ACEA

European
Automobile
Manufacturers
Association

ACEA Position Paper

Future CO_2 standards for heavy-duty vehicles

April 2018

ACEA European Automobile Manufacturers Association

EXECUTIVE SUMMARY

From 2019 onwards, all EU manufacturers of heavy-duty vehicles will use the same, certified VECTO calculation tool to declare and report (in a comparable way) the tail-pipe CO_2 emissions of each vehicle that they build which belongs to vehicle group 4, 5, 9 or 10. VECTO will increase transparency for customers and will allow manufacturers to show the benefits of their product offerings in an objective way; thereby stimulating competition in the truck market.

Currently, the European Commission is developing CO_2 standards for heavy-duty vehicles based on these VECTO values. The following key points must be considered when setting such standards:

- Given that VECTO calculates CO_2 emissions based on a wide variety of 'transport missions' in order to provide relevant customer information, future CO_2 standards will only be relevant if they are based on the most common mission of a particular vehicle.
- The Commission must commit to continue updating VECTO in the future to include the latest CO_2-reduction technologies. VECTO should be updated to incorporate hybrid and electric drivetrains, dual-fuel engines, predictive cruise control, waste heat recovery, eco-roll, etc.
- Any future CO_2 standards should be set for the entire heavy-duty vehicle; separate targets for components (such as the gear box, air drag or engine) might not lead to cost-effective solutions.
- A realistic ambition level for the first period of the regulation (2019-2025) would be a tail-pipe CO_2 reduction of 7% (the first VECTO values for setting a 2025 target will be available in 2019).
- A total 16% CO_2 reduction between 2019 and 2030 would be challenging but possible, provided that VECTO is updated regularly to reflect new technological developments.
- It is vital that the reduction targets and the associated baseline are established well in advance to give manufacturers sufficient lead-time.
- Manufacturers also believe that the 2030 target should be validated in 2022 to take into account the latest fuel efficiency technologies and the CO_2 performance of future heavy-duty vehicles.
- In the long run, the potential benefits of a well-to-wheel approach should also be considered, given the importance of an integrated approach to further reducing CO_2 from trucks.

10 KEY RECOMMENDATIONS

1. Ensure consistency between climate and air quality policy
2. Guarantee robustness of the baseline
3. Define ambition level and timing for 2025 and 2030
4. Reflect diversity of the market
5. Provide flexibility: banking and trading of CO_2
6. Continue to update the VECTO simulation tool
7. Incentivise low- and zero-emission vehicles with a super-credit system
8. Focus on the entire vehicle, not components
9. Be consistent with metrics
10. Introduce on-road verification tests

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INTRODUCTION

European heavy-duty vehicle manufacturers are world leaders in improving the environmental performance of their trucks. Over the past 25 years, the industry has achieved dramatic decreases in pollutant emissions from heavy-duty vehicles. Indeed, pollutants such as nitrogen oxides (NOx) and particles (PM) have been slashed to near-zero levels since 1991: NOx -95% and PM -98%.

In parallel, truck makers have also made great strides in reducing CO_2 emissions. On average, EU manufacturers have managed to cut CO_2 emissions by 1% per year. Per tonne transported, this innovation has resulted in a fuel consumption of as little as nearly one litre of fuel per 100 tonne-km, delivering a significant CO_2 reduction. And, of course, the heavy-duty vehicle industry remains committed to continuing to lower CO_2 emissions in the future.

To put these figures in context, transport is currently responsible for around a quarter of total EU CO_2 emissions, with road transport representing 17.8% of total emissions, arising from the use of vehicles. Of this, all heavy-duty vehicles in Europe combined account for 5% of Europe's greenhouse gas emissions, while they are responsible for carrying 75% of all land-based freight.

In May 2018, the European Commission is expected to come forward with a legislative proposal on regulating CO_2 emissions from new heavy-duty vehicles. These new CO_2 standards would come on top of the mandatory declaration of truck CO_2 emissions using VECTO, as well as the monitoring and reporting of those results by manufacturers.

