STATE OF CALIFORNIA
AIR RESOURCES BOARD

Proposed Amendments to the Heavy-	**)**	**Public Hearing Date:**
Duty Engine and Vehicle Omnibus	**)**	**August 27, 2020**
Regulation and Associated	**)**	**Public Availability Date:**
Amendments; 30-Day Notice	**)**	**May 5, 2021**

COMMENTS OF THE TRUCK AND ENGINE MANUFACTURERS ASSOCIATION

June 4, 2021

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Introduction

At the August 27th, 2020 hearing of the California Air Resources Board (CARB), the Board passed a resolution to adopt the Heavy-Duty Engine and Vehicle Omnibus Regulations and Associated Amendments; and the Proposed Amendments to the Exhaust Emissions Standards and Test Procedures for 2024 and Subsequent Model Year Heavy-Duty Engines and Vehicles, Heavy-Duty On-Board Diagnostic System Requirements, Heavy-Duty In-Use Testing Program, Emissions Warranty Period and Useful Life Requirements, Emissions Warranty Information and Reporting Requirements, and Corrective Action Procedures, In-Use Emissions Data Reporting Requirements, and Phase 2 Heavy-Duty Greenhouse Gas Regulations, and Powertrain Test Procedures. At that hearing, CARB Staff informed the original Board of several recommendations for revisions to (collectively, the "Omnibus Low-NOx Regulations") the regulations as released with the Board Hearing notice. Those revisions ("30-Day changes") were released by CARB Staff on May 5th, 2021, with public comments requested by June 4th, 2021. The Truck and Engine Manufacturers Association ("EMA") hereby submits its comments on these 30-Day changes.

EMA previously submitted extensive comments[1] regarding the Omnibus Low-NO_x Regulations (released with the August 27th Board Hearing Notice) on August 13, 2020. Those EMA comments were data-driven and supported by third-party expert research, including the West Virginia University Center for Alternative Fuels, Engines and Emissions ("WVU"), the Ramboll Group, ACT Research, and NERA Economic Consulting. EMA and its members stand by the conclusions set forth in our prior comments: the Low-NO_x Omnibus Regulations as adopted are cost-prohibitive, infeasible, unenforceable, and illegal. The 30-Day changes do not address the serious overarching concerns that EMA detailed in its initial comments. Accordingly, it bears repeating that this response is focused on only the 30-Day changes and does not reflect the full breadth of EMA's concerns related to the Omnibus Low-NO_x Regulations as a whole.

[1] Heavy-Duty Engine and Vehicle Omnibus Regulation and Associated Amendments; Proposed Rulemaking; Initial Statement of Reasons, COMMENTS OF THE TRUCK AND ENGINE MANUFACTURERS ASSOCIATION, Tim French and Steve Berry, August 13, 2020.
http://www.truckandenginemanufacturers.org/file.asp?F=EMA+Omnibus+Comments+Including+Supplement%2Epdf&N=EMA+Omnibus+Comments+Including+Supplement%2Epdf&C=documents

EMA's Comments Related to Title 13 Amendments

13 CCR §1956.8(j)(10): EMA supports the addition of the example of kinetic energy recovery systems to power an electric heater in the exhaust aftertreatment to the definition of "Hybrid powertrain or optionally certified hybrid powertrain."

13 CCR §2035.(b): CARB's emissions warranty requirements are not currently applicable to vehicles or engines registered in states other than California. In the 60-Day Notice of August 27th, 2020, CARB proposed to broaden the applicability of the California emissions warranty requirements to include 2027 and later model year vehicles and engines "regardless of whether they are registered in California." In EMA's comments on that 60-Day Notice proposal, we stated that "CARB does not have the authority to burden interstate commerce to such an extent, especially for vehicles registered and operated outside the borders of the State of California."

EMA was pleased to see that in the informal draft change notice dated December 27th, 2020, CARB proposed to remove this proposed unilateral extension of its authority regarding emissions warranty by removing references to the applicability to vehicles and engines "regardless of whether they are registered in California." Unfortunately, this modification to the Omnibus proposal was not, in fact, included in the 30-Day Notice of May 5th, 2021. EMA maintains our position that CARB does not have the authority to enforce warranties outside the State's own borders, and recommends that CARB remove the problematic language to reflect the modification contained in the December 2020 draft.

13 CCR §2036(c)(10) and §2112(l)(23): These modifications are proposed to clarify that the warranty and useful life periods for optionally certified diesel hybrid powertrains used primarily in vehicles with a specified GVWR range are the same as for the heavy-duty diesel engines that are certified for use in that same vehicle GVWR range. For heavy-duty diesel engines, however, the warranty and useful life requirements are applied according to the engine's primary intended service class as defined in §1036.140. Primary intended service class considers not only vehicle GVWR, but also engine characteristics and typical vehicle body types, applications, and duty cycles, which are also important criteria for assigning the appropriate warranty and useful life requirements. Omnibus amendments to §1036.140 already instruct manufacturers to identify a single primary intended service class for each optionally certified diesel hybrid powertrain family that best describes the vehicles for which it is designed and marketed. To be consistent with how engines are treated for both criteria pollutant and GHG emissions, the warranty and useful life periods for optionally certified diesel hybrid powertrains should also be based on the powertrain family's primary intended service class, not primarily on vehicle GVWR.

13 CCR §2112.(l)(18) and (19): EMA supports the delay of new Useful Life requirements for engines in MDVs and LHDDEs from MY 2023 to MY 2024.

13 CCR §2112.(l)(22)(A) and (D): References to MY 2023 should be changed to MY 2024 to be consistent with §2112.(l)(18) and (19) delay of new Useful Life requirements as described above.

13 CCR §2140(c)(1), (2), (3) and (4): (see also §86.1915.B.) These modifications relate to engine family non-compliance determinations resulting from testing under CARB's In-Use Compliance ("IUC") testing and manufacturer-run In-use Testing ("IUT") provisions applicable to model year

("MY") 2024 and later engines. CARB has amended these provisions to specify that if 3 or more engines out of 10 exceed the in-use test thresholds for the same bin and the same constituent, *or* if the average bin emissions for each constituent in each bin from all 10 vehicles exceed the applicable in-use threshold, then the family is considered non-compliant.

EMA supports the continued application of the "8 out of 10" pass threshold. EMA also supports application of the "family average" approach, where the results of all 10 engines are averaged for each bin and each constituent. We are, however, concerned that, for example, 2 vehicles, or even a single vehicle, that is marginally exceeding the standard due to a pending emissions control component failure, though not yet severe enough to elevate emissions to the point of illuminating the OBD MIL, could significantly increase the average emissions of the 10-vehicle sample.

CARB has acknowledged the infeasibility of detecting marginal component degradation or impending component failure issues at the new Low-NO_x standards by retaining the current OBD monitor thresholds. For example, rather than being required to detect a failure before NO_x emissions increase to 2.0 times the new low-NO_x (certification cycle) standard, manufacturers are required to detect a failure before NO_x emissions increase to 0.40 g/bhp-hr. For 2024 through 2026 model year engines, the 0.40 g/bhp-hr monitor threshold is 8 times the new FTP/RMC standard of 0.050 g/bhp-hr, and 20 times the new MY 2027 and later standard of 0.02 g/bhp-hr. If we consider the OBD thresholds in the context of the in-use standards, the thresholds are 4 and 10 times the medium/high power 3B-MAW standards of MY 2024 and MY 2027, respectively. This means that a vehicle may be recruited into IUC testing without an illuminated OBD MIL, but having tailpipe NOx emissions at a level of, perhaps, 70% of the MY 2027 NOx OBD monitor threshold. Such a vehicle would cause a 10-vehicle average exceedance of the standard by 15%, even if all other 9 vehicles have tailpipe emissions at 50% of the medium/high power bin in-use standard. Similarly, two vehicles recruited without an OBD MIL-ON condition could have NOx emissions at a level of only 35% of the OBD threshold, such that, when averaged with 8 other vehicles having emissions at 50% of the in-use standard, the in-use test would generate a 10-vehicle non-compliant average result 10% above the standard.

In contrast, vehicles tested under the current not-to-exceed program are subject to a 0.30 g/bhp-hr in-use threshold and a 0.40 g/bhp-hr OBD threshold. The margin between the in-use limit and the OBD threshold is much smaller today than it will be with MY 2024- and MY 2027-compliant engines. The current OBD requirements are extremely difficult to balance between reliably detecting a failure and setting false MIL's, so there is no room to lower the OBD detection limit for most monitors. Regardless of the original intent of OBD, the new circumstances under the Omnibus Low-NO_x standards plainly create a situation where manufacturers will be at considerably more risk for family non-compliance determinations based on the 10-vehicle average pass/fail determination proposed, without earning a family pass on the basis of 8-out-of-10 passing tests.

CARB staff have stated that, with 10 vehicles tested, there is a large enough sample size for the 10-vehicle average to be representative of the engine family's emissions signature overall. That is simply not true. If we conservatively assume that 1 out of every 25 vehicles in the field from a tested engine family is in the status of exceeding the standard due to an impending

emissions component failure not yet severe enough to illuminate the MIL, the probability of recruiting such a vehicle into the random selection of 10 vehicles is 40%. If a manufacturer is required to test 2 families per year, a family non-compliance determination on this basis is almost guaranteed every second year (Notably, our simple example included all other vehicles in the test order performing at 50% of the standard.) The probability of a family non-compliance determination on this basis is even greater in a year where CARB may conduct an IUC audit, despite the family otherwise being well within the metrics for compliance.

The risk to manufacturers under these typical and expected conditions is simply unwarranted. EMA recommends that CARB apply the current "8-out-of-10" pass criteria and also adopt the new "family average" approach across 10 vehicles, determining an engine family to be compliant if *either* of those criteria is met. Adopting EMA's recommendation is a way to ensure that there is both an emissions exceedance generally violative of the standards (the average of the 10 vehicles is in exceedance), and that there is a consistent basis for the exceedance (more than 3 vehicles exceeding the same constituent threshold in the same bin).

