THE FUTURE IS SUSTAINABLE
Electrification and minimising environmental impact
Mitigating climate change and air pollution

The European Union strives to make its economy carbon-neutral by 2050 as part of global efforts to mitigate climate change. The automotive supplier industry supports this objective and will contribute to achieving it by delivering technology solutions to reduce, and, under the right framework conditions, eliminate all vehicle emissions from passenger cars, light commercial vehicles (LCVs) and trucks.

Electrification of the powertrain is key in the medium term and the supplier community will play a leading role in further developing this propulsion technology. Electrification by no means implies a one-size-fits-all solution. On the contrary, the various levels of electrification enable optimum vehicle- and application-specific solutions, from small urban to long range vehicles. European suppliers lead the development of such systems, from mild to full and plug-in hybrids, with growing electric power output and reduced carbon emissions.

If the production of energy and the battery is taken into account, plug-in hybrids compete with battery electric vehicles for the smallest carbon footprint. By resolving the range limitation, plug-in hybrids may therefore be the bridge technology towards electric mobility. European suppliers also have a strong position in technology for full electric vehicles, for example, e-wheel drive and battery management systems. The industry aims to also lead in next-generation battery technology and expects the European Battery Initiative promoted by the European Commission as well as national strategies to support progress.

With the help of new and improved powertrain technologies, changed automotive usage models and a more efficient traffic and transportation infrastructure, the world can largely be rid of the air pollution created today at the point of use by passenger cars and commercial vehicles, specifically in urban environments. The European supplier industry supports a technology-neutral regulatory framework to ensure that the most efficient solutions prevail in the market. We develop technology for battery-electric propulsion, hybrid systems, fuel-cell technology, e-fuels, and other systems that will contribute to the goal of lowering mobility’s environmental impact.
Comparison between hybrid and all-electric powertrains

A hybrid vehicle contains both an electric and an internal combustion engine. The battery is charged via the engine during driving and also stores braking energy at the same time.

A plug-in hybrid electric vehicle can drive in full electric mode and be charged by the electricity grid. The battery also serves as storage for braking energy.

This is a battery electric vehicle with an auxiliary power unit, known as "range extender". This extender drives an electric generator that charges a battery supplying the vehicle’s electric motor with electricity.

The vehicle is powered entirely by the battery, which is charged via the grid.

The vehicle uses compressed hydrogen gas as fuel to generate electric power via a highly efficient energy converter, a fuel cell. The fuel cell transforms the hydrogen directly into electricity to power an electric engine.
Diversity in mobility requires variety of powertrain options

Efficient internal combustion engines will be a feature in personal mobility and goods transportation for decades to come. Even in 2030, automotive suppliers expect that up to 75% of all new vehicles will still contain a combustion engine, including as part of a hybrid solution. Therefore, even as electric vehicles grow in importance, there will continue to be a need to increase the efficiency of the traditional powertrain. European companies are world leaders in powertrain technology and their R&D and manufacturing operations in this important field sustain a highly skilled labour force across the EU. To make traditional powertrains more efficient, regulators also should look beyond the engine and strengthen the deployment of advanced bio-based and synthetic fuels to make combustion CO₂-neutral across the entire fleet.

Given the right framework conditions, which should include the supply of energy and raw materials from renewable sources, zero and low carbon fuels, such as advanced biofuels, contribute to reducing emissions. This is specifically relevant in, for example, air transport or heavy-duty vehicles, where full electrification may not be possible for all applications. Another useful characteristic of zero and low carbon fuels is that they can be used immediately across the entire vehicle fleet and not only in new vehicles. When determining the fleet-average CO₂ emissions of manufacturers, the emission-reduction impact of zero and low carbon fuels should be recognised. New accounting methods should be discussed when relevant regulations are reviewed and, in the area of emissions, a well-to-wheel (WtW) approach or life-cycle assessment (LCA) should be considered.

