

Taking stock: New FVV meta study of life-cycle analyses on alternative powertrain technologies

Life cycle analyses (LCA) provide evidence of how climate-friendly new powertrain technologies are. A new meta-analysis by the Research Association for Internal Combustion Engines (FVV) analyses existing life-cycle studies from the last 15 years. A supplementary paper derives central requirements for drafting future climate protection regulations and guidelines. The study results show that in a global energy and carbon system, various technology options are available from a climate perspective. There is not one single solution for CO₂ neutrality in the mobility sector. The key to sustainable mobility lies in fair technology competition and the defossilisation of energy production.

Frankfurt/M., 21 July 2020 // Electric powertrains, hydrogen-powered fuel cells and the use of synthetic fuels in combustion engines: Various technologies and fuels are currently being discussed in order to significantly reduce harmful CO₂ emissions from road transport. From a scientific point of view, not only the direct emissions from operation must be taken into account, but also those greenhouse gases that are emitted during the production of the vehicles, the generation of the energy sources/fuels, their distribution and, last but not least, recycling at the end of the vehicle's life. The method of life cycle assessment, usually abbreviated as LCA, has established itself as a means of producing a conclusive overall balance sheet. One challenge here is that the results of LCA studies depend heavily on the assumptions made. In a meta-analysis, the specialist consultancy Frontier Economics on behalf of the FVV has now evaluated for the first time more than 80 individual studies from the past 15 years, which consider a total of 110 different scenarios and 430 individual analyses. In order to ensure comparability, the results of all studies were standardised to a compact passenger car with a total mileage of 150,000 kilometres.

Calculated in this way, there is a relatively narrow band of total emissions over the lifetime of the vehicle for all combinations of powertrains and energy sources or alternative fuels. The average value over all studies ranges from 25 to 35 tonnes of CO₂ per vehicle, provided that fossil fuels are still used proportionately for the production of electricity, hydrogen or synthetic fuels. If, on the other hand, only regeneratively produced energy sources are used in operation, the average value is between 9 and 16 tonnes of CO₂ for the entire service life of the vehicle. The remaining emissions then result mainly from the production of the vehicles, the production facilities and the infrastructure for the distribution of the energy sources. All in all, the average values of the results of this study show large differences between the individual studies, which often amount to many times the differences between the individual technologies. "There is no clear winning technology," summarizes Dr David Bothe of Frontier Economics. "Above all, however, the meta-study shows how great the uncertainty in life-cycle analyses still is at present."

For example, in none of the studies the GHG emissions resulting from the installation of the energy infrastructure were calculated down to individual vehicles. In addition, there are fewer than average results available on the influence of recycling - which can certainly improve the CO₂ emissions of battery production, for example - and the results, moreover, scatter widely. While vehicles with battery electric drives or conventional internal combustion engines were considered in almost all studies, only a quarter of all studies make statements on the overall balance of plug-in hybrid vehicles, which are expected to achieve a significant market share in the 2020s. Fuel cell passenger cars are also only

included in 22 studies. Valid results for the use of synthetic fuels are almost completely missing. "In addition, no one has yet investigated where mobility today, despite its harmful impact, may also contribute to climate protection," says Bothe. "For example, the rotor blades of a wind power plant are transported to their location by heavy-duty fossil-fuelled commercial vehicles across the country. In the electricity sector, these plants then avoid emissions. We find such cross-sectoral effects in many places in the economy".

Despite the considerable uncertainties, a general statement can be made: Only a valid life cycle-analysis allows an objective assessment of technological options. In particular, it is important to avoid reducing the emissions from operations assigned to the transport sector by assigning additional emissions to the energy or industrial sector. For example, the study uses a sample calculation to show that if electric mobility were to be introduced on a broad scale without accompanying measures, 90 percent of the cumulative CO₂ savings from passenger car transport could reappear in other sectors and regions by the year 2030, and would thus be of little benefit to climate protection.

The goal is clear: By 2050, road transport is to become climate-neutral. When determining which paths to follow to achieve this goal, one should also bear in mind the time dimension of one-off events, such as a narrow focus on a sector-specific annual target: Large one-off emissions could lead to an increase in emissions in other years and/or sectors and the total CO₂ budget calculated by the Intergovernmental Panel on Climate Change (IPCC) could be exceeded. FVV Managing Director Dietmar Goericke sums up: "From an academic point of view, the results of the meta-study simply only mean: We need more data and more detailed research as a basis for valid political decisions. To do this, we need to keep research open to any new technologies."