If CARB does not adopt the EMA-recommended approach, CARB should consider limiting the average emissions of the two engines exceeding the standard. For example, the average emissions from the two engines exceeding the standard (that is, ($Engine_1$ emissions + $Engine_2$ emissions) / 2) could be limited to 3-times the bin/constituent standard, but never more than the regulated MIL-ON threshold.

13 CCR §2141(f): EMA supports the change that requires manufacturers to retain parts *information* related to examination of failures disclosed in EWIR reports, rather than the parts themselves.

EMA's Comments Related to Diesel Test Procedures

§86.xxx-2.A.1.2.4(6); §86.xxx-15.B.3(a); §86.xxx-25.A.1.9(b)(4)(vii); §86.004-26.B.2.3, 2.4, and 2.5; and §86.xxx-35.B.6: For the same reasons discussed above pertaining to §2036(c)(10) and §2112(l)(23), the requirements for Useful Life, averaging sets, maintenance, durability demonstration, and labeling for optionally certified diesel hybrid powertrains should also be based on the powertrain family's primary intended service class, not primarily on vehicle GVWR.

§86.xxx-2.B.: EMA supports the amendments to the definitions of "Automatic active regeneration" and "Manual active regeneration." We note, however, that there is an editing error: the previous definition of "Manual Active Regeneration" was inadvertently retained. EMA questions the definition of the term "Telematics," regarding whether these systems actually *collect* information. In our view the role of these devices according to the normal terminology is limited to data *transmission*. We also support the change to the definition of "intermediate useful life," where the years component was reduced from 10 years to 8 years.

EMA also supports amendments to the definitions of "Ramped Modal Cycle (RMC)" and "Vehicle-RMC" to allow manufacturers the option of using either the test cycle in §86.1362 or the cycle in §1036.505 for demonstrating compliance with criteria pollutant standards in MY 2024

and later. CARB should add language to confirm they will use the same cycle chosen by the manufacturer for confirmatory and audit testing.

§86.007-15.B.4. allows, within the Averaging, Banking and Trading provisions, manufacturers to apply credit multipliers when they certify a family to new lower standards in a model year prior to the model year where the new standards take effect. For example, a manufacturer may earn credit multipliers when certifying a MY 2023 family to the 2024 standards. EMA is very supportive of this incentive. We request that CARB clarify that, in this example, the credit multipliers are applied also if the manufacture were to certify the MY 2023 family to an FEL higher than the 2024 standard, such as a NOx FEL of 0.08 g/bhp-hr, using all of the (other) standards, test procedures, and other regulatory provisions applicable to the 2023 model year -- for example, an optional idle NOx standard of 30 g/hr, and compliance to NTE provisions. The same principle should apply also to the other standards' change years, and we request that CARB clarify that in the regulation. Similar provisions should also be clarified in the case of Otto-cycle engines.

§86.xxx-15.B.3.(g): The proposed amendment includes a modification to the calculation of emissions credits, introducing a new distinction between "Applicable Useful Life" and "Model Year Useful Life." The distinction is introduced to support scenarios where a manufacturer elects to certify products to the requirements of a future model year having more stringent requirements than the current model year for which the certification is being sought. (To use the example in the regulation, "…for a 2027 model year heavy heavy-duty diesel engine family certified to 2031 model year requirements…") The modification to the calculation of credits is as follows:

Emissions credit equation in 60-Day Notice:

$$Emissions\ Credits = (Std - FTP\ FEL) \times CF \times AUL \times Sales \times 10^{-6}$$

Amended emissions credit equation proposed:

$$Emissions\ Credits = \left(Std - FTP\ FEL \times \frac{MYUL}{AUL}\right) \times CF \times AUL \times Sales \times 10^{-6}$$

The modified equation effectively increases the credits generated when certifying to future model year requirements that have a longer Useful Life. EMA is supportive of the amendment, but believes some clarification is needed.

As an initial matter, there is ambiguity as to whether the standards and FELs to be included in the credit equation should be "Intermediate Useful Life" (IUL) or "Full Useful Life" (FUL) standards and FELs. Considering EMA's comments that follow regarding FEL caps under §86.xxx-15.B.3.(i)(1) and the calculation of IUL FELs pursuant to §86.xxx-15.B.3.(i)(4), it is likely that the FUL (not the IUL) standards and FELs are the more appropriately used in the calculation of credits. This issue requires more analysis and clarification before EMA can make any final recommendation.

Additionally, the definition of "Std" (standard) following the equation should be modified to make it clear that the standard to be used in the equation is that of the *current* model year (the model year for which certification is being sought). The proposed definition of "Std" includes the

term, “applicable”, which is the same term used to describe the Useful Life requirements of the *future* model year (*italics* for emphasis):

> Std = the *applicable* FTP cycle NOx or particulate emission standard in grams per brake horsepower hour for the *applicable* model year,
>
> AUL = *applicable* useful life for the engine family or optionally certified diesel hybrid powertrain family in miles as defined in Section I.2.A of these test procedures. For example, the AUL for a 2027 model year heavy heavy-duty diesel engine family certified to 2031 model year requirements is 800,000 miles,

In the first case, “applicable” is referring to current standards, and in the second it is referring to the future requirements. EMA recommends the definition of “Std” be modified to clarify this point, for example, by using the same term, “current”, as is used in the definition of “MYUL”, and a similar example (*italics* for emphasis):

> MYUL = *current* model year useful life requirement for the engine family or optionally certified diesel hybrid powertrain family in miles as defined in Section I.2.A of these test procedures. For example, the MYUL for a 2027 model year heavy heavy-duty diesel engine family certified to 2031 model year requirements is 600,000 miles,

Also contributing to the uncertainty on the issue of which standard to use in the credit calculation equation is the section related to early compliance credit multipliers (§86.xxx-15.B.4.), which includes the following:

> … Manufacturers that produce and certify engines and optionally certified hybrid powertrains that comply with future model year requirements in title 13, CCR, sections 1956.8, 1968.2, 1971.1, 2035, 2036, 2112 and 2139 on a voluntary basis will be eligible for early compliance credit multipliers subject to the following limitations:

Citing 13 CCR 1956.8 implies that the standards must be effectively pulled ahead for the credit multipliers to be allowably applied. Section §86.xxx-15.B.4.(b) continues (*italics* for emphasis):

> For example, to get a 1.5 multiplier, an eligible 2025 model year engine family must demonstrate compliance with the 2027 model year emission *standards*, useful life, durability, warranty, in-use testing requirements, on-board diagnostics (OBD) requirements, etc. in order to participate in the program.

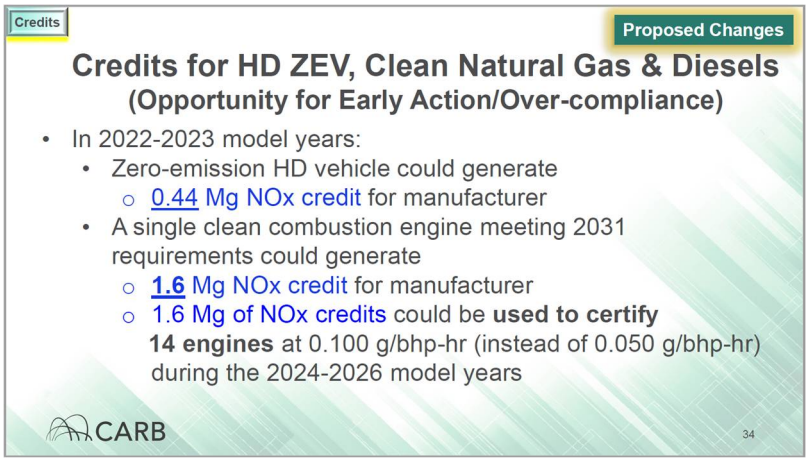
EMA recommends the early compliance credit multiplier provisions also be improved for greater clarity.

EMA supports the credit multipliers of §86.xxx-15.B.4 as a credible means to incentivize early adoption of future standards and requirements. EMA also supports the amendment proposed

to the emissions credit calculation equation at §86.xxx-15.B.3.(g) that also incentivize early adoption of future MY requirements. Improving the clarity of these provisions will be helpful to manufacturer planning and implementation of these important aspects of the AB&T program.

§86.xxx-15.B.3.(j): EMA opposes the proposed amendment that terminates the ZEV NO_x-credit program after the 2026 MY, instead of the 2030 MY as originally proposed. CARB's Omnibus Low-NO_x Regulations and the Advanced Clean Truck Regulation (ACT) impose huge and overlapping burdens on heavy-duty engine and truck manufacturers, and include numerous requirements that will be extremely difficult to fulfill. Manufacturers need *more* flexibilities structured into those regulations if they are to have any chance to comply, not fewer. The ZEV NO_x-credit program touches both the Omnibus Regulation and the ACT, and is therefore of particular importance to the manufacturers of those advanced vehicles. Governor Newsom's recent Executive Order places an even higher priority on the transition to ZEVs. Adding value to ZEVs in the form of more flexible NO_x credits would be supportive of the Governor's demand for increased penetration of electric vehicles. The "value-add" of NO_x credits with each ZEV sale would have the potential to offset price increases due to electrification, and could reduce somewhat the demand for incentives. While some manufacturers of electric vehicles that are not also in the diesel market are not regulated under the ACT, granting NOx credits, credits that could be sold to HDOH diesel engine manufacturers, would increase market penetration for the ZEV-only vehicle manufacturers as well. Accordingly, CARB should not specify a sunset date for earning and using NO_x credits in the Omnibus Regulations. At a minimum, CARB should maintain the original sunset date, keeping the NO_x-credit program in place through the 2030 MY.

