European
Automobile
Manufacturers
Association

ACEA Position Paper

Views on proposals for Euro 7 emission standard

December 2020

ACEA European Automobile Manufacturers Association

EXECUTIVE SUMMARY

- **CLOVE proposals presented to AGVES[1] on 27 October 2020**

  The proposals presented by the CLOVE consortium in AGVES are, to the greatest extent, technically infeasible for vehicles with combustion engines. They have not been subject to any impact assessment or peer review.

- **Air quality**

  Independent air quality studies show the emissions limit scenarios and Real Driving Emissions (RDE) boundary conditions proposed by CLOVE[2] to be contrary to the principle of proportionality, which the Commission must follow.

- **Measurement uncertainty**

  Current Portable Emissions Measurement Systems (PEMS) devices show an absolute measurement uncertainty that is of the same order of magnitude as the proposed emissions limits. On the basis of today's knowledge, such emission limits could not be legally assessed with the necessary level of certainty during on-road testing.

- **Impact assessment and economic viability**

  Although costs must be addressed later in the form of a robust impact assessment, any scenario for a future regulation considered in such an impact assessment must actually be credible for the assessment to have any value.

- **Green Deal and industry competitiveness**

  The implementation of Euro 7/VII, the Green Deal and pathways to the de-fossilisation of road transport must continue to facilitate the competitiveness of the automotive industry in Europe and its place as a globally-leading industry.

  What we have seen so far as proposals for Euro 7 (even with claims they do not represent a final Commission proposal) have not been developed with adequate levels of transparency or debate and would risk industry competitiveness by asking it to bet the house on two massively expensive pathways with limited potential return on investment in internal combustion engines (ICE). In the end, customers and operators will pay, if they can and if vehicles are there.

- **Simplification**

  Simplification would be welcomed by all parties but should not be focussed solely on the legislative documentation to the dis-benefit of the processes and should not introduce unnecessary costs for mobility that consumers will have to bear.

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[1] Advisory Group on Vehicle Emission Standards (AGVES), a stakeholder group chaired by DG GROW of the European Commission.

[2] CLOVE is the Commission consortium of consultants tasked to work on Euro 7.

INTRODUCTION

The European Automobile Manufacturers' Association (ACEA) represents the 16 major Europe-based car, van, truck and bus manufacturers, so its members will be the ones in the frontline when it comes to implementing any potential new Euro 7 and Euro VII regulations. Therefore, ACEA and its members have duly attended all of the Advisory Group on Vehicle Emission Standards (AGVES) meetings and contributed to all of the many consultations launched either by the European Commission or by its CLOVE consortium.

ACEA already published some first views[3] on the overall AGVES process and made a series of key recommendation that aimed to encourage discussions toward a fair, effective and proportionate Euro 7/VII proposal. This position paper now provides a concise summary of the main issues and a more detailed picture of ACEA's considerations vis-à-vis the ongoing discussions and recent developments seen in AGVES on 27 October 2020, where CLOVE presented more concrete proposals and scenarios for Euro 7/VII emission limits and testing procedures were presented.

IMPACT ON AIR QUALITY

The aim of pollutant emissions legislation is to bring environmental benefit by helping reduce, for what road transport is responsible, the concentration of pollutants where levels are too high and endanger human health. ACEA fully supports the aim to adopt adequate measures to improve air quality in the EU, but in the most cost-effective and proportional manner.

As the Treaty on European Union states[4], any such measures that would be taken to handle a problem – that still needs to be analysed and quantified – must be proportionate. In order to achieve this basic and key principle of the Treaty, ACEA and other stakeholders in AGVES have asked the Commission to conduct an air quality analysis. The purpose of that would be to quantify the contribution of road transport to ambient air pollution and determine if a future pollutant emission standard could bring any more cost-effective benefit compared to what the current legislation is delivering through fleet renewal by very clean Euro 6d and Euro VI-E vehicles. Likewise, the analysis should not ignore the fact of increasing electrification of road transport that will come about in order to meet future CO_2 targets already defined and to be defined in the next couple of years.

Unfortunately, such a request continues to be ignored and it remains disappointing that neither CLOVE nor the Commission has presented any air quality assessment during any of the AGVES discussions.

ACEA therefore decided to conduct a detailed air quality modelling study with a team of well-known

[3] https://www.acea.be/uploads/publications/ACEA_Position_Paper-Principles_potential_post-Euro_6_post-Euro_VI_emission_regulations.pdf

[4] For example, see Treaty on European Union; Title 1, Common Provisions, Article 5 and Treaty on the Functioning of the European Union; Protocol (No 2) Article 5 on the application of the principles of subsidiarity and proportionality.

experts in the field. We have been completely upfront and transparent with the assumptions and scenarios in that study and we offered all AGVES stakeholders the possibility to contribute, for instance to suggest potential Euro 7/VII scenarios. NGO stakeholder comments and scenarios have been included in the study.

The aim of the study is twofold. Firstly, the study analyses the impact that fleet turnover by the cleanest Euro 6/VI vehicles, plus the impact of the move towards electrification, will have on overall emissions of the road transport sector and for ambient air quality limit value compliance. Secondly, it tests if potential Euro 7 emission limit scenarios would have any additional beneficial impact on ambient air quality limit value compliance. The study will look at nine cities across the EU28 and a major international transport route through to 2035.