Concretely this means that, from 2019 onwards, all manufacturers of heavy-duty vehicles will use the certified VECTO calculation tool to declare and report the CO_2 emissions from a wide variety of complete truck and trailer configuration (ie those belonging to vehicle groups 4, 5, 9 and 10 to start with). VECTO increases transparency for customers and allows manufacturers to show the benefits of their product offerings in an objective way; thereby stimulating competition in the truck market. As for the future framework, the European Automobile Manufacturers' Association (ACEA) believes that CO_2 standards for heavy-duty vehicles should be based on the following key pillars:

- CO_2 standards should be combined with an integrated approach that looks at all variables influencing truck CO_2 emissions, instead of only focussing on new vehicle technology.
- The European Union should define its own approach to CO_2 standards for trucks.
- Focus should be on the entire heavy-duty vehicle and not on single components.
- Any credible baseline for future standards must be based on VECTO-generated CO_2 data.

With this position paper, ACEA wants to contribute to the ongoing discussions on the future CO_2 regime for trucks by making 10 key recommendations (pages 6-10) for the regulatory framework. However, before elaborating on those recommendations, this paper will first set the scene by providing the necessary context.

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CONTEXT

TRUCKS ARE DIFFERENT FROM CARS AND VANS

Most heavy-duty vehicles are custom-built to meet the specific requirements of customers, who use them for a wide variety of different 'missions'. There are literally thousands of shapes and sizes of trucks, from the number of axles to the size of the engine and fuel tank, to the size of the cab or the height of the chassis.

Considering the complexity of the truck market, introducing legislation suitable for all variations will be challenging. There simply is no 'one-size-fits-all' approach for heavy-duty vehicles. Trucks are not big passenger cars. So, CO_2 reduction policy for heavy-duty vehicles should not follow the same approach as that for passenger cars.

IMPORTANCE OF FUEL EFFICIENCY TO TRUCK CUSTOMERS

Heavy-duty vehicles are economic goods, which makes fuel efficiency a key element in the purchase decision. Fuel represents around 30% of the running costs in the transport sector. Given the competition between transport service providers for goods and people, strong economic incentives already exist for fuel efficiency improvement.

In this respect, VECTO provides a credible, standardised way of comparing fuel efficiency (and thus CO_2 emissions) between trucks of all brands.

TECHNOLOGY NEUTRALITY

It is crucial to give manufacturers of heavy-duty vehicles the necessary flexibility to select the best (combination of) technologies to meet CO_2 reduction objectives. Competition between different solutions and manufacturers will encourage innovation, resulting in the most cost-efficient pathway to the decarbonisation of road freight transport.

Moreover, there is no one technology suitable for all circumstances. What might be the right option for long-haul transport may not necessarily be the best solution in another use case. Also in this respect, the complexity of the truck market and technology neutrality should be respected.

ALTERNATIVE POWERTRAINS/FUELS AND MARKET REALITY

EU truck manufacturers are committed to finding the best powertrain solution for the specific use profile of each customer, but this will require a coordinated approach and continued understanding between policy makers and industry. In order to provide certainty to truck makers that want to further invest in alternative powertrains, and to customers that are interested in buying such vehicles, all EU member states will have to invest in adequate refuelling and recharging

infrastructure – alongside motorways and national roads, but also in urban areas. It will also depend on the availability of supportive schemes and incentives to stimulate sales of alternatively-powered trucks.

The transition from diesel to alternative powertrains for the heavy-duty segment will happen at a very different pace than with light-duty vehicles, such as passenger cars. Trucks literally cover thousands of different use cases. What might work for one vehicle in a specific context, will not work in another situation. The Renewable Energy Directive (2009/28/EC) lays the foundation for evaluating the climate impact of alternative fuels for heavy-duty vehicles.

It is crucial that policy makers adopt a technology-neutral approach. For the time being, diesel remains the powertrain of choice for heavy-duty vehicles, with 98% of all trucks powered by this technology. Diesel offers low fuel costs and high mileage, ensuring a long range between stops. It also provides high pulling power, which improves load-carrying and towing: crucial for the transport of heavy goods.