While EMA opposes early sunsetting of ZEV NOx credits, there is another important aspect of ZEV NOx credits that CARB should reconsider. The concern is clearly highlighted in the material presented on page 34 of Staff's presentation to the Board at the August 27th hearing. The slide reports that HD ZEVs, the ultimate solution CARB envisions for the future, earn significantly fewer NOx credits for early introduction than early introduction of HD combustion engines:



There are two reasons for this outcome. The primary reason is the availability of Early Compliance Credit Multipliers applied for early introduction of HD engines subject to the Omnibus Regulations. For example, an engine certified prior to MY 2024 in compliance with all

the requirements of the 2027 standards, can apply a credit multiplier of 2.0. (This example is an introduction two regulatory standard steps ahead of requirements; introductions one step ahead can apply a multiplier of 1.5, and introductions three steps ahead can apply a multiplier of 2.5.). EMA supports the availability of these credit multipliers as a strong incentive for manufacturers to develop and certify products with environmental benefits before they're compelled by regulation.

The second factor is that the transient cycle conversion factor (ECF) relating vehicle miles to FTP cycle work is lower for Class 8 ZEVs than for HHDDEs for the same amount of cycle work (see new §86.007-15.B.3.j.2, where ECF is determined by dividing cycle work by 6.8 for ZEVs, compared to dividing by 6.5 for HDDEs).

The combination of Early Compliance Credit Multipliers applicable only to combustion engines and lower transient cycle conversion factors for ZEVs has the illogical effect of earning manufacturers significantly more NOx credits per sale of vehicles with early introduction combustion engines than they can earn from early introduction of ZEVs. CARB should apply NOx credit multipliers, or similar regulatory means, to permit ZEVs to earn at least as many credits per sale as combustion engines when introduced prior to regulatory requirements. Similar incentives should be applied to sales of ZEVs in excess of the annual minimum percentages required by the Advanced Clean Truck Regulation.

§86.xxx-15.B.3.(i)(1): The HHDDE maximum NOx FTP FEL levels ("FEL caps") of 0.100 and 0.050 g/bhp-hr are expressed as figures ostensibly comparative to the 2024 through 2026 MY FTP NOx standard of 0.050 g/bhp-hr, and the 2027 and later MY FTP NOx standard of 0.020 g/bhp-hr, respectively. EMA believes that CARB intended that that these FEL caps are the maximum allowable levels of the Intermediate Useful Life (IUL) standards, rather than the Full Useful Life (FUL) standards shown in the table of 86.007-11.B.5.3.3., and discussed in the provisions for determining Intermediate Useful Life FELS in §86.xxx-15.B.3.(i)(4). For consistency of approach, and recognizing that the NOx standards as described in the table 86.007-11.B.5.3.3. are actually FUL standards, and also that the FEL calculation methods of §86.xxx-15.B.3.(i)(4) are based on the FUL NOx standards, EMA recommends that CARB establish the NOx FEL caps for 2027 and later MYs as FUL FEL caps. By CARB's proposed requirements of §86.xxx-15.B.3.(i)(4), the FUL NOx FEL caps would be as follows:

MY	FUL NOx standard	FUL NOx FEL cap
2024-2026	0.050 g/bhp-hr	0.100 g/bhp-hr
2027-2030	0.035 g/bhp-hr	0.065 g/bhp-hr
2031 and later	0.040 g/bhp-hr	0.070 g/bhp-hr

If CARB were to accept EMA's recommendation regarding the NOx FEL calculation methods of §86.xxx-15.B.3.(i)(4) below, then the 2027 FUL NOx FEL cap would be as follows:

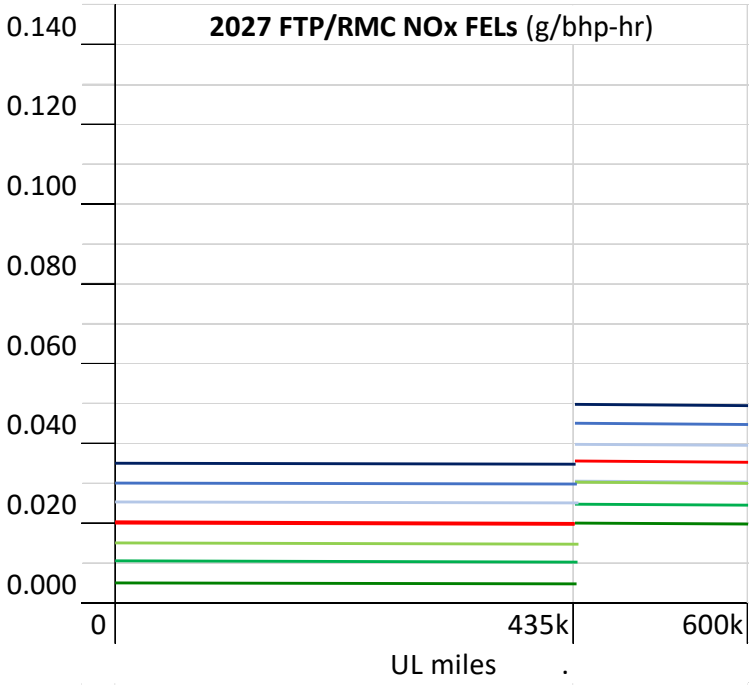
MY	FUL NOx standard	FUL NOx FEL cap
2024-2026	0.050 g/bhp-hr	0.100 g/bhp-hr
2027-2030	0.035 g/bhp-hr	0.088 g/bhp-hr
2031 and later	0.040 g/bhp-hr	0.100 g/bhp-hr

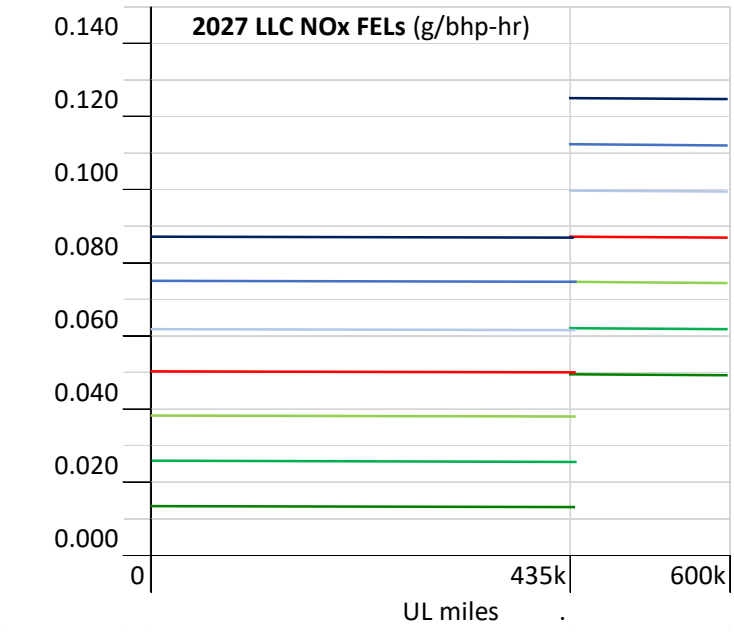
§86.xxx-15.B.3.(i)(4) proposes a method for determining MY 2027 and later Intermediate Useful Life (IUL) NOx FELs based on the Full Useful Life (FUL) NOx FELs to which the family is being certified. (The RMC and LLC Full Useful Life NOx FELs are determined based on the Full Useful Life FTP NOx standard as described in §86.xxx-15.B.3.(i)(2) and (3)(A).) The calculation process proposed produces an outcome where the difference (in g/bhp-hr) between the Intermediate Useful Life NOx FEL and the Intermediate Useful Life NOx standard is set to be equal to the difference between the Full Useful Life NOx FEL to which the family is being certified and the Full Useful Life NOx standard.

Below is a table of FTP and LLC NOx FELs for a range of potential Full Useful Life NOx FELs for MY 2027-2030 standards (the figures in red are the actual standards), calculated according to the proposed method:

2027	FTP NOx emission standard (FUL)	Delta to standard	FTP NOx FEL_{IUL}	FTP NOx FEL_{FUL}		LLC NOx FEL_{IUL}	LLC NOx FEL_{FUL}
	0.035	0.015	0.035	0.050		0.088	0.125
	0.035	0.010	0.030	0.045		0.075	0.113
	0.035	0.005	0.025	0.040		0.063	0.100
	0.035	0.000	0.020	0.035		0.050	0.088
	0.035	-0.005	0.015	0.030		0.038	0.075
	0.035	-0.010	0.010	0.025		0.025	0.063
	0.035	-0.015	0.005	0.020		0.013	0.050

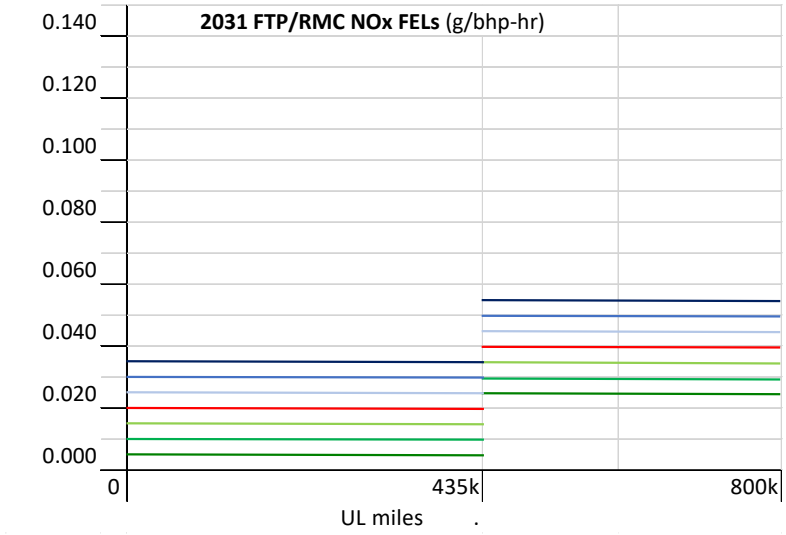
The same FELs are represented graphically below, first for the FTP NOx FELs (and RMC FELs, which, by the regulation, are equivalent to the FTP NOx FELs), then for the LLC NOx FELs (the red line is the actual standard).

