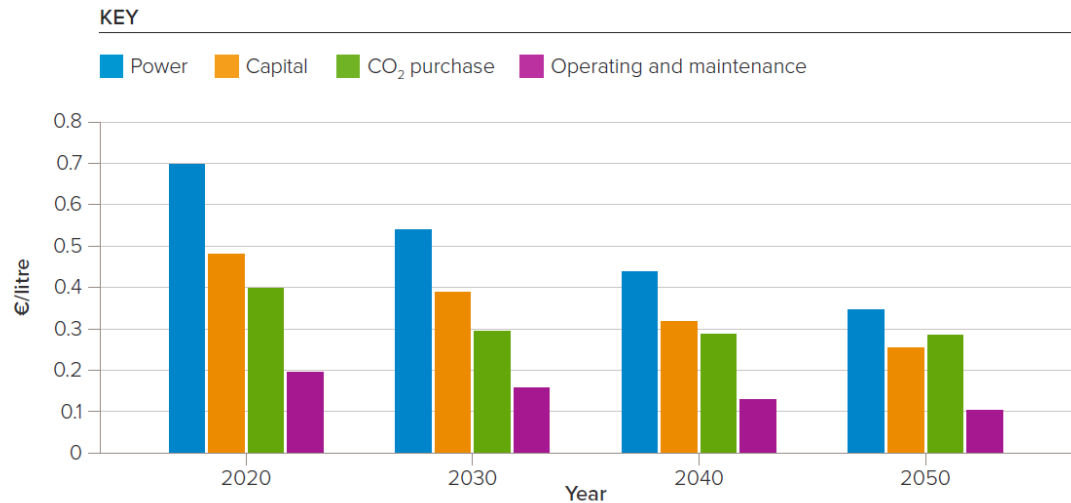
Early introduction through blending to reduce carbon footprint of conventional fuels - Providing time for scale-up to meet demand

Cost-effective if imported from countries with an abundant renewable energy sources (EU costly due to intermittency issues)

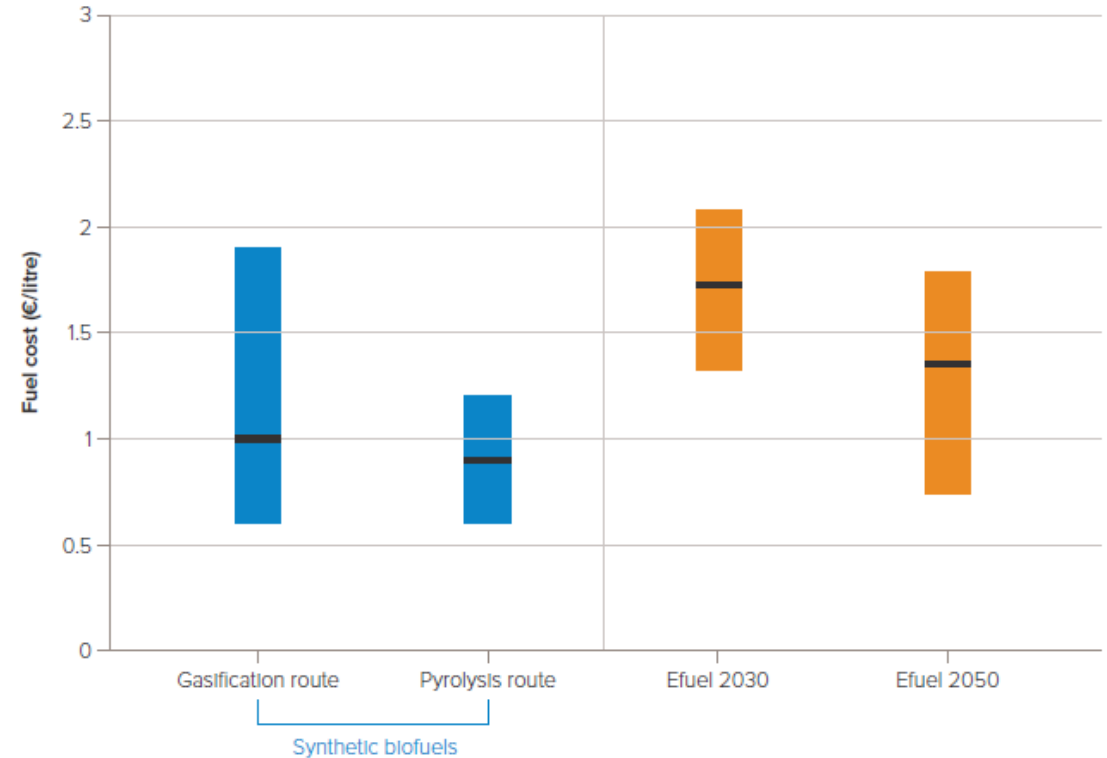
Long term energy storage in liquid form for uses other than transport

GHGs reduction can be achieved with less burden on the power sector

# e-fuels are technically feasible and their cost will decrease over time



Based on 6% interest rate, 25 years' project lifetime, replacement of stacks after 15 years, using solar power (2344 hours full load hours/year)



- Biofuel projections based on 6% interest rate, 20 years' project lifetime and biomass cost of €75/metric ton.
- The biofuels costs range is based on first-of-a-kind to nth-of-a-kind plants.
- Gasification route includes gasification and conversion. Pyrolysis route includes pyrolysis and hydrogenation.

Commercial scale demonstration and LCA-based regulations will accelerate speed to market

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