Reduction of CO₂ emissions of cars in the EU

<table>
<thead>
<tr>
<th>Year</th>
<th>Emission Reduction</th>
</tr>
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<tbody>
<tr>
<td>1995</td>
<td>-36% (NEDC)</td>
</tr>
<tr>
<td>2021</td>
<td>-37.5% (WLTP)</td>
</tr>
</tbody>
</table>

(Source: 4)
Progress in pollutant emission reduction

**Light-duty vehicles**

- **NOX Emissions**
  - PETROL and DIESEL
  - 94% reduction for PETROL
  - 92% reduction for DIESEL

**Heavy-duty vehicles**

- **NOX Emissions**
  - DIESEL
  - 95% reduction for DIESEL

Reduction of pollutant emissions

Automotive suppliers are proud to be able to deliver the technology to further reduce pollutant emissions from vehicles and support the establishment of ambitious but realistic standards for type approval and air quality. The further development of such standards - for example of a possible future EURO 7 norm and a revision of the Air Quality Directive - should be based on sound science and realistic targets.
This decade, there will be a clear focus on battery-electric technology, which is crucial in meeting emissions targets coming into force in the coming years. In the longer term, however, a broader approach is required, including hydrogen power and other technologies that only play a marginal role today. In this context, European suppliers have long argued in favour of a well-to-wheel approach rather than a tank-to-wheel approach for CO\textsubscript{2} standards legislation. Looking at the entire lifecycle ought to level the playing field for various drivetrain technologies, as it takes into account all emissions associated with a vehicle and not just a part of it. The European Commission is currently examining the potential contribution of life-cycle analysis to the regulation on emissions, which incorporates well-to-wheel (WtW). Some suppliers are already moving to implement LCA in their business. The industry supports the work that is currently undertaken on behalf of the Commission to develop a methodology for LCA. It is expected to be considered in the context of the review of the CO\textsubscript{2} regulation (2023 for cars, 2022 for HDV) and may be used in future regulation.

"In the area of emissions, we need to not just look at tailpipe emissions, but take a 'well-to-wheel' approach. We also need to look at the entire lifecycle of the automotive products from manufacturing all the way to recycling."

Olivier Rabiller, President and CEO, Garrett
Joining efforts to enable rapid electrification

The European Union has adopted the most ambitious targets for carbon emissions from vehicles worldwide. Numbers vary depending on the strategies chosen by manufacturers, but we assume that by 2030 a share of 40% of the vehicle fleet will need to be plug-in hybrid or fully electric in order to meet the fleet-average CO$_2$ target.

The rate of growth in electric-vehicle sales varies from country to country and depends on factors that are outside the control of the automotive industry. These include consumer confidence, the need for a better charging infrastructure and the current inability of the electricity grid to transmit sufficient amounts of renewable energy. Also, in the absence of higher electric-vehicle sales volumes, these cars continue to be expensive compared with traditionally powered vehicles. Hence, the total cost of personal mobility is likely to increase and there is a need for policy makers to consider a stronger contribution to the goal of realising the transformation towards electric mobility.

The review of the CO$_2$ standards for cars and vans in 2023 and for heavy-duty vehicles (HDVs) in 2022 should be seen as an opportunity to critically review the development of Europe’s charging infrastructure, the relatively low EV sales and the cost to consumers of electric mobility. The review provides a good opportunity to make some key decisions on ways to support the mobility transformation. Stepped up efforts to upgrade Europe’s EV charging infrastructure would be one important step. The reviews of the Alternative Fuel Infrastructure Directive and the Directive on Energy Efficient Buildings are opportunities to support the deployment of such an improved charging infrastructure.

Comparison of the EU’s CO$_2$ targets for cars and vans with similar regulations worldwide

<table>
<thead>
<tr>
<th>Region</th>
<th>2015 Target</th>
<th>2021 Target</th>
<th>2025 Target</th>
<th>2030 Target</th>
</tr>
</thead>
<tbody>
<tr>
<td>Europe</td>
<td>130 g/km</td>
<td>95 g/km</td>
<td>81 g/km</td>
<td>59 g/km</td>
</tr>
<tr>
<td>Japan</td>
<td>122 g/km</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>China</td>
<td>117 g/km</td>
<td></td>
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<tr>
<td>US</td>
<td></td>
<td>99 g/km</td>
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</table>

(Source: 5)
Global CO₂ emissions overview

Global anthropogenic emissions

- **Other**: 73.4%
- **Transport**: 26.6%
  - Marine: 10.7%
  - Road: 74.4%
  - Aviation: 11.6%
- **Other**: 3.3%

(Source: 7)

Light-weighting and advanced materials: key areas for innovation

Light-weight technology should be considered a full part of the integral low emission mobility strategy, and many automotive suppliers innovate and invest substantially in this field. Light-weighting has the potential to reduce CO₂ emissions in significant quantities. Each 10% reduction in vehicle weight, will generate a 6-8% improvement in fuel economy and energy efficiency.