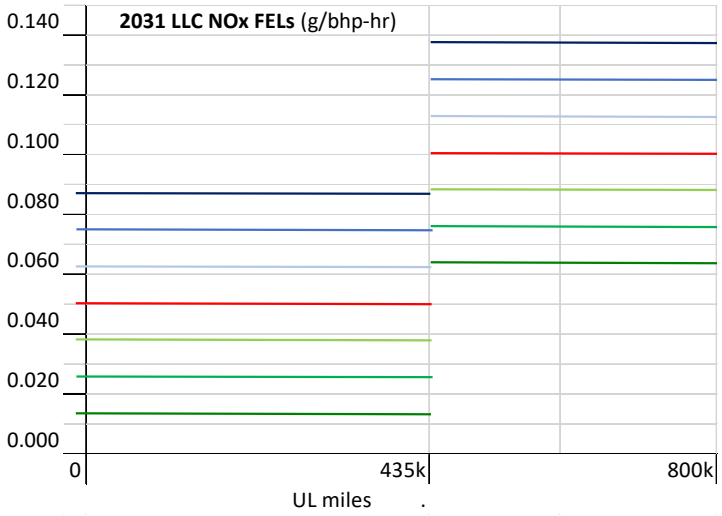




A similar table of potential NOx FELs for 2031 and later standards, and similar graphical representations of those FELs, are shown here:

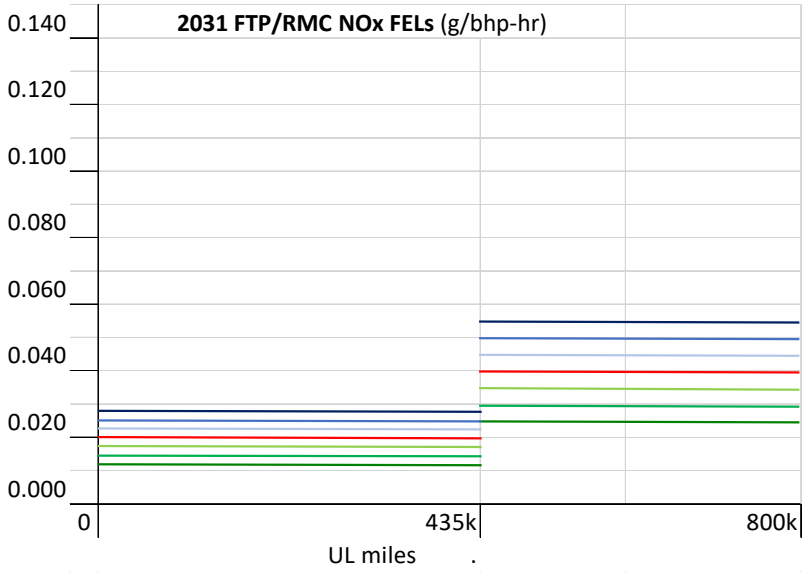
2031	FTP NOx emission standard (FUL)	Delta to standard	FTP NOx FEL_{IUL}	FTP NOx FEL_{FUL}		LLC NOx FEL_{IUL}	LLC NOx FEL_{FUL}
	0.040	0.015	0.035	0.055		0.088	0.138
	0.040	0.010	0.030	0.050		0.075	0.125
	0.040	0.005	0.025	0.045		0.063	0.113
	0.040	0.000	0.020	0.040		0.050	0.100
	0.040	-0.005	0.015	0.035		0.038	0.088
	0.040	-0.010	0.010	0.030		0.025	0.075
	0.040	-0.015	0.005	0.025		0.013	0.063

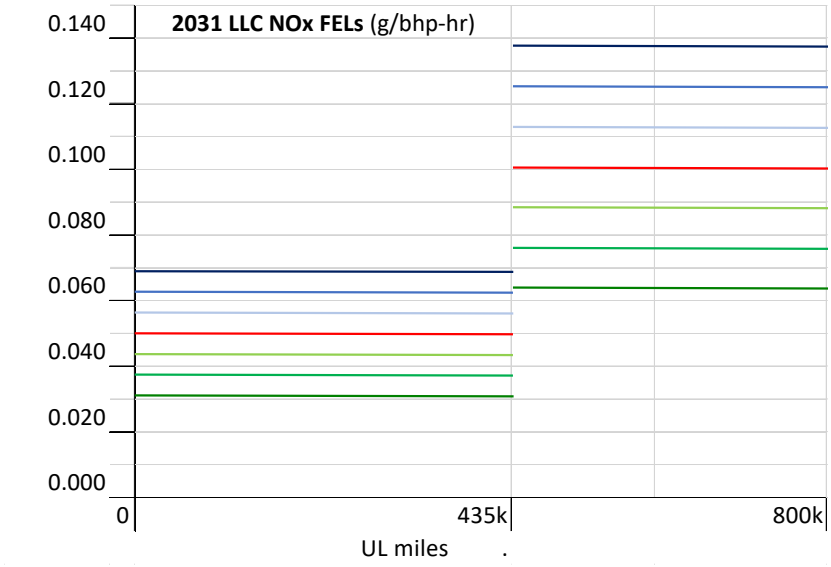




One outcome of this proposed methodology is that, for example with respect to the 2027-2030 MYs, a FUL FTP NOx FEL of 0.020 g/bhp-hr would be 4 times the IUL FTP NOx FEL of 0.005 g/bhp-hr, whereas the FUL FTP NOx FEL of 0.050 g/bhp-hr would be only 1.4 times the IUL FTP NOx FEL of 0.035 g/bhp-hr. The RMC FELs would be equally impacted in this way, and similar anomalies can be found from the results of the required NOx LLC FEL calculations, and for all NOx FELs for the 2031 and later model year standards.

EMA recommends a different approach to setting the IUL NOx FELs based on the FUL FTP NOx FEL, where the ratio of the FUL NOx FEL to the IUL NOx FEL is established to be equivalent to the ratio of the FUL NOx standard to the IUL NOx standard. This would mean, effectively, that if an FUL NOx FEL were 50% below the FUL standard, the IUL NOx FEL would also be 50% below the IUL standard. The result of the EMA-recommended method is presented graphically below for the same range of potential FUL FTP NOx FELs:





EMA believes that establishing IUL NOx FELs based on the ratio of the FUL to IUL standards is a more rational approach than the one proposed in the 30-Day Notice. EMA recommends CARB adopt this preferred approach for determining FELs in the Final Rule.

§86.xxx-15.B.4. This section describes how to apply credit multipliers for cases where a manufacturer certifies to future model year requirements. See EMA comments regarding these provisions in the comments related to the emissions credit calculations at §86.xxx-15.B.3.(g)

§86.004-25.A.(b)(7)(ii) permits manufacturers to request new scheduled emissions-related maintenance intervals for 2024, 2027 and 2031 model year families, with provisions to carry-over the scheduled maintenance for limited additional model years. The extended Useful Life provisions, coupled with the very stringent emissions standards of the Omnibus Rule, will almost certainly compel manufacturers to add new emission-related service maintenance, including replacement of certain emissions-related components within the Useful Life. The rule provides that the Executive Officer will only approve new maintenance procedures upon reviewing "detailed evidence supporting the need." With the implementation of the Omnibus Rule, the goal of component maintenance will shift from preventing component failure to avoiding component performance degradation to the point that tailpipe emissions approach or exceed the in-use requirements, even if the component is still within the manufacturer's specifications. Examples may include NOx sensor drift, NO2/NOx ratio of a DOC catalyst, or turbocharger performance, depending on the system design.

The new emissions-related maintenance provisions are problematic in several ways. First, it will be extremely difficult for manufacturers to gather sufficient data and analysis to provide "detailed evidence supporting the need" for new maintenance. Manufacturers are already incentivized by customer-satisfaction concerns to limit the overall maintenance requirements for their products, so they will not request any additional maintenance unless there are sufficient compliance risks to justify them. Under these circumstances, it is appropriate that CARB permit manufacturers the ability in these transition years to implement new emissions maintenance

requirements without Executive Officer approval. This policy would be consistent with what CARB describes in Attachment A to the 60-Day Notice, "Staff Suggested Changes", page 7:

> **Proposed Changes to Scheduled Maintenance**
> CARB staff would propose changes to the scheduled maintenance to give manufacturers an option for more flexibility in scheduling supplemental maintenance for emission-related components and systems. This flexibility, which would be allowed for the transitional model years of 2024, 2027, and 2031, when the emissions standards become more stringent, would give manufacturers time to analyze the components and systems to ensure compliance at the lower standards for the lengthened useful life periods.
>
> Currently, manufacturers are already able to request new scheduled maintenance under the existing provisions in section 86.094-25 (b)(7)(ii), of the Test Procedures. Specifically, the provisions allow requests for new scheduled maintenance for cases when an existing component is redesigned, or when an entirely new technology is used in a component, or when an existing component may be influenced as a direct result of the implementation of any new technology. In any of these cases the manufacturer would have the opportunity to petition CARB for more frequent maintenance intervals as needed. However, the request must be approved prior to the introduction of the new maintenance. *The proposed changes would instead offer an option for manufacturers to set the recommended supplemental scheduled maintenance without submitting the request, and waiting for approval under the existing provisions.* Thus, CARB staff is proposing this change to ease the burden of compliance for the transitional years when the emissions standards are lowered. [*italics* for emphasis]

If CARB does finalize the regulation including the requirement to seek Executive Officer approval to require new emissions-related maintenance, CARB should accept manufacturers' reasonable explanations and data submittals, rather than "detailed evidence supporting the need," as sufficient for Executive Officer approval.