Some first findings have already been presented during AGVES and the final results will be presented in a focused way during the November AGVES. The full study will be made public later this year but the analysis performed so far suggests that the replacement of the oldest vehicles with new Euro 6d and Euro VI-E vehicles – along with the increasing uptake of zero-emission vehicles (that may even accelerate further due to the European Green Deal and review of the CO_2 regulations) – shows very promising results, and even the most severe Euro 7/VII scenarios would bring only marginal benefits. The next step is to look at the cost-benefit analysis.

These findings already seriously challenge the ongoing approach from the Commission and suggest that the principle of proportionality is being ignored in the existing activity. ACEA therefore urges the Commission to conduct an analysis of the impact that potential new emission standards would actually have on air quality and to demonstrate their cost-benefit in an open and transparent way.

EUROPEAN GREEN DEAL

ACEA has committed to the European Green Deal[5] and also endorsed the 2030 Climate Plan presented by the Commission in September 2020. These long-term roadmaps will require massive investments from industry to deploy a full range of zero- and low-emission vehicles in the coming years.

While the clear ambition target of carbon-neutrality was set to 2050, the co-legislators already agreed in 2019 on ambitious CO_2 targets for 2025 and 2030. However, the new 2030 Climate Plan will aim to accelerate even more this shift toward alternatively-powered mobility by 2030. The Commission for instance foresees that by 2030 a majority of new cars sold would have to be zero- and low-emission models. Therefore, this would even further reduce the contribution a Euro 7/VII regulation introduced between 2025 and 2030 could have on air quality.

ACEA calls on the Commission to not regard Euro 7/VII in isolation but to take a comprehensive approach that would set a clear roadmap towards achieving carbon neutrality that does not

[5] https://www.acea.be/publications/article/paving-the-way-to-carbon-neutral-transport-10-point-plan-to-help-imple

jeopardize the competitiveness of EU industry nor its ability to invest into new technologies.

CLOVE PROPOSALS

A detailed analysis of the suggestions made by CLOVE on 27 October 2020 would require a thorough analysis via a proper scientific paper presenting all test results and assumptions taken and therefore more time. Therefore, at this time ACEA will only comment on some of the most challenging proposals presented by CLOVE.

Testing procedures

The requirements for on-road testing (RDE for light-duty and PEMS-ISC for heavy-duty vehicles) have been extensively discussed and debated over the past decade, the current provisions have been shown to be robust and are delivering excellent results through effective control of pollutant emissions from vehicles where it really matters – on the road.

A point that is often overlooked is that vehicle manufacturers have to ensure compliance at the extreme boundaries of RDE testing and thereby achieve emissions values (or design targets) in normal use that are well below those indicated by the limit values. This is of course no indication that such values can be achieved in all cases of vehicle use, and even the cases of abuse as presented by CLOVE. These provisions have also been the strong basis for international harmonisation and today many global regions follow EU rules for on-road testing.

CLOVE has presented drastic changes without any proper demonstration of the flaws of the existing on-road testing provisions in EU Regulations. For instance, the Euro 7/VII on-road test would, according to the proposal, contain no minimum average speed, sensible limitations of positive elevation gain, maximum altitude or v*apos. The proposal basically aims to impose absolute emission controls under any possible driving event, however infrequent and at whatever cost.

The existing provisions for on-road compliance testing were cast into legislation in the first place for a good reason and therefore any massive upheaval of such measures should be thoroughly justified in terms of technical feasibility and statistical relevance of the driving conditions and should protect the manufacturer from having to ensure compliance under, for example, misuse conditions.

On-road testing has been a major breakthrough for the EU legislation and ACEA fully supports the Commission's aim to make it the backbone of possible Euro 7/VII regulations. However, on-road testing must represent conditions having the most statistical relevance for driving across the EU and should not be understood as any condition that could theoretically occur.

Without applying proper statistical considerations, vehicles would be designed for the absolute worst-case driving scenarios (eg someone living in an isolated place at the top of a mountain, towing a trailer in winter conditions) and all EU citizens from 27 different member states would unfairly have to bear the high additional cost despite new vehicles providing no additional benefit to their 'normal' use case. Such an approach breaches the principle of proportionality.

While the current provisions for on-road testing might offer room for improvement, a simple unjustified deletion of necessary boundaries cannot be a constructive way forward and, due to its technical infeasibility, renders all associated proposals for emissions limits unrealistic. ACEA therefore calls on CLOVE and the Commission to reconsider the suggested approach.

Limit scenarios

Besides the suggested new testing conditions CLOVE also presented new emission limit scenarios to be investigated for the Euro 7/VII proposal the Commission aims to make in 2021.

Only two scenarios were presented for light-duty (LD) vehicles and two scenarios for heavy-duty (HD) vehicles. While today the heavier N1 vehicles (class II & III) have different limits than passenger cars, it is surprising the proposal made no reference to those vehicles. These vehicles are the backbone of our delivery system and their higher utility must be recognised by the legislation to allow them to exist and prevent a market distortion. It is environmentally beneficial to have one big N1 rather than two smaller N1 vehicles delivering goods, ACEA believes that this must continue to be reflected in new emission limit proposals.

Initial analysis would conclude that both of the scenarios presented are technically infeasible. Even with a more realistic concept for RDE testing, which would consider the representativeness of the testing conditions, Scenarios B in both cases LD and HD are completely infeasible for the entire fleet. They would therefore result in massive market distortion, an unacceptable (to the customer) reduction in vehicle usability – eg trailer towing and an increased retention of older vehicles in the fleet. Scenarios A need much further analysis of feasibility but would lead to the elimination of many smaller vehicle models. Importantly, considering the limitations of PEMS measurement uncertainty, Scenario A appears fundamentally infeasible.