IMPACT OF OTHER EU LEGISLATION ON CO_2

Clean Vehicles Directive

Criteria for heavy-duty vehicles to qualify for quotas under the Clean Vehicles Directive should be realistic. All efficient powertrain and fuel options must be considered, both alternative ones and modern combustion engines.

General Safety Regulation

The impact of new safety requirements (adding extra complexity and cost to the vehicle) on the CO_2 performance of trucks should be carefully considered in order not to jeopardise future CO_2 targets. The timeline foreseen for the introduction of such safety requirements should be in line with the timing and development of the CO_2 regulation.

Weights and Dimensions Directive

More aerodynamic cabins should be part of the 'toolbox' that manufacturers can use to further reduce the fuel consumption of heavy-duty vehicles. In addition, alternative powertrain options – plus the additional space and weight they require – must be considered properly as well. Further regulatory action is needed to make this possible.

Revision of the Eurovignette Directive

ACEA welcomes the revision of the Eurovignette Directive, including the European Commission's proposal to introduce a CO_2 differentiation of charges for heavy-good vehicles as a means to incentivise the market uptake of the cleanest vehicles. Manufacturers of heavy-duty vehicles support this, provided that any such differentiation is introduced in a 'neutral way', ie with no increase in the total amount of toll revenue collected from the transport industry.

INTEGRATED APPROACH IS THE WAY FORWARD

To accelerate the reduction of CO_2 emissions from heavy-duty vehicles, we need to move beyond new vehicle technology alone by also looking at how vehicles are used. Firstly, because new vehicles represent such a small fraction of the fleet, it is important to look at the entire vehicle fleet rather than just new vehicles.

Secondly, there are many other factors than just the vehicle that determine CO_2 emissions – such as permitted vehicle length and weight, trailer design, regulations, alternative fuels and powertrains, driver behaviour, infrastructure, and better utilisation of the vehicle (for example load optimisation). Not to mention the enormous potential of intelligent transport systems, connectivity and automation; with truck platooning being a great example of what can be done.

As part of a more integrated approach to reducing CO_2 emissions from heavy-duty vehicles, ACEA suggests that the Commission explores setting enabling conditions for alternative fuels – such as gas, biofuels, synthetic fuels, power-to-X technology, electricity, etc – by exploring the potential benefits of a well-to-wheel approach.

If we want to reduce CO_2 emissions from road freight transport in the most effective way, we should not only focus on setting CO_2 standards for heavy-duty vehicles, but instead have to draw on the full spectrum of solutions available. Hence, a truly integrated approach is the best way forward.

10 KEY RECOMMENDATIONS

1. ENSURE CONSISTENCY BETWEEN CLIMATE AND AIR QUALITY POLICY

Reducing pollutant emissions requires conflicting measures to reducing CO_2 emissions. This 'technological trade-off' makes it extremely difficult to decrease CO_2 emissions and pollutants simultaneously. The EU truck industry believes that it is possible to deliver the CO_2 reductions proposed under the third recommendation of this paper (see below), provided that the current Euro VI emission standard remains in place up until 2030 (ie no further intermediate steps beyond Euro VId). Any changes to today's Euro standard would pose significant challenges to meeting future CO_2 targets.

2. GUARANTEE ROBUSTNESS OF THE BASELINE

In order to ensure that future CO_2 standards for heavy-duty vehicles are calculated properly and that they will deliver CO_2 reductions in practice, these standards need to be based on a statistically solid baseline. In this respect, certified procedures and VECTO are important instruments to ensure the transparency of the process, allowing for data comparability across vehicles and manufacturers.

The VECTO computer simulation tool models CO_2 emissions from a wide variety of trucks. It can provide vehicle-specific CO_2 figures for various mission profiles, considering factors such as specific usage patterns, vehicle configurations and payloads.

