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RDE legislation: How to define the regulatory NTE emission limits?

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Background

The Cars 2020 Communication of the European Commission suggests the application of legally binding NTE emission limits for RDE tests as from September 2017/18 for all new types/vehicles registered. This suggestion follows the traditional approach in type approval legislation where new requirements are introduced for all new whole vehicle type approvals according to Directive (EC) 2007/46 at a first date D_{WVT} and for all new registered vehicles at a second, later date D_{RV} (i.e. $D_{WVT} < D_{RV}$).

For the discussion below the following facts must be considered:

- The definition of a whole vehicle type according to Directive (EC) 2007/46 is quite vague. Actually a "whole vehicle type" is primarily an administrative structure allowing vehicle manufacturers to obtain regulatory approval for a certain group of vehicles he can assemble to some extent freely according to his commercial and organisational needs rather than a technically well-defined vehicle category on which robust legislation could be based on.

  Therefore, if the manufacturer wants to avoid demanding new legislation applicable to new whole vehicle types there is a strong temptation that existing vehicle types are extended to cover new models, even this is not the intention of the legislation. The risk of undermining the legal intention in such manner exists in particular if there is a large time gap between the dates D_{WVT} and D_{RV}, which for this reason for in type approval legislation typically limited to 1 year. The serious consequences if one deviates from this traditional practice for the application of specific technical requirements and for the credibility of the type approval system as a whole are demonstrated by the well-known dispute around the application of the MAC Directive (EC) 2006/46, where the said time gap amounts to 6 years.

  Given the high importance and technical challenges resulting from RDE requirements it can be assumed that the definition of a date D_{WVT} for its mandatory application is rather irrelevant because manufacturers could easily avoid it. In addition, given the high stakes of the RDE legislation a gap of more than 1 year between the dates D_{WVT} and D_{RV} risks creating a legal and political limbo, since "would be" extensions of type approvals are likely to be challenged by independent bodies and competitors, foreseeably putting the Commission and Member States in a very difficult position.

- Even the timely introduction of robust RDE requirements are strongly suggested by the legal provisions of Euro 5/6 co-decision Regulation (EC) 715/2007 as well as air quality legislation, it has to be acknowledged that they constitute a severe challenge for manufacturers. Consequently industry asks for sufficient lead time in order to keep (at least a relevant percentage of) vehicle models that are already on the market now or are currently in an advanced stage of development also on the market for a certain time period after September 2018. For newly developed vehicles industry is more flexible and would accept tighter RDE requirements at an earlier date. This situation basically would suggest a gradual introduction of RDE requirements of different severity levels for the fleet, e.g. by requiring a more severe NTE emission limits for a certain percentage of the fleet and a less severe value for the rest (where the percentages and NTE emission limit values could change over time). While such "fleet approach" is common in the US, it does not exist yet in Europe and its introduction in the existing type approval

infrastructure (many different independent type approval authorities, no penalties for violation of fleet targets, missing control tools) is challenging and would require innovative ideas and especially necessary regulatory enforcing elements, like e.g. authority structures and penalties in case of missed compliance.

- In the political discussions for establishing the first legal RDE package (defining the test procedure) it became very clear that Member States have strongly different opinion on the introduction scheme of binding RDE requirements. This is in particular true for a first date D_{RV} when such requirements should be applied to all new registered vehicles. It is very likely that the value of the date of D_{RV} and the level of NTE emission limits applicable at this date will be very controversially discussed. Although a significant improvement of NOx emissions of vehicles actually on the road must be achieved in due time there is also a need for sufficient lead time for industry. Therefore non-traditional regulatory elements for achieving these objectives should be considered in addition to the traditional ones.

Application steps of NTE emission limits

Cars 2020 does not specify whether the NTE emission limits to be applied as from 2017/18 are "final", i.e. whether there would be just one or several steps of severity for NTE emission limits over time. While a policy of several steps of NTE emission limits may of course be the final results of technical analysis and political discussions it is very risky to define a "multi-step" approach for NTE emission limits from the start, since this obviously lowers the level of ambition of the first step, which is quite decisive for achieving air quality objectives in the years to come.