The proposal that "in the case of heavy-duty vehicles, the proposed [minimum] trip duration [kWh]" of "0.5 x WHTC reference work", including a cold start at -10°C, would mean that the proposed emission limits apply more or less to the cold start phase. Such a massive weighting of emissions to the cold-start phase would be highly disproportionate and beyond reality compared to the normal use cases of commercial vehicles for goods or passenger transport. This would definitely lead to a negative impact on fuel consumption and emissions of CO_2.

These scenarios also introduce limits for non-pollutant greenhouse gases such as N_2O or CH_4 while other greenhouse gases, such as CO_2, are not limited for an individual vehicle by the European legislation.

The new proposal also sets limits for particles (PN) based on SPN 10 (particles sizes down to 10nm) while the current baseline is set on SPN23. Hence, the actual reduction is much higher than the numerical limits suggest, as this new requirement would simply lead to more particles being counted. Furthermore, the limits suggested are to be met under a much wider range of testing conditions compared to the existing framework, for instance including particle filter regeneration

events.

TECHNICAL FEASIBILITY AND ECONOMIC VIABILITY

While not discussing under this paragraph the actual impact the presented scenarios would have on air quality, ACEA believes that the emission limit scenarios presented by CLOVE, coupled with the suggested new testing conditions, would in practice result in a situation very similar to a ban of vehicles powered by an internal combustion engine, including hybrid electric vehicles.

ACEA appreciates there is desire to change the boundary conditions for the current on-road tests and acknowledges that there is scope for improvement with the aim to diminish the number of invalid tests which still occur. However, the existence of such boundary conditions is still fully necessary to ensure vehicles cannot be tested in a completely unrepresentative way that would combine all of the worst cases (eg a fully loaded car going uphill at high altitude under low ambient temperature in an aggressive driving style). All EU citizens would have to bear the cost of a technology needed (if it's even possible) to comply under some rare, extreme and unrepresentative driving possibilities.

We must stress again that heavy-duty vehicles are the backbone of Europe's commercial transport framework and help contribute to the economy of all member states. Trucks are not simply big cars and a 'one-size fits all approach' will not work. Heavy-duty vehicles are business tools owned by professionals who, for commercial purposes, are always looking for the best performing vehicle, taking into account fuel consumption and efficiency – ie total cost of ownership (TCO). This is also why trucks are usually tailor-made to customers' specific orders or are custom-built for a specific mission.

Like for cars and vans, the heavy-duty vehicle manufacturers face big challenges in the next years on CO_2 but will move towards electrification at a pace to meet future CO_2 fleet targets and which must be matched, far better exceeded, by all political stakeholders for charging infrastructure and facilitating consumer and operator vehicle choice.

CLOVE approach to suggest new testing provisions

ACEA believes these scenarios were suggested based on an approach that simply does not respect the reality manufacturers face when designing a vehicle and signing a compliance certificate that it would not exceed the limits under all regulated conditions. Take a simple example of the 'open' or 'unlimited' specification for altitude for light- and heavy-duty vehicles. Such proposals have no relationship to the reality of driving in Europe, let alone any relationship according to statistically justified European driving conditions.

In fact, CLOVE has been conducting measurements and observed that a majority of points were already below a certain low limit, such as in figure 3 below. It is disappointing that for those tests performed outside of today's RDE boundary conditions (stealthily referred to as "RDE non-

compliant" when in fact they are simply tests outside current EU RDE legal conditions), no information was given regarding the severity of the testing.

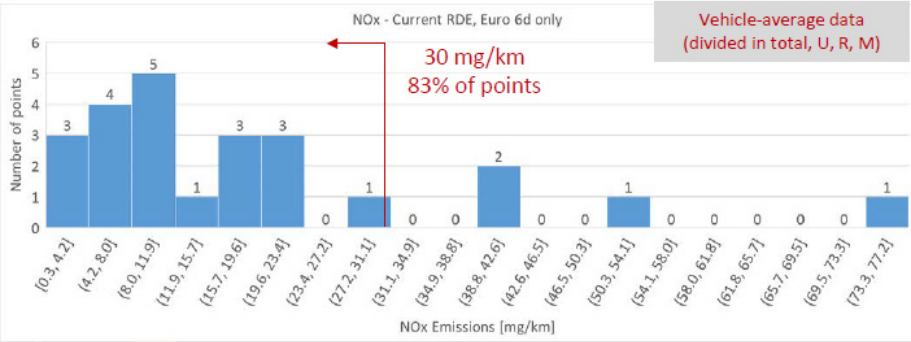


Figure 1: CLOVE approach to present new limits

While this approach provides a good picture of the average performance of vehicles, it cannot be used to set new emission limits. While a vehicle may emit ultra-low emissions for most of its driving and applicable conditions, what matters for a manufacturer are the extreme situations that are a combination of the worst boundary conditions (eg low temperature, high load, high altitude, etc). The current RDE legislation does not prevent vehicles to be tested in this way and third-party testing may even focus on these extreme scenarios.

Therefore, the simple statistical approach presented is not a way forward to define new limits as it completely neglects the complexity of vehicle's emission control systems.

It also seems to completely ignore the capability of PEMS measurement and the uncertainty of such measurement (see below).

Indications of what best available technology could achieve

To know what the best available technology could deliver it would be necessary to test vehicles fitted with best available technologies under a very wide range of driving conditions exploring the boundaries of the on-road regulated framework and see what limits are achievable.