Additionally, EMA proposes that the new provisions also be permitted to apply to "non-replaceable" components or systems, but that the manufacturer should not be responsible to pay for that maintenance. As explained earlier, manufacturers will only establish new emissions maintenance requirements if they foresee risks of non-compliance without them, and if the consequences of a future non-compliance determination is so extreme that manufacturers feel compelled to implement a number of new maintenance requirements to avoid those extreme consequences. The repair costs of non-replaceable components, which must, by current regulation, be paid for by the manufacturer, will necessarily be recovered in the purchase price of the vehicle. In this case, the "service" charges to the customer also will bear the cost of the 12% Federal Excise Tax that is assessed on the purchase price, compounding the cost "surcharge" effect. These additional customer costs will be borne on top of the other very significant cost increases compelled by the Omnibus Low NO_x Rule. The original purchaser may not gain any benefit for this initial cost increase due to the maintenance occurring after the vehicle is resold. Historically, the additional cost is seldom recouped from the second purchaser. By eliminating the requirement that the manufacturer pay for this emissions-related maintenance, a manufacturer will be able to incentivize owners to adhere to those maintenance requirements in ways that do not drive

significant increases in purchase price -- increases that cause prospective buyers to purchase out-of-state, from the used truck market, or simply to retain vehicles longer.

§86.004-26.B.1.1.1.3.2. through B.1.1.1.4.4: EMA supports the addition of new options for MHDDE and HHDDE manufacturers to fulfill the durability demonstration requirements for the 2024-2026 model years. This additional flexibility is likely to be critical to certifying manufacturers' ability to deliver certified products within the 2-year lead-time for MY 2024 products. EMA recommends that a similar abbreviated testing option be made available to MDE and LHDDE manufacturers as well.

While the new abbreviated DF testing options will be helpful, the requirement to provide in-use emissions and OBD data from 50% or more of the manufacturer's California sales volume for three consecutive model years is overly burdensome (see §86.004-26, B.1.1.1.3.2 and B.1.1.1.4.3). CARB already is planning to finalize provisions within the Inspection and Maintenance ("I&M") Rule that will require periodic submittal of in-use data from the same vehicles. To also require manufacturers to submit the same data, on such a large volume of their California-sold vehicle population, is simply unnecessary. If CARB finalizes the Inspection and Maintenance rule to require periodic submittal of in-use data, CARB should also modify the Omnibus Rule to no longer require the same in-use data to enable abbreviated DF testing options *in the same rulemaking effort.*

For HHDDEs, the first increase to Useful Life takes effect in 2027, with a subsequent increase in 2031. One issue, however, that manufacturers will have to address concerns carrying-over engine families into model years when new Useful Life provisions take effect. Consider a manufacturer who launches a new product, or technology enhancements, to certify to an FEL below the prevailing standards, earning emissions credits as part of a long-term compliance plan. For example, a manufacturer may launch a new product with a NOx FEL of 0.035 g/bhp-hr in MY 2026. The manufacturer could be prohibited from carrying-over that same engine family into MY 2027 at the same emissions level due exclusively to the new Useful Life requirement. EMA requests that CARB clarify how manufacturers can carry-over an engine family under these circumstances by, for example, conceding emissions credits equivalent to the emissions that would be emitted over the "extended" portion of the new Useful Life requirement. While the example provided relates to a HHD engine, CARB should clarify this issue for all of the product categories. Understanding available flexibilities will be important to enabling manufacturers to develop pathways to compliance.

§86.004-26.B.1.1.3.10.: EMA supports the amendment that forbids "other persons" to disconnect, modify or alter telematics systems without the consent of the certifying engine or vehicle manufacturer.

§86.004-26.B.2.7.: The amendment includes a potentially inaccurate reference, "I.26."

§86.xxx-30.B.1.: CARB's 60-day Notice prohibited carryover of a family that failed an in-use test order or had an un-resolved corrective action requirement following EWIR failure threshold

exceedances. The 30-Day Notice permits such a carry-over if the manufacturer extends the emissions warranty on the failed component to Full Useful Life for that family or test group[2].

EMA recommends that the specific situation for each engine family for which a carryover or carry across application is submitted, and for which the corrective action is not fully implemented, be evaluated on a case-by-case basis. Consideration should be given to, for example, the failure rate, the actions taken to date, the schedule for implementation of (additional) corrective actions, and the emissions impact of the failure. In certain cases, upon considering these factors, the carryover or carry across should be permitted without extending the emissions warranty.

§86.1370.B.6.2.: The provision relates to managing window concatenation when conditions exist that meet one or more of the various data-invalidation criteria. CARB's original language limited windows to 600 seconds in total duration when seeking to accumulate 300 seconds of valid data within the window. The modified text requires that a window would not close unless more than 600 *continuous* seconds of invalid data are encountered; otherwise, the window should continue to accumulate data until 300 seconds of valid data are captured to close the window.

Careful management of the procedures regarding concatenation is very important, as an analysis of the WVU 100-vehicle Southern California fleet data shows that 23% of the windows recorded during that extensive in-use testing included periods of concatenated data (were greater than 300 seconds long). Further examination of that data shows that, when applying the proposed concatenation limits, 7 of the 9 vehicle categories tested had windows longer than 16.7 minutes (1,000 seconds) in duration, with linehaul (23 vehicles) and construction tractor (8 vehicles) categories having 0.25% and 1.1% of windows exceeding 16.7 minutes, respectively (across all-test days). The longest measured window was 42 minutes, from the linehaul category.

The new provisions regarding concatenation limits will be infeasible and impractical. Long window durations loaded with invalid data segments can present a significant challenge for thermal management strategies to avoid NOx breakthroughs. CARB has made no demonstration of the technical feasibility of the concatenation provisions as proposed. On the basis of these concerns, EMA recommends that CARB restore the originally-proposed 600-second maximum window length. A second preference would be that CARB increase the maximum window duration to 900 seconds. If neither of those recommendations is acceptable, EMA recommends invalidating windows longer than 600 seconds that also have an average power level less than an appropriate threshold.

§86.1370.B.6.2.6.: For MY 2024-2026 engines, CARB proposes to include cold coolant operation as invalid data for window calculations, not only as encountered following cold start, but also if encountered at later points during the test day. Data would be invalid whenever the coolant temperature is less than 158°F, and varies by more than +/-3.6°F over a five-minute interval.

EMA supports the proposed modification. However, we propose that the provision should not sunset after MY 2026. There is no known technology that nearly immediately raises SCR temperatures to levels that ensure high NOx conversion efficiency following a cold start. There

[2] There is a grammatical error in the proposed last sentence.

will be operators who start a cold engine and, within a minute or so, are under heavy load pulling onto the highway. It is entirely feasible that much of the excess NOx generated under such a condition will be placed in the (most stringent) medium/high power bin, and that the impact of several minutes of windows at engine-out NOx levels could easily lead to a failure in that bin. Catalysts for heavy-duty diesel engines are much larger and have much more thermal mass than in automotive gasoline applications. Also, exhaust temperatures are inherently lower due to higher compression ratios and lean-burn combustion. "Close-coupling" the catalyst helps to increase diesel-application SCR temperatures more rapidly, but not sufficiently to overcome these concerns, especially in colder ambient temperatures. Keep in mind that close-coupling is not physically possible in some vehicle applications. Moreover, SCR NOx reduction relies on DEF injection that requires sufficient heat and time to stabilize before starting. CARB has not demonstrated near-instant NOx control upon cold start, especially in colder ambient temperatures. Until technology is demonstrated to be capable of overcoming this condition, the coolant temperature exclusion should apply. Accordingly, this provision should not sunset after the 2026 model year.

§86.1370.B.6.2.7. and 6.2.8.: EMA supports the addition of manual and automatic active regeneration, as well as "engine shut-off or keyed off," to the conditions for which data is considered invalid. EMA also supports inclusion of all of these events, as well as zero-drift check or conditioning of the PEMS unit (as specified in §86-1370.B.6.2.1.), as invalid data conditions in revised §86-1370.B.6.2 eligible for the window-length concatenation limits.

86.1370.B.6.3.1: To address manufacturer concerns related to the challenges associated with invalidating a test day where cold-start does not occur at coolant temperatures at or below 86°F (30°C), CARB has proposed that, "If conditions are infeasible to meet the cold start requirements, the test may be conducted if circumstances were included in the test plan approval process in 86.1920.B.3.2 and approved by the Executive Officer."

EMA appreciates that CARB has heard our concerns on this matter, but recommends that CARB adopt a more direct, regulation-based approach to accommodating those circumstances where the cold-start requirement was not met, rather than relying on Executive Officer approval. The issue is too unpredictable to be managed in the manner proposed. In our comments to the 60-Day Notice, EMA presented several arguments (reiterated) explaining why this provision is overly restrictive, and could needlessly lead to re-testing, with all the undesirable consequences of unplanned additional test-days:

> There are still other complications raised by CARB's new proposed in-use testing requirements, including the requirement to include a cold-start. Conducting PEMS tests is very different from conducting test-cell tests. In the test-cell environment, nearly all measurement equipment can be connected and verified prior to starting the test. Test cells are not reliant on signals from the engine controller, such as those required to measure exhaust flow and fuel flow. In a test cell, measurement systems can be verified independently, without interaction with the test article, before engine start. Test cell equipment and functionality also benefit from not being removed from the test cell and

> test article, and re-installed for every test. That is not the case with PEMS testing.
>
> When conducting in-use testing with PEMS, each test is similar to a test-cell installation and commissioning exercise. With that tremendous complexity, plus the dependency on new controller connections for each PEMS test, it often takes a number of attempts to get all of the systems working reliably. Re-initialization of data communication is often necessary because of engine shutdowns and the reliance on engine control module data (again, not necessary in the test cell environment). Those J1939 communication initializations often cause issues during PEMS testing. What all this means is that there is a high risk, under the requirements CARB has proposed, of a test being declared invalid due to equipment malfunction during a cold-start. The consequence of that outcome is that testing would have to be rescheduled for another day, with the very real possibility that the customer would not be able to accommodate the extended request during the course of the test team's travel itinerary. That also can damage the good will that helped in recruiting the fleet customer and vehicle in the first place.

Moreover, ambient conditions in Southern California are frequently >86°F, making it impossible to meet the cold-start criteria, especially for those tests having engine-start in the afternoon.

