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Electric vehicles, ICE fuel economy and vehicle efficiency regulations

Over two million electric vehicles have been sold globally. Electric vehicles (EVs) have significantly lower carbon emissions than conventional internal combustion engine (ICE) vehicles. However, a key question is how best to integrate electric vehicles within existing vehicle efficiency standards.

There are several ways to compare the CO_2 impacts of electric and combustion engine vehicles. The most comprehensive approaches include life-cycle accounting to consider the carbon emissions from generation of electricity (or petroleum extraction, refining, and distribution), as well as just tailpipe emissions. As Figure 1 shows, this outcomes of this analysis varies by region and source of energy, but EV emissions are, in general, significantly lower.

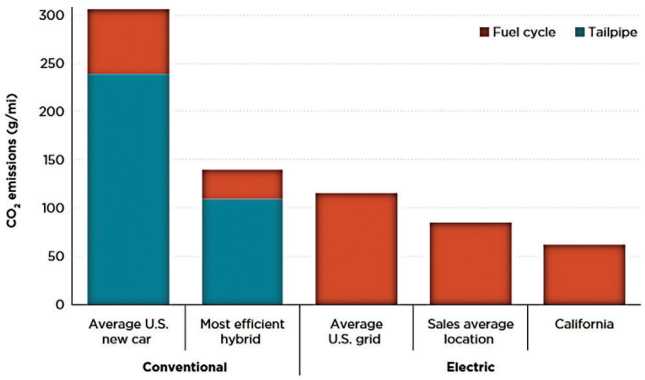
A paper by the ICCT assesses options for integrating electric vehicles within U.S. and European CO_2 emission and efficiency regulations. It focuses on three regulatory approaches: life-cycle accounting, tailpipe accounting (i.e., electric vehicles are counted as zero), and the use of multipliers or super-credits (i.e., electric vehicles get counted multiple times). These are assessed for their impact on the relative cost-effectiveness of electric vehicles versus combustion vehicle technologies, the regulating efficiency improvements of combustion vehicles, and the implications for fleet-wide CO_2 emission reductions. It concludes:

1. Standards can help drive electric vehicles into the market.
2. Electric vehicle multipliers or super-credits can have a substantial environmental cost
3. There is a limited place for preferential incentives for electric vehicles within the efficiency and CO_2 regulations.

Current regulatory policy in the US

In the US, electric vehicles currently receive several incentives, including being counted as zero grams CO_2 per mile for fleet averages until higher volumes of sales are reached. Plug-in hybrid electric vehicles with around 20 miles range are counted as 40% electric, whereas those with 40 miles range are counted as 63% electric. There are also multipliers that are applied to electric vehicle sales, which start at 2.0 in 2017, and phase down to 1.3 in 2021. In later years, the regulatory provisions use upstream electricity-related

FIGURE 1 Electric and conventional vehicle test-cycle and upstream fuel cycle emissions in the US



emissions, based on KWh per mile, grid average CO_2, distribution losses (6.5%) and charging losses. An additional 'credit' is subtracted from this rating which removes the equivalent gasoline vehicle's upstream oil (extraction, transport, refining cost). Some factors influence the comparison – the US grid has shifted from 39% coal in 2014 to 30% coal in 2016, and is projected to fall to 25%.

Current regulatory policy in Europe

GFEI partners are at the heart of efforts to improve the efficiency of HDVs, including the International Council on Clean Transportation (ICCT) who support the G20 Transport Task Force on this issue. The G20 Energy Efficiency Leading Platform has recognised the value of voluntary collaboration on heavy-duty vehicles, and encourages the "development of standards and programmes to improve fuel efficiency and reduce GHG emissions from LDVs and HDVs, to the greatest extent possible".[3]

GFEI is launching a new target for HDVs, based on the detailed analysis from the International Council on Clean Transportation in their working paper 14, we are establishing a '35by35' target for HDVs. This targets a 35% improvement in fuel efficiency of HDVs globally by 2035 through improvements to aerodynamics, tyres, engines and braking amongst others.

ICCT's analysis and conclusions

Standards can help drive electric vehicles into the market.

Efficiency regulations, if developed with smart built-in incentives, clear targets for electric vehicles, and complementary consumer policies, can be highly effective in accelerating the deployment of electric vehicles. Comprehensive policies use consumer incentives, sustained education, and charging infrastructure programmes, or even mandates and local vehicle licensing restrictions.

Electric vehicle multipliers or super-credits can have a substantial environmental cost.

When electric vehicle shares increase to above 5% of new vehicle sales, super-credits would increasingly undermine wider vehicle efficiency improvements. If super-credits and zero-upstream emissions accounting are used for electric vehicles, standards up until 2030 could see a 26-41% loss in regulatory CO_2 benefits.

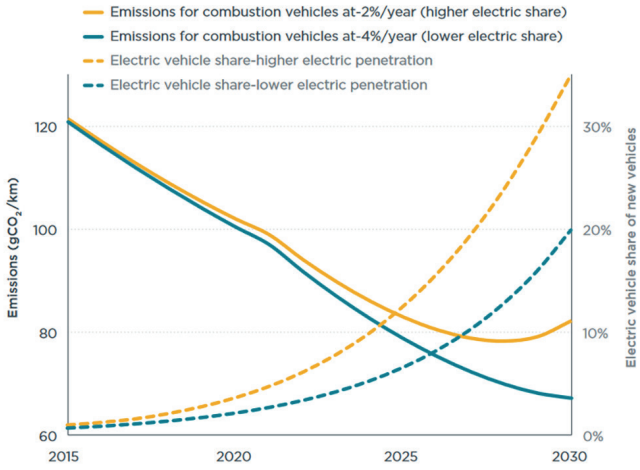
In the US case, a 23% penetration of electric vehicles results in a 26% loss in the US regulatory programme benefits. In Europe, the regulation loses 41% of its intended benefits. This would amount to an enormous lost opportunity to continue to improve ICE efficiency. It suggests that plans to eliminate multipliers after 2021 in the US are warranted.

There is a limited place for preferential incentives for electric vehicles within the efficiency and CO_2 regulations.

Accounting for zero gram electric vehicles reduces the cost per CO_2 reduction by 23-33%. This puts lower-range electric vehicles on par with advanced combustion and hybrid technology. This costs approximately 4-6% of regulatory benefits. Electric vehicles inherently have very low CO_2 emissions due to their much greater on-vehicle efficiency and lower carbon energy sources. Powering electric vehicles on average electric grids provides substantial CO_2 benefits, typically 50-70% lower than average light-duty vehicles in the US and Europe.

The use of zero gram accounting means that two companies could take very different compliance approaches. One might seek to progressively deploy electric vehicles, whereas another could opt for an approach that focuses instead on improving the combustion fleet to comply with standards.

FIGURE 2 Illustration of higher and lower electric vehicle penetration scenarios to meet 6% per year CO_2 emission targets for 2021-2030 in Europe



Reference: ICCT Working Paper 2017-07 (June 2017) Integrating electric vehicles within U.S. and European efficiency regulations by Nic Lutsey

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