In 2019 AECC worked on a concept car that was fitted with a combination of all existing best available after-treatment technologies[6] (ie NOx trap + upstream SCR + downstream SCR + ASC + DPF).

While today all of these individual technologies exist on the market no vehicle is fitted with a combination of all of them and such a demonstrator vehicle, without being necessarily representative of the whole EU fleet, could be considered as best available technology or even beyond.

[6] http://www.aecc.eu/wp-content/uploads/2019/04/190516-AECC-IAV-IPA-Integrated-Diesel-System-achieving-Ultra-Low-NOx-on-the-road-Vienna-Symposium.pdf

We cannot comment on the industrial technical feasibility, commercial viability of investing in such concepts, or the cost, but ACEA believes that this gives at least a limited perspective of what best available after-treatment systems could achieve.

Figure 4 compares on the left the performance of this demonstrator vehicle with two red lines representing the two CLOVE scenarios for light-duty vehicles. The right picture shows the intention of CLOVE to harmonise the emission performance requirement removing all relevant RDE boundary conditions.

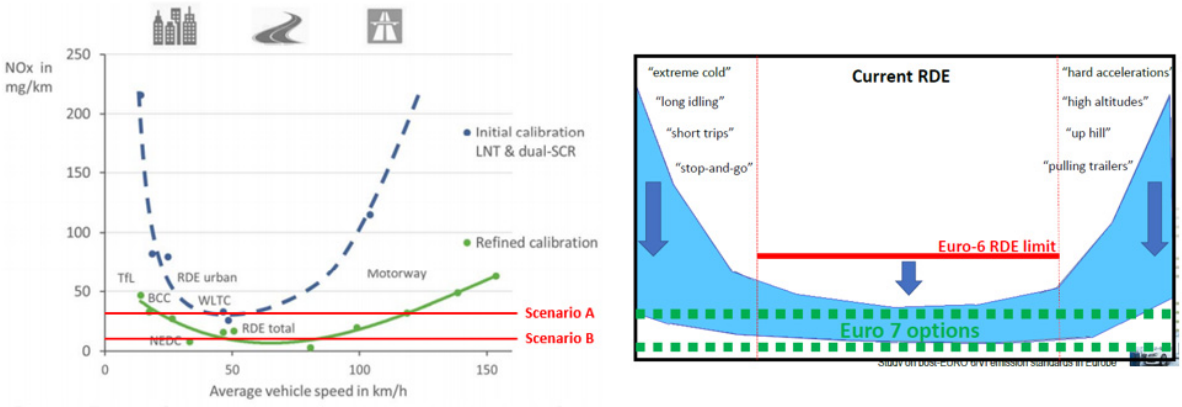


Figure 2: AECC demonstrator vs CLOVE LD scenarios

AECC's findings seem to indicate that the presented emission limit Scenarios A and B, coupled with a fully revised testing procedure, would certainly be technically unachievable, even with the best available after-treatment technology.

Furthermore, additional new provisions such as the consideration of particle filter regeneration events specifically capped to new emission limits for the regeneration event would further worsen the picture and render these scenarios even less feasible.

ACEA therefore believes that if the clean internal combustion engine is to have a chance to exist under a Euro 7/VII regulation, a complete and serious revision of the scenarios presented by CLOVE has to be made because industry planning decisions for what happens 10 and more years away are being taken now.

UNCERTAINTY OF MEASUREMENT EQUIPMENT

When Euro 6 and Euro VI were introduced, as for the previous emission standards, all measurements were performed in labs. However, over the past decade, Portable Emission Measurement Systems (PEMS) have been developed to allow for on-road testing of vehicles. This has been a breakthrough in emission legislation and has been proven to be very effective in helping control emissions on the road under real driving conditions.

However, as these devices did not exist when Euro 6 and Euro VI legislations were debated and

agreed by the legislators, and PEMS have a considerably much higher measurement uncertainty compared the labs, a margin of error was introduced to take this into account.

However, as these PEMS are already part of the measurement landscape when Euro 7/VII is being discussed, ACEA understands from the AGVES discussions that a Euro 7/VII proposal would already take into account the measurement uncertainty when setting the limits, removing therefore the necessity for a measurement margin to be considered.

Therefore, all emission limits scenarios presented above would effectively lead to much lower emission limits in real life as manufacturers would have to set their engineering targets well below the limits to cope with this measurement uncertainty.

The measurement uncertainty of PEMS is a topic subject to great debate, and the Commission regularly tries to quantify this PEMS inaccuracy during its regular review of the so-called PEMS margin. For instance, the Commission's Joint Research Centre (JRC) published in 2020 its latest up-to-date report[7] on the matter.

In its analysis, JRC takes into account all sources of inaccuracy and sums it up to obtain the overall PEMS uncertainty. While many of the inaccuracies are expressed in percentage of the measured values, some elements are in absolute terms – as shown in the red square in the below picture.