For all of the reasons presented here and in our earlier comments, EMA recommends that CARB increase the cold-start coolant temperature threshold to at least 104°F (40°C). Additionally, CARB should provide that the test is acceptable if coolant temperature is no more than 19°F (10°C) higher than ambient temperature at cold-start. That said, there are unplanned fleet management issues that arise frequently that could make meeting even those modified provisions difficult, and therefore EMA additionally recommends that, without prior Executive Officer approval, a limited number of tests not meeting the requirement be permitted without invalidation. To be specific, EMA recommends that 2 out of 5, 3 out of 6, or 4 out of 10 vehicles be allowed to be reported as part of a test order even if they do not meet the cold-start coolant temperature conditions.

§86.1370.B.6.3.2.[3]: CARB proposes that the minimum number of valid windows in any bin should be 2,400 for a valid test, and that if a test-day does not include at least 2,400 windows in each bin, the manufacturer should test additional days with that vehicle until 2,400 windows are accumulated. CARB has also removed the requirement that the test-day include at least 3 hours of non-idle operation.

In our August 25th, 2020, comment submittal, EMA recommended that CARB should specify a minimum valid window count threshold for any bin from a test-day. It is important that the HDIUT requirements do not create a situation where an engine's emissions compliance is judged on the basis of a small sample of data, so EMA appreciates that CARB has attempted to address this matter. We also support the elimination of the requirement to have at least 3 hours of non-idle operation, as it is no longer necessary if a minimum window count is specified. EMA is, however, concerned about the specific provisions for minimum window count as proposed.

[3] There is a drafting error in the citation for this provision: "6.3.2 2"

As an initial matter, we are concerned that that the proposed 2,400 windows is insufficient to make a robust determination of compliance. EMA understands that this figure, which could represent as little as 40 minutes of data (though in most cases it will include more "real-time" data) is based upon the duration of typical test cell certification cycles. However, test cell certification cycles are not a good reference for this purpose, because there is much more randomness to the duty cycles, ambient conditions, engine operating conditions and other factors that can influence emissions during an in-use test compared to the strictly controlled cycle and conditions of a certification test. Data convergence to a reasonably representative level has to occur during the test-day. For this reason, we believe that much longer time periods (i.e., much longer than 40 minutes) are necessary for a fair and reasonable assessment in-use. CARB should demonstrate with representative data how many windows are sufficient to reasonably represent a vehicle's emissions performance in any bin during an in-use test.

To analyze the practical consequences of the proposed 2,400 window threshold, we can turn to real-world data as recorded by WVU on the 100-vehicle fleet in Southern California. Presented in the table below are the percentage of test-days where <2,400 windows were recorded for the day. The table includes the view for the entire fleet, and for two of the worst-case categories for bin window count.

Vehicle category	Qty vehicles tested	Number of test-days, total	Percentage of test days having <2,400 windows		
			Idle Bin	Low Bin	M/H Bin
Fleet (all vehicles)	100	2077	42%	14%	17%
Food/beverage/distribution, heavy	15	309	90%	47%	70%
Drayage	17	414	0%	20%	34%

It is clear from this data that manufacturers will very frequently encounter test-days that fail to accumulate the proposed requisite number of windows in each bin. CARB proposes in 86.1912.B.2 that if a vehicle does not acquire 2,400 windows in each of the three bins, they should continue testing for as many days as may be required to accumulate 2,400 windows in each bin. Taking into consideration the "fleet" perspective (all 100 vehicles from multiple categories), a full 20% of the test-days accumulated <400 windows in the Idle Bin, meaning it would take *at least* 6 test-days to accumulate 2,400 windows. Indeed, 10% of the test-days have *zero* Idle Bin windows, and would therefore never accumulate 2,400 windows despite months of testing.

In light of the foregoing, EMA supports the proposed amendment that permits a manufacturer to "instruct the fleet to idle the test engine at the end of the shift day for a minimum of 40 minutes and a maximum of 60 minutes" as a reasonable approach to dealing with the idle bin not meeting the minimum window count requirement at the end of the test day. EMA recommends that the provision be revised to permit the manufacturer to "*request* the fleet" idle at the end of the test day, and that the duration be limited to that which is required to achieve the minimum window count criteria. The provision should further allow that the OEM technician be permitted to conduct the additional idle testing if the fleet does not agree to do so.

The special consideration given to the idle bin is an important amendment; however, there may be cases where it does not resolve the issue. For example, if the vehicle is equipped with the automated 5-minute shutdown timer required by California provisions at §86.007-11.B.6.1., it will not idle for the required time of the proposed amendment without shutting down. The same would be true if the fleet from which vehicle is being tested has programmed the vehicle for automated shutdown after a period of time. CARB should consider the options proposed by EMA below to overcome this limitation.

In addition to those issues related to acquiring 2,400 windows in the idle bin, there remain concerns with the low and medium/high power bins as well. EMA recognizes that there is a tension between having *enough* data to make a responsible judgment about bin compliance on a test article, while also needing to *limit* the data requirements to avoid an excessive number of test-days to fulfill the minimum data needs. There are, however, reasonable ways to resolve this situation.

There are other opportunities CARB should consider to address instances where the minimum window count criteria is not met. For example, if the number of windows is sufficiently below the minimum threshold (perhaps, lower than 50% of the threshold), the test vehicle would be considered a PASS for all constituents in that bin, because the data sample is not statistically sound enough to make a determination, and there's little chance to acquire the threshold minimum after a second test day (cumulatively). Alternatively, the PASS determination might be made only if the window count is less than, say, 30% of minimum, while an interval from 30% to 60% could be assessed after applying an adjustment to the standard (2x, for example) to accommodate the uncertainty associated with small data samples.

For the vehicles having, after a test-day, a window count in a single bin above the 60% threshold, the manufacturer could be obligated to test a second day. If, after the second day of testing, the minimum threshold is not met, the bin would be assessed on the basis of the accumulated windows against the adjusted standard (as was described for the 30% to 60% interval above).

All of the aforementioned options regarding how to respond to a test vehicle having less than the threshold minimum window count could also be conditioned upon how the bin had performed up to that point in prior tests from the test order. For example, if there are already 5 vehicles tested and all five had demonstrated compliance for all constituents in "bin x", and the 6^{th} vehicle did not meet the minimum data requirements for bin x, then the test could be considered a PASS and the test plan could continue to the next vehicle under the assumption of leaving the 6^{th} unit out of an eventual 10-vehicle average. If, however, there were already a constituent having failed in bin x in a prior test, then the second test day could be required (again, but only if there were reasonable expectation to meet the threshold in the second day, so >60% of the threshold was acquired in the first day). The parameters expressed here (the "6^{th}" vehicle) are only offered by way of example, but the concept could be applied with different conditional parameters.

Another possibility is to include a provision specifying that if the total window count from all bins in a test-day exceeds some threshold (a different, higher threshold than that discussed for a single bin), the vehicle would be assessed only on the basis of the bins having met the single bin

window-count threshold, without additional days of testing. The bin not meeting the window-count requirement would be considered a PASS for reasons already described.

If the final rule provides for possibilities that a compliance determination is made on the basis of limited data (less than the regulated minimum threshold, but judged against 2x the in-use standard, for example), the manufacturer should have the option to include, or not, that bin's data from that vehicle in a 10-vehicle average determination should one be necessary. That is, the 10-vehicle average may be based on less than 10 vehicles for the bins where window count threshold levels were not met. Vehicles having zero windows in a bin would be removed from the averaging for that bin. Any bins where the minimum window count was met for all 10 vehicles would include all 10 vehicles results for that bin(s)

It must be recognized that the manufacturer has no control over how a vehicle will be operated on any single test-day. The data from the 100-vehicle Southern California fleet, like many other large IUT datasets, tell us that emissions from one day to the next are highly variable, dependent upon many factors, such as route, traffic conditions, driver habits, ambient conditions, and more. A vehicle with a high-performing emissions control system may, on any given day, emit at levels higher than typical for that vehicle under the influence of one or multiple of these factors. EMA therefore recommends that the IUT provisions allow a manufacturer to choose, solely at its discretion, to conduct additional test-days for a vehicle, and include the accumulated emissions measurements from all test days combined in the final results.

It is critically important to resolve all of these issues regarding minimum data requirements to ensure the success of the in-use test program. For example, if multiple test days are routinely needed as a contingency depending on the first test day's window counts by bin, the outcome will be that many cooperative fleets will find it unmanageable to accommodate in-use testing into their working schedules, making recruiting efforts even more challenging than they are today. In addition, those vehicle categories and applications where minimally-populated bins are frequent will be routinely avoided in the recruiting process, potentially leaving a "blind spot" in the overview of in-use compliance. A separate analysis would be needed regarding impacts of the minimum 2,400 window count threshold for Otto Cycle engines (§86.1370.B.1.3.2). EMA is willing to work with CARB to develop data-based strategies to overcome the challenges associated with window count requirements.

§86.1370.B.6.3.3. requires that for MY 2024-2046 engines the average engine power over the test *must* be ≥10% of the engine's peak power for a valid test, and that the manufacturer should test additional days until a valid test is achieved. EMA recommends that the manufacturer be given the option to submit data and count the vehicle toward the requirements to satisfy the in-use test order even if the 10% average power threshold is not met. We further recommend that the manufacturer be permitted to select another test vehicle, or even another fleet, if, upon testing a second day, the 10% threshold is not met (and the manufacturer elects *not* to submit the data as tested.) The average power criteria could overlap with and be further confounded by the minimum window count criteria of §86.1370.B.6.2. The revisions EMA recommends will permit manufacturers to avoid testing multiple days to no avail if the selected fleets operations do not typically meet the average power criteria.

§86.1370.B.6.4. through 6.6.: EMA supports the revised equations related to binning and bin emissions calculations as proposed.

§86.1370.B.6.6.: CARB proposes to increase the in-use emissions conformity factor from 1.5 to 2.0 for model years 2024 through 2029.