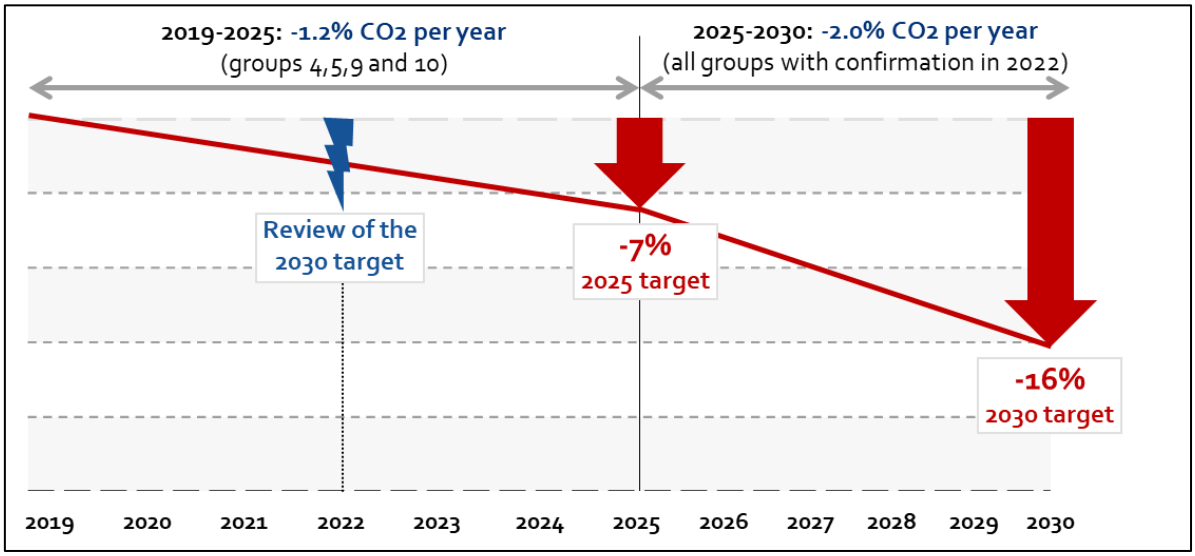
The upcoming EU legislation on the certification of CO_2 from heavy-duty vehicles will require a mandatory declaration of CO_2 values for each truck using VECTO. That is why, when it comes to setting future CO_2 standards, any credible baseline for future limits must be based on VECTO-generated CO_2 data (starting in 2019, with the first official data available at the beginning of 2020).

3. DEFINE AMBITION LEVEL AND TIMING FOR 2025 AND 2030

ACEA members believe that the following timing and ambition levels for future CO_2 standards for heavy-duty vehicles are achievable at a high, but acceptable, cost. Nevertheless, the extremely short lead-time should be taken into account when setting the 2025 standard, especially given that the product development of heavy-duty vehicles to be sold in 2025 is already underway.

- A 2025 CO_2 reduction of 7% (ie -1.2% per year) for vehicle groups covered by the scope of the mandatory CO_2 declaration in 2019 (vehicle groups 4, 5, 9 and 10 – covering 80% of EU fleet emissions); based on a 2019 baseline calculated according to certified procedures and VECTO.
- A 2030 CO_2 reduction target of 16% (ie -2% per year from 2025 to 2030) for all vehicle groups covered by the scope of the mandatory CO_2 declaration. This target would be based on the 2019 baseline and should be validated in 2022.

This validation of the 2030 target in 2022 would allow one to take into account the CO_2 performance of vehicles at that point in time (as declared through VECTO) as well as the latest fuel efficiency technologies made available by then.



4. REFLECT DIVERSITY OF THE MARKET

Future CO_2 standards for heavy-duty vehicles should take into consideration the different configurations and cycles of vehicles. Hence, a specific baseline has to be set for each vehicle sub-group to which the reduction target should be applied, combined with flexibilities such as banking and trading of CO_2 (see recommendation five).

Such a system would ensure a fair approach to delivering CO_2 reductions across the fleet, while in parallel reflecting the complexity and diversity of the market and use cases. It also makes sure that all manufacturers share the responsibility to reduce CO_2 and that there is no discrimination with regard to the product portfolio of a particular manufacturer.