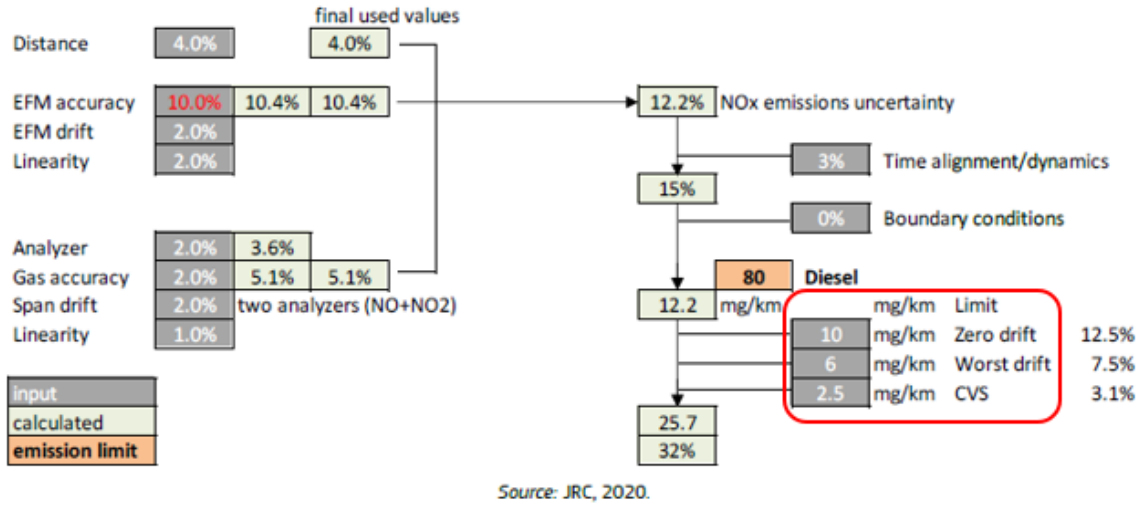


Figure 3: PEMS uncertainty assessment – Calculation of the NOx margin

Figure 5 indicates that the contribution of the zero drifts and the CVS inaccuracy would for instance already be within the same order of magnitude (and even exceed some) of the limits suggested in the different CLOVE scenarios, meaning that manufacturers would effectively have to comply with

[7] See: https://ec.europa.eu/jrc/en/publication/real-driving-emissions-2018-2019-assessment-portable-emissions-measurement-systems-pems-measurement

development targets set at zero (or even potentially lower).

Therefore, the work from the Commission's own Joint Research Centre demonstrates that very low emission limits coupled with a disregard of the measurement uncertainty is incoherent and may make a Euro 7/VII formulated on such a basis an actual ban of vehicles fitted with an internal combustion engine.

While these considerations are for today's best-in-class PEMS there is no indication these devices would become more accurate in the years to come. The current status is therefore likely to remain valid under when a future Euro 7/VII would apply and completely contradict ultra-low limits already incorporating measurement uncertainty.

While PEMS performance might improve and the so-called margin might be lowered in the future, the Commission JRC agrees that measurement uncertainty will never be sufficiently close to zero to be neglected. Even if the NOx margin could be lowered substantially below [0.32] on the basis of demonstrated improvement for all PEMS devices, that still means the proposed limit Scenarios A and B would be highly influenced by PEMS measurement capability.

It makes it even more necessary to acknowldedge that PEMS measurement uncertainty cannot be a fixed factor as a multiplier of a lower emission limit as we all know an NOx (or PN) measurement uncertainty expressed in mg/km (or mg/kWh for heavy-duty vehicle measurement using PEMS) is the correct scientific approach.

According to the latest JRC report on the NOx measurement uncertainty margin, the Commission should explain the PEMS measurement uncertainty with a Euro 7 limit of 10 mg/km or 30 mg/km. Indeed, this raises many questions.

For example, does the Commission and/or CLOVE have any data from PEMS validation testing on a chassis-dyno by measuring diesel vehicles with WLTP emissions close to 10 mg/km or 30 mg/km NOx? In such conditions, PEMS would be operating in an ideal environment in terms of temperature, altitude, humidity, etc so during an on-road RDE test, PEMS would be expected to have more uncertainty due to the effects of variation in these conditions. In Euro 6d, the limits for the PEMS validation tests are prescribed. Does Commission expect to have better PEMS accuracy on the road than they specify in the laboratory?

REGULATORY SIMPLIFICATION

ACEA acknowledges that the Commission, CLOVE and other stakeholders have shown great interest in simplifying the emission legislation. ACEA overall agrees with the need to seriously look at simplification and would support a simplification of regulations where it can be made without creating further ambiguity and avoiding simplification affecting the stringency of the requirements.

ACEA believes that 'simplification' should not be solely understood as simplification for the legislator (ie a shorter legislative text or a more convenient package to present to the co-legislators)

but must imply simplification of a regulation's understanding and implementation for manufacturers and authorities who must deal with regulations on a day-to-day basis across the EU and EEA and different type-approval authorities (TAA) and technical services (TS).

For instance, while the new approach suggesting to define a new border between light- and heavy-duty domains based on the Technically Permissible Maximum Laden Mass of individual vehicles could be perceived as a simplification of the legislation, it would actually dramatically increase the complexity of its implementation. Today, a technically similar vehicle can be configured as either an N1 or an N2, as the choice of being N1 or N2 does not only depend on the vehicle's capacity to be heavier than 3.5 tons (eg a specific driving license is required for N2).

Therefore, such a new consideration would push a manufacturer to certify one vehicle twice, under the light- and heavy-duty provisions, thus creating an enormous burden and unnecessary costs that are passed onto customers. Authorities would also have to test the same vehicle under different regimes, which would be very inefficient.

ACEA believes that manufacturers and authorities should thoroughly assess the impact of any of the proposed simplifications to prevent it from creating unforeseen side effects that would inadvertently increase the complexity of implementing the legislation, which is clearly the opposite of the Commission's intention.