EMA supports the modification. EMA has long been a proponent of additional compliance margin during the early years of new standards. The proposed modification is directionally correct. However, even with this adjustment to the in-use conformity factor, the MAW in-use protocols have not been adequately verified as a viable compliance tool, and the technical feasibility of the in-use standards remains highly uncertain. Additionally, EMA stands by our position that PEMS measurement accuracy must be accounted for in any PEMS-based in-use test program. The PEMS measurement accuracy should not be considered as "accounted for" within the Conformity Factor. It is an issue that is completely separate from the actual in-use standard, but critical to the assessment of compliance to that standard.

EMA specifically has concerns about the occasional and unavoidable impacts of low SCR temperatures on the Medium/High Power Bin average emissions. EMA recommends that any Medium/High Power Bin windows having at least one datapoint recorded where T_{exh} measures 200°C or less should be reassigned to the Low Power Bin. There is no available technical solution ensuring adequate SCR temperatures in cases of return to service after long idling periods, coasting, or following extended key-off events. Such a provision as EMA recommends would protect against serious impacts on emissions results in the most stringent bin, the Medium/High Power Bin, while not *excluding* data, but merely assigning it to another bin.

Another of EMA's concerns regarding the 3B-MAW in-use standards is that CARB has directly linked the NOx emissions limits of the Idle Bin to an *optional* idle-NOx standard. The CARB "clean-idle" NOx standard is provided as an alternative to the automated 5-minute engine shutdown system of §86.007-11.B.6.1. The idle-NOx standard is not a mandatory standard, yet CARB has based the Idle Bin NOx threshold on this optional standard. Similarly, there are extended idle portions included in the new LLC certification test schedule that cannot be completed by an engine equipped with the automated 5-minute shutdown timer. This means that only engines designed to meet the optional clean-idle requirements are capable of completing the LLC. Otherwise, they would necessarily be equipped with the non-programmable timer that would force the engine to shutdown after any 5-minute idle period. Any demonstration of LLC compliance feasibility would be predicated on the condition that the engine would necessarily be designed to comply with CARB's optional clean idle standards, else it could not complete the LLC test so as to demonstrate compliance. CARB has, in effect, made compliance to the otherwise-stated optional clean-idle standard a mandatory requirement. CARB failed to make the required rule-making record to support or justify the de facto conversion of the optional low-NOx idle standard into a mandatory standard under the Omnibus Regulations. As a result, those aspects of CARB's rule-making are invalid.

§86-1910.A.(6)(g)(ii): This provision regarding minimum window count criteria for each bin is redundant to §86.1370.B.6.2 (and §86.1912.B).

§86.1912.B.: This provision regarding minimum window count criteria for each bin is redundant to §86.1370.B.6.2 (and §86.1912.A.6.(g)(ii)). This provision is also in conflict with §86.1370.B.6.2 (and §86.1912.A.6.(g)(ii)) because it permits only one ("an") additional day of testing, rather than an unspecified number of additional days of testing.

§86.1915.B.1. increases the period of time within which a manufacturer must notify the Executive Officer if an engine family is found to be in non-compliance as a result of Phase 1 testing for 2024 and later model year engines. EMA supports this amendment.

§86.1915.B.5. describes engine family pass/fail criteria in the case of an in-use test order for 2024 and later model year engines. See our comments above related to similar provisions in 13 CCR §2140(c)(1) and (2).

§86.1920.B.3.1.: The 60-Day notice included new requirements for manufacturers to submit detailed information regarding their test plans to fulfill an in-use test order (at least 30 days before testing is to commence). The 30-Day Notice proposal provides that a manufacturer may identify certain data elements as "forecast" if they are not known at the time the information is sent to CARB.

Some 37 information elements are required to be submitted at least 30 days prior to the commencement of testing, the vast majority of which would be unknown or subject to change that far in advance. The 30-Day Notice proposal is a practical approach to overcoming this issue. EMA supports the proposal to identify unknown elements in this submission as "forecast."

§86.1920.B.3.2.: EMA's comments with respect to the manufacturer's request for Executive Officer approval where the cold-start condition may not be included in the test day are discussed above related to the provisions of 86.1370.B.6.3.1.

§1065.514.A.3.4.: EMA supports the proposed LLC cycle-validation criteria for variable-speed gaseous-fueled engines with a single-point fuel injection system.

§1065.518.B.1.: EMA supports CARB's proposal to retain the current "default" number of allowed preconditioning cycles (specifically, two preconditioning cycles). It is appropriate and beneficial that CARB maintain the same requirements as under the federal regulation.

To be clear, and consistent with the provisions of §1065.680.B.1., EMA recommends that the provision include the addition of the underlined text:

> For confirmatory testing, you may request Executive Officer approval for us to run more than two preconditioning cycles; the Executive Officer shall approve this upon determining that the extra preconditioning cycles are limited to the minimum technically necessary to meet the intent of this section, for example, to restore ammonia in the SCR catalyst due to the effect of DPF regeneration on NH_3 storage in the SCR catalyst; that emissions during the operation from the end of the regeneration through the end of the requested extra preconditioning cycles <u>(preceding the standard preconditioning cycles not requiring Executive Officer approval)</u> are fully accounted for in the measurement and calculation of emission factors EF_L and EF_H as specified in section 1065.680 of these test

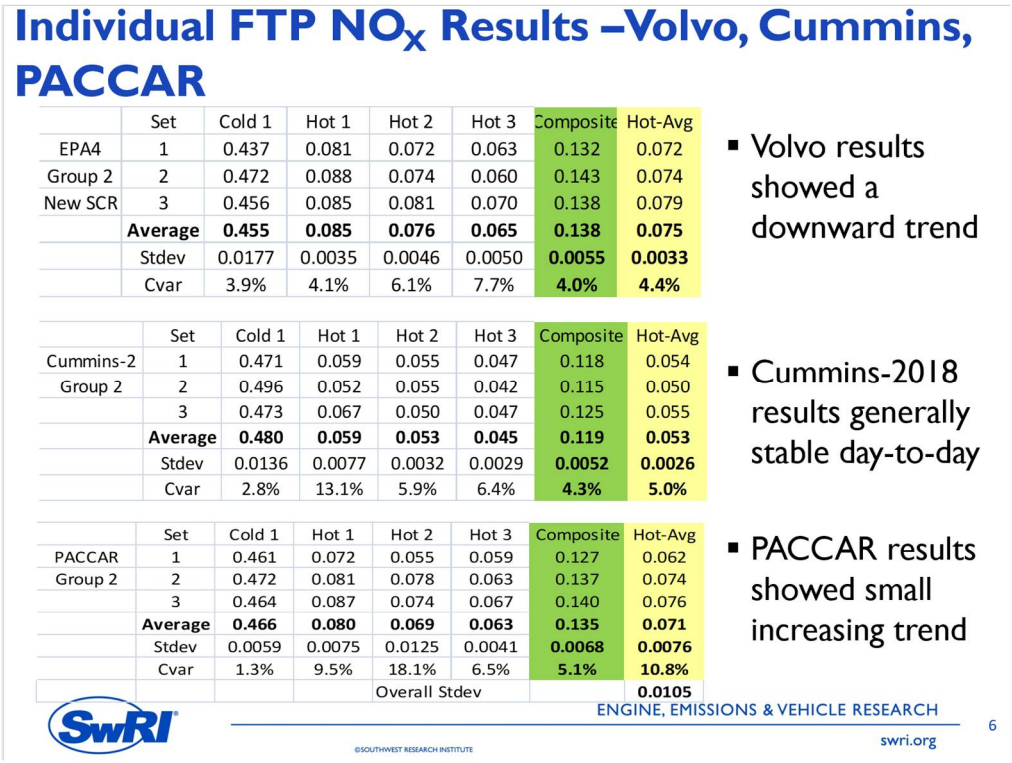
> procedures; and that the request for extra preconditioning cycles was made prior to the engine family being certified.

The regulation should also acknowledge that the LLC, which is proposed by CARB to use two *FTP* preconditioning cycles, is an exception to the requirement in this provision that "the specific cycles for preconditioning are the same ones that apply for emission testing."

§1065.518.B.2. includes new requirements regarding emissions stability during successively repeated emissions tests. In discussions with CARB staff, and in an October 7th, 2020 EMA memo to CARB Staff, EMA expressed manufacturers' considerable concerns with the following overly-restrictive requirement contained within §1065.518.B.2:

> Additionally, emissions performance should not deteriorate, degrade, or decrease upon successive repeats of the certification cycle. The emissions control system should not use different control targets upon successive repeats of the certification cycle given the same or similar test conditions. For example, the emission level from the first Hot FTP following the Cold FTP should be consistent with any emission level from a Hot FTP that was conducted as part of a series of back-to-back Hot FTP cycles up to the point the next regeneration is triggered.

The requirement at issue establishes unreasonable expectations regarding measured tailpipe emissions stability when repeating a certification cycle multiple times. Measurement variability will play an obvious role in the differences in the measured results from one test to the next. The environmental conditions in the test cell can vary over time, influencing tailpipe emissions results. During recent "Round Robin" testing among industry, regulatory agencies, and other laboratories, the same test article was shown to have decreases in subsequent hot FTP tests in one lab, but increases in another:



These variations could be even more significant, on a relative basis, at the very low emissions levels that will need to be demonstrated when certifying products to CARB's 2027 NOx standards. For example, a 2024 or 2027-compliant engine may have a hot-FTP measured test result of 0.001 g/bhp-hr, with a subsequent hot-FTP measuring 0.002 g/bhp-hr. A mere 0.001 g/bhp-hr increase of that type, an entirely possible and, in fact, highly probable outcome with future engines, is actually a 100% increase in measured emissions. This example clearly illustrates the need for reasonable limits regarding emissions increases. Manufacturers require reasonable limits that they can design to and CARB staff require reasonable limits that they can enforce in a reasonable manner.