However, the Commission services reluctantly had to accept the political realities and in the TCMV discussion most Member States were actively advocating 2 steps for introducing NTE emission limits in conjunction with a clear announcement of this policy already in the first legal RDE package. Some Member States seemed to be willing to accept that manufacturers cannot make major modifications to their existing models or model policy already in the pipeline – a view which is not necessarily shared by the Commission services. This generally suggests the following approach:

- It must be clear from the outset of discussions that the second step of NTE emission limits can solely be determined by a strict interpretation of the legal requirements of the Euro 6 co-decision Regulation (EC) 715/2007 while recognizing also the implications resulting from existing air quality legislation. This means that NTE emission limits of the second step should be defined on the basis of the regulatory Euro 6 emission limits and an error and statistical analysis for the PEMS procedure. Limitations on the emission performance resulting from the design of existing vehicles have no role in this discussion. A "back calculation" of legal air quality requirements for NO2 concentrations in the ambient air to "compatible" NOx emissions of diesel vehicles may support the subsequent political discussion, albeit it is legally not decisive.

- The general objective for the first step of NTE emission limits should be to achieve the maximum reduction of NOx emissions by feasible modifications and improvements of existing "exemplary" vehicles and "exemplary" vehicles in an advanced stage of development without creating a massive knock-out effect on

diesel vehicles. The details of this approach will still have to be decided, in particular the quantitative balance between regulatory ambitions (driven by air quality considerations) and development burden. Albeit this approach acknowledges to some extent limitations of existing or soon-to-come designs for the emission performance, it should be clear that also for the first step no guarantee can be given that each Euro 6 vehicle which is today on the market will continue to be so with "only small modifications". In particular Euro 6 vehicles with no NOx after-treatment at all cannot be considered for determining the benchmarks of the first step, i.e. such vehicles are likely not to be able to comply even with the first step of NTE emission limits and could not be marketed anymore (NB: such vehicle designs were never intended to be applied for the Euro 6 standards from a regulator's perspective!).

For "mainstream" Euro 6 vehicles equipped with a performing NOx after-treatment system it could be considered to require effectively significant improvements of the calibration via software modifications, but no major hardware changes for the first step. Again, since the effect of a given NTE emission limit on different vehicle designs varies for technical reason, this general objective has to be understood as a guiding principle and not as a strict "guarantee" for each Euro 6 vehicle equipped with a NOx aftertreatment to remain in the market.

If such approach is followed, the challenge for the imminent regulatory decision process is to find out the "right" NTE emission limits, timing and additional parameters implementing the "save Euro 6 vehicles with a performing NOx aftertreatment system by applying calibration changes" in the most balanced manner.

Regulatory tools for implementing NTE emission limits of the first step

Combinations of the following regulatory options may be considered for the first step of NTE emission limits.

The second step of NTE emission limits can most likely be implemented by only specifying a mandatory date D_{RV} for all new registered vehicles.

(1) Specify an application date D_{WVT} (with NTE emission limit NTE_{WVT}) for all new whole vehicle type approvals according to Directive (EC) 2007/46. However, as discussed above, such date would probably be meaningless in practical terms and could mainly serve as a promotion tool for manufacturers claiming that they comply with RDE requirements at a much early date than they actually do.

(2) Specify an application date D_{RV} (with NTE emission limit NTE_{RV}) for all new registered vehicles. Obviously this date ensures a universal application of RDE requirements and cannot be circumvented on a large scale (there are some minor exemptions for end-of-series vehicles etc.). But this date does not allow for a distinction between vehicle models already on the market and new developments.

(3) Specify an application date D_{ET} (with NTE emission limit NTE_{ET}) for all new emission type approvals according to Regulation (EC) 715/2007. This would be a new approach in type approval legislation but there is no apparent reason

why such date could not be specified (the correct legal wording is of utmost importance of course!). Contrary to the whole vehicle type the emission type is much better specified by technical constraints. Extensions of existing emission types to effectively new technologies are not easily possible, at least not if the legal wording for the definition of an emission type is strictly followed, even one may find some loopholes also here (NB: a more detailed examination of the practical handling of emission type extensions is necessary). In principle the link of new requirements to the emission type would ensure that only new technical developments are affected by the new RDE requirements (and existing vehicles could continue to be marketed).