COMPETITIVENESS OF THE EU INDUSTRY

Today, emission legislations and technical requirements are harmonised at the global level within the United Nations Economic Commission for Europe (UN-ECE) for all contracting parties to the so-called 1958 and 1998 Agreements.

For instance, today most global regions follow EU requirements for heavy-duty vehicles. Besides, for light-duty vehicles, UN Regulations on both WLTP and RDE, covering the current EU provisions, were recently adopted.

While any change in EU regulations needs to be mirrored at UN level, too drastic disproportionate changes to such regulations, that could for instance endanger the economic viability of internal combustion engines (in order to promote electro-mobility) may isolate EU regulations globally as contracting parties deciding otherwise would simply stop following EU legislations.

This could be severely detrimental to EU industry that would have to design EU-specific products that would not be fit for any other market, and it could also have an adverse environmental effect as countries might also stop following other progressive EU legislation that could have brought balanced environmental improvements.

CONCLUSIONS

ACEA welcomes the ongoing AGVES process that aims to discuss the work performed by CLOVE and the Commission on the foundations of an impact assessment for Euro 7/VII, and to exchange on the views and studies presented by all stakeholders.

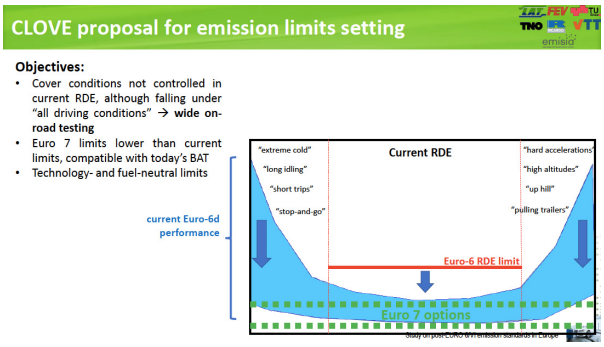
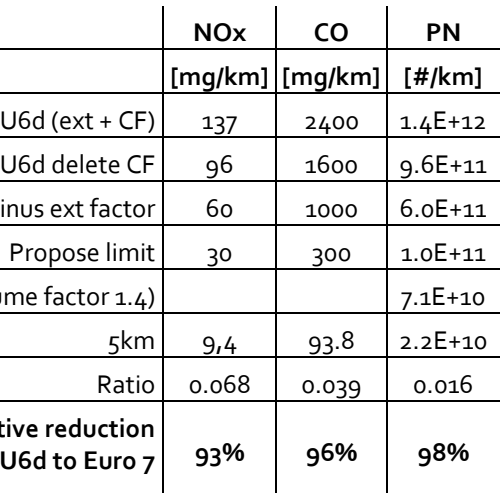
However, improvements must be brought into the process to improve its transparency and ensure all stakeholders have the same capability to constructively contribute and defend their legitimate interests. Receiving material from the Commission and CLOVE before meetings will help preparation and the dialogue. Hence, we would kindly request that if the next AGVES on 24 February 2021 would be the last meeting, the final report from CLOVE be made available at least 10 working days before the meeting.

ACEA urges once again the European Commission to adopt a top-down approach to clearly define the objectives of a potential Euro 7/VII proposal that should aim to tackle air pollution coming from on-road transport in the most cost-effective way. Only such an approach can make the Commission fulfil its legal obligation set out in the Treaty and ensure that society does not bear unjustified costs for a legislation that would have minimal impact on air quality while on the other hand the EU is already clearly setting its path toward zero-emission mobility.

The shift toward carbon-neutral mobility is ongoing in Europe and the European Green Deal will dramatically accelerate this trend. ACEA believes that such new considerations, that were not present when the first Euro 7/VII discussions started (eg the new Climate Plan 2030), must be thoroughly accounted for in the impact assessment that would accompany the legislative proposal. Only such an approach would respect the Commission's better regulation aim as it would consider the overall legislative roadmap that Europe's automobile industry is facing.

ACEA and its members remain fully committed to constructively contribute to all Euro 7/VII discussions and to the AGVES process and are keen to engage further with the Commission and stakeholders to fully detail its views.

ANNEX – COMMENTS SPECIFIC TO CERTAIN CLOVE SLIDES

Slide in CLOVE presentation	Comments
	Considering only: • Deletion of CF • Deletion of extended boundary factor 1.6 • Minimum 5 km distance The effective limits are reduced by 86-85% for a test conducted under effectively open-RDE conditions. For gasoline engines, the 5km min distance alone (assuming that pretty much all emissions are emitted in that first 5km) reduces the effective target from 60mg to 19 mg/km. CO is not regulated in Euro 6d RDE but assumed CF= 1.5 for illustration purposes. Adding the proposed limits and estimate of effect of PN10. Effective emission limits are reduced by 93-96%. The 'budget' for a min distance trip This does not even take into account additional levels of severity such as extended temperature and altitude, limitless acceleration / road gradient, PN during DPF regeneration
	EHC: Phosphorous poisoning by additives for lubrication oil. Fuel consumption penalty by huge electric power. ASC: No O_2 to oxidise ammonia since PI engine has stoichiometric combustion. AAP: NH_3 could be reduced by O_2 supply, but NOx would be increased because TWC does not work. A certain temperature is needed for exhaust aftertreatment systems to work best. Three or more litres catalyst in closed coupled position → not realistic installation proposition, especially for small-sized vehicles. Under-floor position is not expected to help activate the catalyst in cold conditions just