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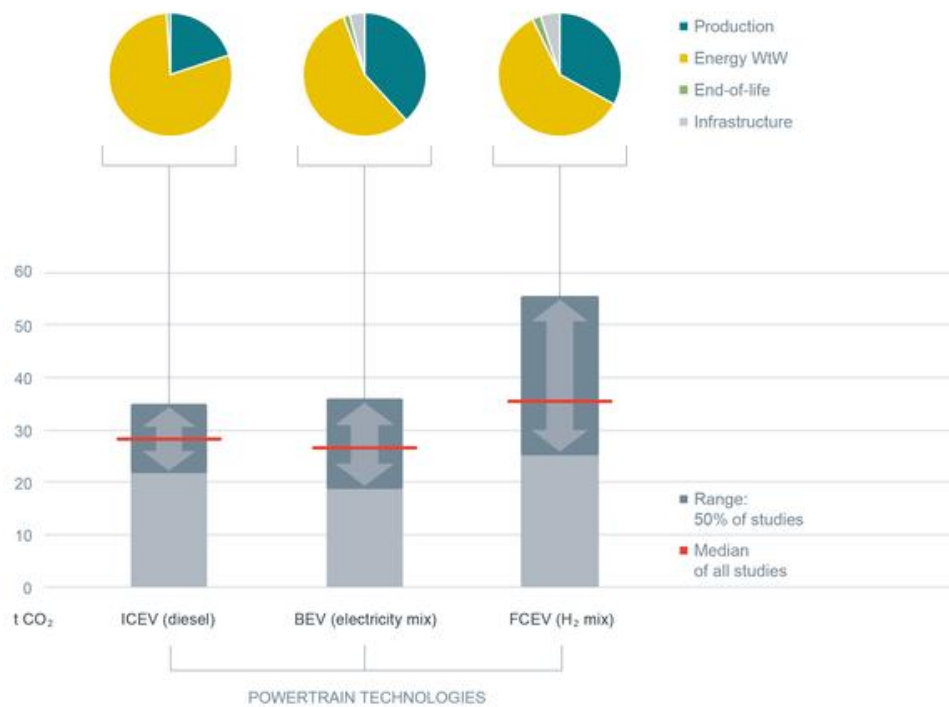
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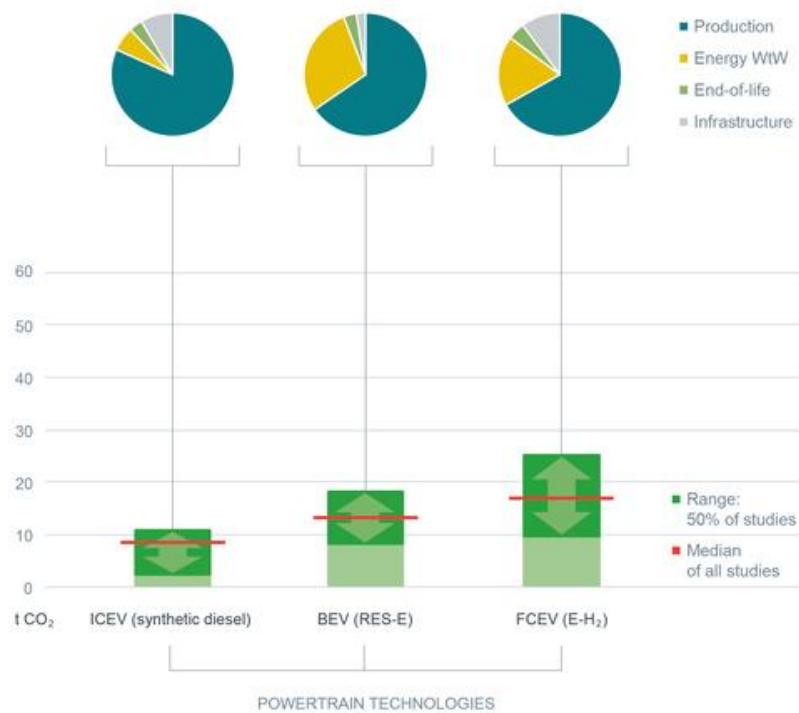
Research Association for Combustion Engines (FVV): Efficient use of the global CO₂ budget in the mobility sector - Four theories based on a meta-study on life-cycle analyses (Executive Summary | Thesis). Frankfurt/M., 2020

Research Association for Combustion Engines (FVV): Cradle-to-Grave Life-Cycle Assessment in the Mobility Sector - A Meta-Analysis of LCA Studies on Alternative Powertrain Technologies (Full Version | Expert Paper). Issue R595 | Frankfurt/M., 2020

Anhang Press release 21/07/2020 <http://idw-online.de/de/attachment80404>



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