That is why the cycles used for setting the limits should be as close as possible to the EU 'real world' situation of each vehicle sub-group, allowing for the fleet reduction targets to be distributed equally over the various vehicle sub-groups. Each vehicle sub-group should be defined in a way that:

- Matches reality and is credible; sub-groups should be defined based on the main real-use conditions/applications according to the mission of the vehicle (cycle, load, etc).
- Ensures that there is a representative number of sub-groups. Enough to:
    - Differentiate between technologies and specifications, in function of the use cases and the missions concerned (eg consider separate sub-groups for high-capacity vehicles, such as the European Modular System).
    - Allow for fair targets for different manufacturers with different portfolios.
- Guarantees that definitions are robust, both today and in light of future product changes.
    - Boundaries and loads/cycles should be robust in the short term but should also allow for

adjustments in the future.

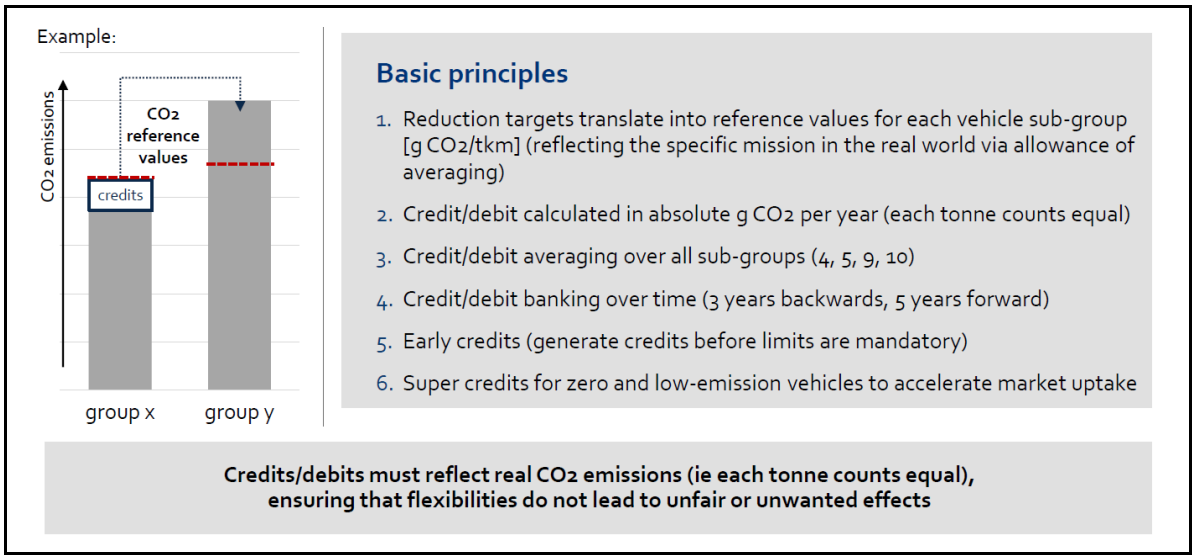
The EU truck industry believes that this approach is the most workable and reasonable way forward; it helps to avoid distortion of the market on the one hand, and allows for a single fleet ambition level on the other.

Flexibilities should be provided for the different vehicle groups and sub-groups, by enabling the transfer of CO_2 credits and debits between the groups. For each sub-group, a reference value has to be set as the baseline and the defined fleet ambition level should be applied accordingly.

5. PROVIDE FLEXIBILITY: BANKING AND TRADING OF CO_2

Flexibility should be provided by means of a credit system, with CO_2 credits and debits being calculated on the basis of absolute tonnes of CO_2 for each single vehicle and allowing for averaging over all vehicle sub-groups. The generated credits and debits could then be used within a certain time frame (valid three years backwards and five years forward), which would enable manufacturers to make large steps in reducing CO_2 through new product offerings with intervals of more than one year. Such a credit system would also reflect the long product cycles and development time of heavy-duty vehicles in a meaningful manner.

Applying the above-mentioned system to the various vehicle sub-groups in the portfolios of Europe's truck makers would guarantee an equal distribution of efforts among all, as well as being the best way to meet CO_2 emission targets and market demand at the same time.