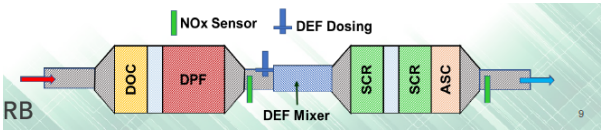
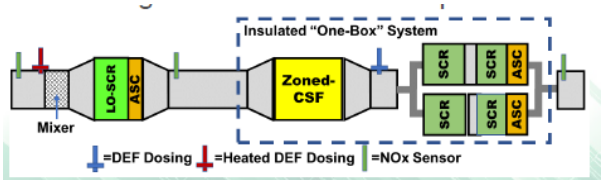
	NOx	CO	PN
	[mg/km]	[mg/km]	[#/km]
EU6d (ext + CF)	137	2400	1.4E+12
EU6d delete CF	96	1600	9.6E+11
EU6d minus ext factor	60	1000	6.0E+11
Propose limit	30	300	1.0E+11
PN10 (assume factor 1.4)			7.1E+10
5km	9,4	93.8	2.2E+10
Ratio	0.068	0.039	0.016
Effective reduction EU6d to Euro 7	**93%**	**96%**	**98%**

	after engine start. High level of complexity to integrate each emission reduction device to achieve best performance.

Euro 7 emission limits scenarios – LDV in mg/km, #/km
 	
| Euro 7 scenarios
	NOx	SPN_{10}	CO	CH_4 (1)	N_2O (1)	NH_3 |
						|---|---|---|---|---|---|---|
						| EURO 6 | 60/80 (PI/CI) | 6×10^{11} (SPN_{23}) | 1000/500 (PI/CI) | - | - | - |
						| A | 30 | 1×10^{11} | 300 | 10 | 10 | 5 |
						| B | 10 | 6×10^{10} | 100 | 5 | 5 | 2 |
						
						Lifetime Compliance LDV – proposed Euro 7 approach
						
						| Type | Name | Regulation | Current status | Euro 7 approach |
						|---|---|---|---|---|
						| 5 | Durability | UNECE R83
						EU 2017/1151 | Whole vehicle durability
						Component testing in lab
						Deterioration factors | Whole vehicle durability, 240k km and 15 years(1) (Tier 3, US approach) |
						
						- At the TA stage:
						  - Testing at 'fresh' conditions
						  - OEM declaration for 'aged' conditions
						  - Checked by ISC/MaS up to end of useful life
							Extremely stringent emission limits for light-duty vehicles. Coupled with open-RDE testing, neither Scenario B or A have any potential for technical feasibility or cost-effectiveness.
							As presented by the Commission/CLOVE in AGVES, Euro 7 proposals contain very low base emission limits with no assessment if they are actually needed to address air quality concerns.
							The assumption is that air quality improvements, cost effectiveness and proportionality are being deliberately ignored for political means.
							Capability of PEMS to measure at such low levels. NOx limit * 1.32 makes absolutely no sense.
							PEMS uncertainty factor must be a mg/km basis. According to the latest JRC report on the NOx measurement uncertainty margin, COM should explain the PEMS measurement uncertainty with a Euro 7 limit of 10 mg/km or 30 mg/km.
							Does the Commission/CLOVE have any data from PEMS validation testing on a chassis-dyno by measuring diesel vehicles with WLTP emissions closer to 10 mg/km or 30 mg/km NOx? In such conditions, PEMS would be operating in an ideal environment in terms of temperature, altitude, humidity etc, so during an on-road RDE test PEMS would be expected to have more uncertainty due to the effects of variation in these conditions. In Euro 6d, the limits for the PEMS validation tests are prescribed. Does the Commission expect to have better PEMS accuracy on the road than they specify in the lab?

Euro 7 emission limits scenarios – HDV in mg/kWh, #/kWh | Euro 7 scenarios | NOx | SPN_{10} | CO | CH_4 (1) | N_2O (1) | NMHC | NH_3 | |---|---|---|---|---|---|---|---| | EURO VI | 460 | 6×10^{11} (SPN_{23}) | 4000 | 500 (PI) | - | 160 (CI, THC) | 10ppm ~40 mg/kWh] | | A | 120 | 4×10^{11} | 1500 | 100 | 50 | 50 | 20 | | B | 40 | 1×10^{11} | 400 | 50 | 25 | 25 (2) | 10 |	Extremely stringent emission limits for heavy-duty vehicles (HDV). Coupled with open-RDE testing, neither Scenario B or A have any potential for technical feasibility or cost-effectiveness.

