EUROPEAN UNION CO_2 STANDARDS FOR NEW PASSENGER CARS AND VANS

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Technology potential and cost for reducing vehicle CO_2 emission levels

A variety of technologies for reducing new passenger car type-approval CO_2 emission levels are available, including efficiency improvements of combustion engine vehicles and transitioning to electric vehicles. Three scenarios were modeled in order to assess the required investment cost per vehicle as well as associated savings from a consumer and society perspective for different type-approval CO_2 reduction targets:

- **Adopted policies**: Manufacturers comply with the currently established reduction targets of 15% by 2025 and 37.5% by 2030 but make no efforts to go beyond the necessary levels of CO_2 reduction. The **remaining potential of internal combustion engine (ICE) vehicles is untouched** and **electric vehicle market shares stagnate from 2030 onwards**.
- **Lower ambition**: Current reduction targets are strengthened to **20% by 2025** and **50% by 2030**. In addition, a **70% target for 2035** is introduced. Manufacturers **tap some of the remaining ICE potential** (reducing CO_2 by about 1% annually) and further increase the market share of electric vehicles, so that **battery electric vehicles (BEVs) account for about half of new car sales by 2035**.
- **Moderate ambition**: New car CO_2 reduction targets are strengthened to **30% by 2025**, **70% by 2030**, and **100% by 2035**. To comply, vehicle manufacturers have to **greatly exploit the remaining potential of ICEs** (at a rate of about 4% type-approval CO_2 reduction annually between 2021 and 2025, including a reduction in vehicle mass and transitioning to mild hybrid vehicles). **Plug-in hybrid electric vehicles (PHEVs) are phased out** quicker than in the Lower Ambition scenario. **BEVs reach a market penetration of about 50% by 2030 and 100% by 2035**.
- **Higher ambition**: All new cars achieve **zero tailpipe CO_2 emissions by 2030**. This means a rapid transition towards BEVs with the remaining ICE potential being fully exploited in the transition years.

For all scenarios, direct manufacturing costs increase compared to 2021, between about €400 in the adopted policies scenario in 2025 to about €1,700 in the higher ambition scenario in 2030 (Table 1). For 2035, incremental manufacturing costs decline compared to 2030, mainly due to improved learning for electric vehicle technologies.

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These **initial investments in improved vehicle technologies are balanced by fuel cost savings throughout the lifetime of the vehicle**. From a consumer perspective, for 2025, the moderate ambition and higher ambition scenarios provide the most favorable cost-benefit: initial technology investments are fully paid for within four to six years of ownership, due to lower fuel cost. For 2030, the higher ambition scenario ensures the quickest payback period (two years) and the highest savings. For 2035, technology investments are recouped within one to two years for all scenarios except the adopted policies scenario, and savings are highest for the moderate and higher ambition scenarios.

By about 2025, a BEV with 350 km electric range becomes **cost-efficient** from a consumer perspective, **without any subsidies**. By 2030, BEVs with significantly higher electric ranges are also cost-efficient and, from a cost perspective, much more attractive to consumers than ICE-based vehicles, including PHEVs.

In addition to fuel cost savings, calculations from a societal perspective also consider the avoided CO_2 emissions with an external cost of €180 per ton CO_2. For society, in all years, those scenarios with the highest CO_2 reduction also provide the greatest savings —in other words, **the higher the CO_2 savings, the higher the net benefits for society**.

Table 1. Summary of cost-benefit calculations from a manufacturer, consumer, and societal perspective, for the years 2025, 2030 and 2035 with respect to a 2021 baseline.

Scenario	Average new car CO_2 level	Additional manufacturing costs	Consumer payback period	Net consumer savings years 0-8	Societal savings vehicle lifetime
2025					
Adopted policies	**-15%**	382 €	**>8**	-83 €	-995 €
Lower ambition	**-20%**	671 €	**>8**	-229 €	-17 €
Moderate ambition	**-30%**	804 €	**4**	600 €	580 €
Higher ambition	**-40%**	1,199 €	**6**	420 €	987 €
2030					
Adopted policies	**-37.5%**	938 €	**6**	331 €	139 €
Lower ambition	**-50%**	1,223 €	**4**	913 €	1,752 €
Moderate ambition	**-70%**	1,380 €	**3**	1,889 €	3,422 €
Higher ambition	**-100%**	1,703 €	**2**	3,107 €	5,660 €
2035					
Adopted policies	**-37.5%**	695 €	**3**	778 €	416 €
Lower ambition	**-70%**	930 €	**1**	2,457 €	3,977 €
Moderate ambition	**-100%**	1,079 €	**1**	4,250 €	6,856 €
Higher ambition	**-100%**	1,079 €	**1**	4,250 €	6,856 €

Flowing from the analysis, ICCT recommends considering the following policy actions:

- The stringency of the **2030 fleet-average CO_2 targets** for cars and vans should be set at a **minimum of 70%**, relative to the 2020/21 baseline, to ensure optimal payback periods and societal savings.
- The stringency of the **2025 CO_2 targets** should be strengthened **as much as possible**.
- A target for **all new cars and vans to have zero tailpipe emissions** should be introduced for **2035 at the latest**.

FOR MORE INFORMATION

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

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