6. CONTINUE TO UPDATE THE VECTO SIMULATION TOOL

As explained before, the baseline for future CO_2 standards should be based on VECTO-generated data. That is why it will be crucial that VECTO is updated regularly in the future in order to incorporate new technologies that will be introduced by truck makers to deliver on the CO_2 targets. Robust updates of VECTO will provide strong incentives for truck manufacturers to put cutting-edge

technology in their vehicles – thereby stimulating further CO_2 reductions and encouraging customers to buy the most-efficient vehicles. However, this would require a well-defined process with a clear timeline.

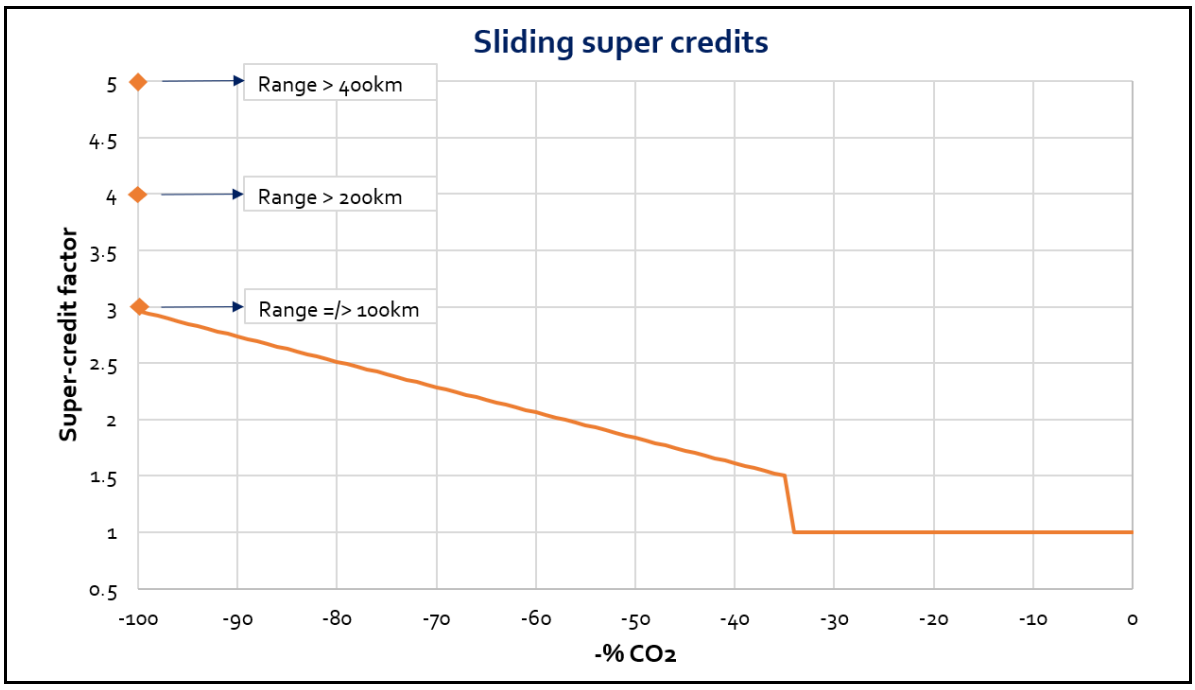
ACEA recommends that VECTO is reviewed on an annual basis. Already now, technologies such as hybrid and electric drivetrains, dual-fuel engines, predictive cruise control, waste heat recovery and eco-roll are not accounted for. A first update to bring VECTO on par with current technology would be possible in 2020 for vehicle groups 4, 5, 9 and 10. From 2023 onwards, VECTO should be updated for all vehicle groups.

These updates should go hand in hand with the 'ECO feature' process. When a truck manufacturer wants to introduce a new feature to reduce CO_2, without having to reveal it to its competitors, the ECO feature process should be used to confirm the fuel reduction benefit. Once an ECO feature has been approved and published, it should be added to VECTO as soon as possible.