	Limits proposed are together more stringent than the very strict California regulation 2024/27. Not only extremely low levels of NOx have been proposed but the combination of lower PM number requirements incl. 10nm size, reduced numbers fulfilled also during/after regenerations very low N_2O and NH_3 limits. CARB proposal does not require PM number fulfilment or NH_3 in test cell or on-road. Existing N_2O limit of 134 g/kWh does not change and is considered as a technically feasible cap to avoid excessive N_2O release by the exhaust aftertreatment. From presentation of EMA in the October AGVES, it was indicated that it could even be difficult for manufacturers to continue to offer diesel engines at all under such requirements, even at the proposed 2024 level. Concerning GHG: • Proposal to have a choice to add CO_2 equivalents to the VECTO result instead, since neither CH_4 nor N_2O are toxic components (ie pollutant emissions) but are GHG gases. • Specifically for gas engines: very low CH_4 limits will likely end the introduction of carbon efficient gas vehicles with lower CO_2 benefits.
Proposed wide on-road testing vs current ISC for HDV Parameter / Current ISC / Future wide on-road testing Ambient temperature [°C] / -7°C to 35°C / **-10°C to +40°C** (as for cars) Cold start / Test evaluation from $t_{coolant}$ > 30°C on; cold start weighted with 14%% / Test evaluation from engine start on; no weighting of cold start Trip duration [kWh] / > 4 x WHTC work / > 0.11 * P_{rated} (i.e. > 0.5 x WHTC work*) Engine load [kW/kW_{rated}] / Only work windows > 10% valid / Test average > ...% (**) Max. altitude [m] / 1600 m / - Positive elevation gain [m/100km] / - / - Durability [km] / N2, N3<7.5t, M3: 300k km; M3, N2, N3 <16t: 300k km; N3 > 16t: 700k km / ** * WHTC work can be approximated with 0.5 hours at average 22% P rated ** Analysis ongoing	All test-bed limits also apply to open-RDE testing with CF = 1.0. From -10 °C to 40°C, any altitude, also short trips, cold start without weighing factor. Not only NOx, CO, HC, PN (current PEMS) but also the other regulated emissions. Minimum trip duration "0.5 x WHTC reference work", including a cold start at -10°C, would mean that the proposed limits practically apply to the cold start phase. Any test concept without cold start WF is absolutely not representative for the vast majority of HDV use cases. Cold start weighting would be extremely disproportionate and unrealistic compared to the normal use of a commercial vehicle for goods or passenger transport. Scenario B would, even with 'best available technology',

	will be difficult to fulfil in the Euro VI laboratory cycles and for road cycles, with the proposed lack of ambient boundaries. It will practically delete ICE as an option for heavy-duty vehicles. **Measurement** Will PEMS or sensor technology exist in the Euro VII timeframe that could, with acceptable accuracy, measure and verify compliance with such very low proposed limits? Already today the available PEMS instruments can have an offset larger than the measured value. It is doubtful if technology exists at all to secure emission compliance over useful life with such very stringent limits. Especially since the Commission indicated to also extend the maximum lifetime beyond what we have today (verbal indication: "1 million km").
Scenario A: Best known technology • Improved combustion to meet down to 1g NOx/kWh engine out if EAT is cold (for CNG engines optimised λ=1 control or technology like diesel for HPDI) • Closed coupled DOC+SCR+ASC (3WC for λ=1 engines) for fast heat up and low N2O and NH_3 formation, possibly increased catalyst volumes and advanced materials • Further optimised thermal management for faster heat up and preventing cool down (e.g. cylinder deactivation, hot EGR, throttle, late injection) aligned with HEV and WHR strategies • Pre heating of EAT, possibly coupled with storage catalyst or to further reduce cold start extra emissions • Improved DPF/GPF substrates for high filtration efficiency from clean state • High DPF filtration efficiency during and immediately after regeneration, in conjunction with regeneration frequency and temperature control **Scenario B**: Apply emission levels achieved in Scenario A for WHTC as limit in entire wide on-road range	Not based on actual technical feasibility testing as CARB (using SwRI) but on a "literature study"? CLOVE has tested only 8 Euro VI HD vehicles, not even the latest technology (ie not Euro VI step E) and this is the basis for possible measures against which industry would have to pay billions of Euros?
	Today's Euro VI step E emission technology could typically be the picture to the left. Provides a very high degree of NOx reduction under the majority of the driving patterns applicable for HD vehicles. This is already a very efficient technical solution but is a substantial part of the total engine component cost. With this solution it is still possible to balance very high degrees of NOx reduction with good CO_2/FC performance.
	Technical solutions designed to meet, or intended to meet, the proposed extremely low limit values for NOx combined with very stringent limitations of N_2O and NH_3 will be very costly and massively complicated. One example is shown to the left but this would

	need to be complemented with electrically heated exhaust aftertreatment systems or 'fuel burners', creating the necessary environment for an aftertreatment efficiency that is high enough during all operating conditions and the extreme ISC cold start requirements. Even with powerful systems the limits for short trip ISC ("0,5 x WHTC work") will most likely not be achieved. To drive the technology requirements to this point will severely limit the possibilities for CO_2 and fuel consumption reduction and have significant uncertainties on durability and operating costs over the vehicle lifetime.
OBD evaluation with respect to emissions - Not effective in securing low-emission on-road operation - Limited effective in detecting malfunction - Very burdensome at TA Euro7 principles - Acknowledge importance for consumer-workshop relation - Update + improve on-road detecting + include tampering Euro7 approach 1. OEM-declaration at TA: keep OBD-functionality for consumer and (independent) workshop 2. Introduction of TCI: continuous check of whole vehicle conditions (explanation in next slides) 3. (Next step) introduction OBM: continuous check of on-road emissions	Suggests a lack of appreciation of on-board diagnostics (OBD). OBD demonstration (at type approval) no longer needed – but the statement is quite unclear. Testing Conformity Indicator (TCI) has been invented and seems a sort of 'overall MIL for emission conformity'; the details are unclear, CLOVE seems to have misunderstood the concept of OBD.

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- 14.6 million Europeans work in the auto industry (directly and indirectly), accounting for 6.7% of all EU jobs.
- 11.5% of EU manufacturing jobs – some 3.7 million – are in the automotive sector.
- Motor vehicles account for €440.4 billion in taxes in major European markets.
- The automobile industry generates a trade surplus of €74 billion for the EU.
- The turnover generated by the auto industry represents over 7% of EU GDP.
- Investing €60.9 billion in R&D annually, the automotive sector is Europe's largest private contributor to innovation, accounting for 29% of total EU spending.

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