(4) In addition to binding regulatory NTE emission limit manufacturers may be allowed to "overachieve" regulatory requirements and to indicate in the CoC a lower vehicle (to be precise: PEMS test family) specific value NTE_V for its RDE emissions. The latter must be established according to the provisions and procedures of the RDE legislation (including in-service-conformity requirements). In particular it is not sufficient to meet the value NTE_V for RDE emissions in just one PEMS test at type approval, the manufacturer has to certify that all valid PEMS trips provide for RDE emissions below NTE_V. If (!) these values are used by local legislation, e.g. for granting financial incentives or regulating the access to low emission zones in areas with severe NO2 concentration problems, they could establish a kind of front-runner principle. Some advanced manufacturers would set standards that will have to be followed more or less closely by the others due to competitive market pressure.

(5) Apply NTE emission limits on a fleet basis, e.g. looking at averages or certain fleet percentages in bins of increasing "RDE severity". As already mentioned, this approach would be very difficult to implement in Europe. However, it could be considered to use the existing infrastructure for monitoring CO2 emissions for the purpose of Regulations (EC) 443/2009 and 510/2011 also for monitoring RDE based NOx emissions of the fleets. But even if this would be possible, the legal enforcement of such legislation remains unsolved, since consequences in case of the violation of fleet targets must be defined (for the CO2 legislation there are severe financial penalties but extending them to NOx emissions would require a co-decision act). Manufacturers have occasionally shown an interest in a fleet approach to RDE NOx emissions and might come up with a proposal, e.g. by defining consequences for existing type approvals in case of violations of fleet targets, that can be adopted in Comitology.

<u>Scenarios for implementing NTE emission limits of the first step</u>

In the following three scenarios for implementing NTE emission limits of the first step are outlined. These scenarios do not correspond to concrete political positions of the Commission services but are considered to be compatible with the political will of most Member States as they were visible in the TCMV discussions until now as well as with the spirit of the Cars 2020 Communication and should be a basis for further discussion.

Scenario 1:

Application date[1]	NTE emission limit[2]	Comment
D_{WVT} = 1/9/2017	NTE_{WVT}	Not controversial but probably a mainly cosmetic measure in practical terms
D_{RV} = 1/9/2018	NTE_{RV}	Supported by the Commission services due to the principles of Cars 2020. It may however be politically difficult to get sufficient support for an ambitious value of NTE_{RV} in line with expectations on air quality improvements.
D_{ET} = 1/9/2018	$NTE_{ET} < NTE_{RV}$	Probably less controversial than D_{RV}, therefore probably a significantly more ambitious NTE emission value can be applied.
After publication of the legislation	*(voluntary)* NTE_V	Establishes front-runner principle.

Scenario 2:

Application date[1]	NTE emission limit[2]	Comment
D_{WVT} = 1/9/2017	NTE_{WVT}	Not controversial but probably a mainly cosmetic measure in practical terms
D_{RV} = 1/9/2019	NTE_{RV}	Application date would probably be accepted by many Member States (and has even been proposed by some manufacturers). However, it would be politically problematic for Commission services due to the principles of Cars 2020. The level of NTE_{RV} will have to be discussed.
D_{ET} = 1/9/2018	$NTE_{ET} = NTE_{RV}$	The application of a reasonably ambitious NTE emission limit to all new emission types by 1/9/2018 could partially compensate the delayed (with respect to Cars 2020 intentions) application of binding requirements to all new registered vehicles.

[1] The application dates are here given for M1 and N1 class 1 vehicles. Application to N1 class 2 & 3 and N2 vehicles would be shifted according to the respective shifts for the application of Euro 6 emission limits.

[2] To be determined according to the principles outlined under second bullet of "Application steps of NTE emission limits".

After publication of the legislation	*(voluntary) NTE$_V$*	Establishes front-runner principle.

Scenario 3:

As an alternative to the two concrete scenarios above the introduction of fleet requirements could also be considered for the first step of RDE NTE emission limits. Basically the parameters for the implementation on the fleet (NTE emission limit values, required percentages of compliance) could become gradually more severe over several years. The Commission services are however currently not in a position to provide a proposal with requirements applicable to the fleet rather than individual vehicle types that is workable from a practical and administrative perspective but are open to suggestions from Member States and stakeholders.