Light-weighting can be used across the vehicle
Ambitious European CO₂ targets for 2030

To make this possible by 2030, 40-50% of Europe’s vehicle fleet will have to be

1. Plug-in hybrid (PHEV)
2. Fully Electric (BEV)

Emissions reduction

2018 2030

Electric car share

How to facilitate this?

- Consumer confidence in the technology
- Battery charging infrastructure
- Increase the sales in the mass market

“Energy efficiency is the point where climate action and profitability intersect”

Volkmar Denner,
CEO, Robert Bosch
Automotive suppliers acknowledge their responsibility to deliver products that are sustainable from cradle to grave and they extend this sustainability goal to their manufacturing operations.

As many raw materials are finite, sustainable resource use is key. Further innovation will be crucial to protecting the environment in general and in combination with our industry’s insight about depletion of resources. **Today already, more than 85% of the weight of vehicles that reach the end of their lifecycle is reused or recycled on average across the EU**. The auto industry has, thus, achieved the target set out in the End of Life Vehicles Directive. It is performing better in this respect than many other consumer goods sectors.

Recycled steel, glass and plastic have been used in the automotive supply chain for years. It is important that recycled materials fulfil the same criteria for safety and quality as virgin material. **A rigid legal obligation on the use of recycled material, e.g. plastic, may contradict such requirements and should be avoided.** In the upcoming review of the End-of-Life Vehicles Directive it will be important to ensure consistency in the regulatory framework, and to avoid overlap between regulations on the recycling of vehicles and other goods, such as electronic devices or batteries.

**Remanufacturing of parts and components has been around for decades and contributes to the circular economy** by restoring the functionality of an existing part in standardised industrial processes with the same warranty as a new part. Work continues on the harmonisation of definitions and legal standards in markets across the world but more progress is needed to support industrial remanufacturing.

The **REACH regulation** defines the framework for the use of chemical substances. **Legal certainty and transparency** in the further development of REACH is crucial for businesses to adapt long-term planning and production accordingly.
Actions on the road to zero carbon emissions

The European supplier community is developing a technology approach for the life of the vehicle and is aware that it needs to deploy different technologies for different mobility segments:

- Continuing to improve emission-reduction technologies.
- Investing heavily in alternative drivetrains, including hybrid drives, electric motors, battery and battery management technology and fuel-cell.
- Working to introduce energy-efficient multi-modal and autonomous mobility concepts such as robo-taxis, shared people carriers, etc.
- Collaborating with automakers and city, regional, national and supranational regulatory bodies to develop a more efficient traffic and transportation infrastructure.

- Seeking ways to improve supply chain and resource efficiencies and better methods to reuse and recycle materials as well as remanufacturing of parts and components.
- Researching and deploying new forming and joining technologies, and innovative materials, including lightweight and biobased materials.
- Collaborating with energy and utility providers to help connect transportation to more efficient fuel and greener power options.
Promoting a regulatory framework that **rewards efficiency** and emissions reduction in a technology-neutral framework, e.g. well-to-wheel approach and life cycle analysis.

**Adopting incentives** aimed at rapidly creating demand for electrified and electric vehicles as well as the necessary charging infrastructure, e.g. in the Directives on Alternative Fuel Infrastructure, Energy Efficient Buildings and Renewable Energy Directive.

Promoting solutions for a **secure hydrogen distribution** infrastructure.

Reducing national and regional divergences for electric mobility: charging infrastructure, standardisation of charging infrastructure, price differences etc.

**Developing standards for emissions of vehicles** and air quality which are ambitious but realistic and based on sound scientific evidence.

Ensure a reliable and transparent regulatory framework on remanufacturing, resource use and recycling that does not interfere with requirements on material quality and safety.