7. INCENTIVISE LOW- AND ZERO-EMISSION VEHICLES WITH A SUPER-CREDIT SYSTEM

Low- and zero-emission vehicles (LEVs and ZEVs) can make an important contribution to the decarbonisation of road freight transport, but they need to be incentivised in order to accelerate the market uptake of these innovative but very costly powertrains, and to enable customers to afford them. A system of 'super credits' (which give extra weighting to LEVs and ZEVs, ie these vehicles would count for more than one unit in reaching the targets) is the most effective approach to incentivise the market uptake of low- and zero-emission vehicles.

The image below provides an overview of how the super-credit system should work.



In short, super credits should apply to vehicles emitting at least 35% less CO_2 than the reference value of each vehicle sub-group (derived from a 2019 baseline). Above 35%, the super-credit factor should be increased in a linear way according to the percentage CO_2 reduction. The CO_2-reduction rate of LEVs and ZEVs has to be calculated based on the VECTO mission-profile cycles.

8. FOCUS ON THE ENTIRE VEHICLE, NOT COMPONENTS

Any future CO_2 standards for heavy-duty vehicles should focus on the entire vehicle or vehicle combinations (according to the definition in VECTO) and not on single components; this is the most cost-effective approach. Component-based CO_2 standards, such as standards for engines, can even have a negative impact on the net CO_2-reduction of a vehicle, as such standards do not properly reflect how the components are being used (and perform) in the real world. Moreover, some of the latest innovations (such as hybrid powertrains and sophisticated gear boxes) deliver significant CO_2 reductions, but would not be properly considered using a component-based approach.

9. BE CONSISTENT WITH METRICS

To be coherent with the metrics used for the mandatory declaration of CO_2 emissions from heavy-duty vehicles based on the VECTO calculation tool, future CO_2 emission standards must refer to the work done by the vehicle. Standards should therefore be defined using the following metrics: g/t*km or g/m3*km for heavy-goods vehicles, and g/passenger*km for heavy-passenger vehicles.

10. INTRODUCE ON-ROAD VERIFICATION TESTS

The European Commission is currently developing an 'on-road' verification test procedure (VTP) for heavy-duty vehicles to check if the parameters provided for the VECTO calculations match with reality.

Industry supports this activity as a verification of the concept selected by the Commission to simulate the CO_2 performance of complete vehicles and vehicle combinations based on the assumptions used with respect to their configurations and missions. However, it is unacceptable to consider this as a conformity of production (CoP) activity for which manufacturers are responsible, as these are not based on type-approval requirements.

There will indeed be differences between the results of such an 'on-road' test and the calculations made by VECTO, considering that the on-road test may be affected by weather conditions (eg wind and humidity), road infrastructure, traffic, driving style, etc. The objective of the VTP is thus not to compare the initial calculated and certified CO_2 values of the vehicle with its on-road performance, as both use different metrics and are based on other cycles.

Instead, ACEA believes that the main purpose of the VTP is to check the validity of the VECTO approach and to verify that this method correctly simulates the performance of complete heavy-duty vehicles. What is more, it may also help to identify necessary updates of VECTO as well as updates of the component certification methods.

European Automobile Manufacturers Association

ABOUT ACEA

- ACEA represents the 15 Europe-based car, van, truck and bus manufacturers: BMW Group, DAF Trucks, Daimler, Fiat Chrysler Automobiles, Ford of Europe, Honda Motor Europe, Hyundai Motor Europe, Iveco, Jaguar Land Rover, PSA Group, Renault Group, Toyota Motor Europe, Volkswagen Group, Volvo Cars, and Volvo Group.
- More information can be found on www.acea.be or @ACEA_eu.

ABOUT THE EU AUTOMOBILE INDUSTRY

- 12.6 million people – or 5.7% of the EU employed population – work in the sector.
- The 3.3 million jobs in automotive manufacturing represent almost 11% of EU manufacturing employment.
- Motor vehicles account for almost €396 billion in tax contributions in the EU15.
- The sector is also a key driver of knowledge and innovation, representing Europe's largest private contributor to R&D, with more than €50 billion invested annually.
- The automobile industry generates a trade surplus of about €90 billion for the EU.

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