Additionally, there is no reason to expect that the entry conditions to a hot-FTP cycle with or without a soak period following the cold-FTP/20-minute-soak/hot-FTP certification cycle would be the same or similar to the entry conditions of the "official" hot-FTP that follows the 20-minute soak period. The NH3 storage levels may not be the same. There can be aftertreatment temperature differences that could influence emissions levels. Indeed, any number of factors can influence tailpipe emissions in such a case. The SCR-related variables mentioned are an indisputable consequence of utilizing this important technology, the very technology that CARB has literally doubled-down on in the feasibility demonstration by Southwest Research Institute for the 2027 NOx standards.

CARB staff have explained that they expect manufacturers to design their emissions control systems and control strategies to be fully robust against small deviations in emissions when running consecutive repetitive tests, even when there are no limitations on varying soak times between tests. That is an unreasonable expectation, for which CARB has made no demonstration of technical feasibility. Without reasonable limits on the amount by which the highest of

successive repeat tests might be permissibly greater than the official test of record, this provision is simply not workable.

One approach a manufacturer could consider to ensure compliance with the successive repeats emissions-increase prohibition is to develop controls that essentially guarantee, or at least improve the chances that, the first test is always the highest in the series. That approach, however, would violate the prohibition on differing control commands in successive repeats: "The emissions control system should not use different control targets upon successive repeats of the certification cycle given the same or similar test conditions." EMA has concerns with that *control stability* requirement as well. One should expect natural variability in the table values used to command functions caused by the variability of sensed values, or even true values, during the test cell measurement procedures. Moreover, there is considerable uncertainty associated with the phrasing "same or similar input conditions." There is also the possibility that periodic control strategies could be invoked that would "use different control targets," such as an approved AECD that assesses and adjusts stored ammonia levels in the SCR catalyst, or the initiation of an intrusive monitor. Future engines are likely to expand upon the implementation of controls that constantly monitor engine and ambient conditions and make small adjustments in the effort to balance NOx emissions compliance and CO2 compliance. EMA therefore recommends the addition of the underlined text here:

> The emissions control system should not use different control targets upon successive repeats of the certification cycle given the same or similar test conditions, <u>except where AECDs are triggered according to conditions approved by the Executive Officer</u>.

CARB should reconsider and adopt this qualifying element in these stability provisions.

Returning to the prohibition against increased tailpipe emissions results during successive repeats of certifications tests, CARB also rejected EMA proposals to allow emissions to increase above the first tests results, but only if all the results from all of the repeated tests were compliant to the standard or FEL to which the engine was certified. For example, as long as all of the hot-FTP results in a series of repeated hot-FTPs, when combined with the cold-FTP measured prior to the first hot-FTP (test of record), produced compliant results (after applying IRAFs and deterioration factors), the engine would not be determined to be non-compliant.

CARB's refusal to accept this practical and reasonable means to address concerns about successive certification test results creates the potential for unreasonable if not irrational consequences. Consider the case where Manufacturer A is deemed compliant if the cold-hot composite emissions were held constant over successive hot repeats (e.g. cold/hot#1 composite = cold/hot#n composite) at a level 20% below the standard, whereas Manufacturer B's family would be deemed non-compliant if cold/hot#1 were 50% below the standard, but the highest successive hot pushed the composite to 40% below the standard. This example clearly illustrates why the "as long as all repeats are compliant" approach is the most rational way for CARB to deal with any concerns about emissions controls in the case of repeated certifications tests.

Considering all of the foregoing factors, EMA recommends that CARB modify the requirements of §1065.518.B.2 regarding successive repeats to allow for increases in emissions as

long as no individual test produces failing results. If CARB continues to reject this practical and reasonable solution, they should specify reasonable limits on the amount by which the highest of successive repeat tests might be permissibly greater than the official test of record, but only after presenting data that demonstrates the feasibility of those limits. Either of these recommendations would also require that CARB establish reasonable grounds for the *emissions control* stability as well, making the exception for approved AECD activity, for example.

If CARB rejects both the first and the second recommendations set forth in the previous paragraph, then EMA recommends that CARB modify the provision by adding the underlined text as follows:

> Additionally, emissions performance should not deteriorate, degrade, or decrease upon successive repeats of the certification cycle beyond reasonable levels attributable to test-to-test variability. The emissions control system should not use substantially different control targets or strategies upon successive repeats of the certification cycle given the same or similar test conditions, except where AECDs are triggered according to conditions approved by the Executive Officer. For example, the emission level from the first Hot FTP following the Cold FTP should be statistically consistent with any emission level from a Hot FTP that was conducted as part of a series of back-to-back Hot FTP cycles up to the point the next regeneration is triggered.

Finally, all of the new provisions that CARB proposes to add to §1065.518 are not descriptions of acceptable measurement practice. Rather, they are requirements and limitations that should be defined in the relevant standard-setting part of the regulation.

1065.680.B.1. The 30-Day Notice specifies that only manufacturers requesting and being granted Executive Officer approval to use "extra" (more than two) preconditioning cycles are required to include the preconditioning emissions from those extra preconditioning cycles (and only those extra preconditioning cycles) in the EF_H measurement and calculation of infrequent regeneration adjustment factors ("IRAFs"). EMA supports this amendment to the 60-Day version of the regulation. EMA requests that CARB confirm that if no extra preconditioning cycles are approved, the preconditioning practices for the two (or fewer) "default" preconditioning cycles as applied today based on the federal provisions of 40 CFR 1065.680 are acceptable, and that IRAFs may be determined without including the emissions from those default preconditioning cycles.

§1065.935.B.2.: CARB has proposed to modify the provisions related to PEMS drift correction for NO, NO_2, and NO_x. EMA has a number of concerns regarding the proposed drift correction process, including the following issues.

We appreciate that CARB has recognized the significant impact that PEMS NOx measurement drift can have on the measurement accuracy, which is critically important in the context of the very low NOx levels that PEMS will need to measure and record, and the very stringent standards established under the Omnibus Low NOx Regulations. This is especially true for the Medium/High bin, where the standard requires a maximum allowable average NOx concentration of 7 to 8 ppm (MY 2030 and later, when the conformity factor is reduced to 1.5). In light of that ultra-low standard, CARB has proposed to reduce the maximum allowable level of PEMS drift for NO, NO_2, and NOx, from earlier proposed drift levels of +/-5 ppm, to +/-2.5

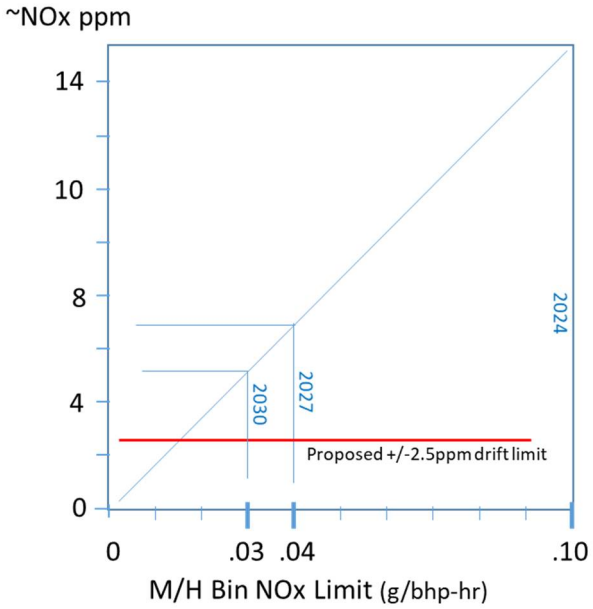
ppm at any zero-check (relative to the pre-test zero). Emissions recorded when the zero-check has exceeds +/-2.5ppm would be invalid. The remaining valid data would be corrected by Equation 1065.672-1.

As can be seen from the RMC emissions test results generated with the SwRI Stage 3 engine (set forth in the table below), NOx levels of 1 to 3 ppm will necessarily dominate most Bin 3 operation if compliance it the be achieved. Consequently, it will be critical to accurately measure those 1 to 3 ppm NOx levels, so that the day's average emissions in the bin (including inevitable transient NOx breakthroughs, for example, during a "return to service" event following a period of extended idling or coasting), can reliably demonstrate a passing level. Very small errors of +1 to +2 ppm (after correction) when measuring 3 ppm or lower NOx levels, will almost certainly lead to determinations of Bin 3 noncompliance for engines which are actually meeting the standard. This issue goes to the core of the likely infeasibility of the Bin 3 requirements.

	A	B	C
100	1.6	2.5	2.0
75	2.6	1.9	1.4
50	2.3	3.3	2.3
25	2.3	8.6	1.6
Idle		5.1	

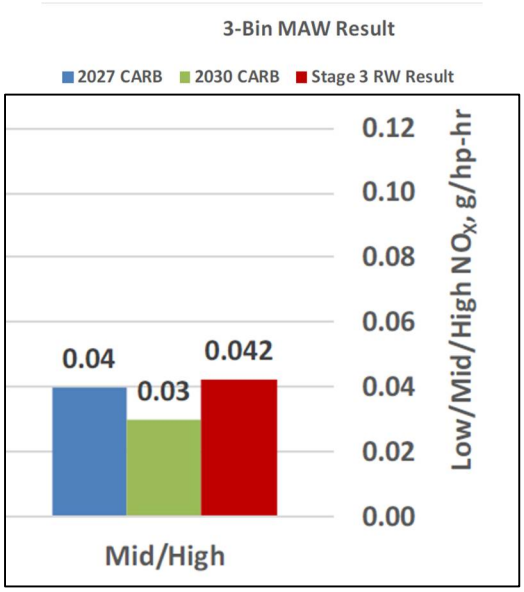
SwRI Stage 3 average NOx concentrations (ppm) at Ramped Modal Cycle test points

The scale of the maximum allowable PEMS NOx zero-drift during a test-day relative to the very stringent Medium/High Bin in-use NOx limits is shown in the following graph, and clearly reflects the extreme sensitivity of Bin 3 NOx compliance to zero-drift.

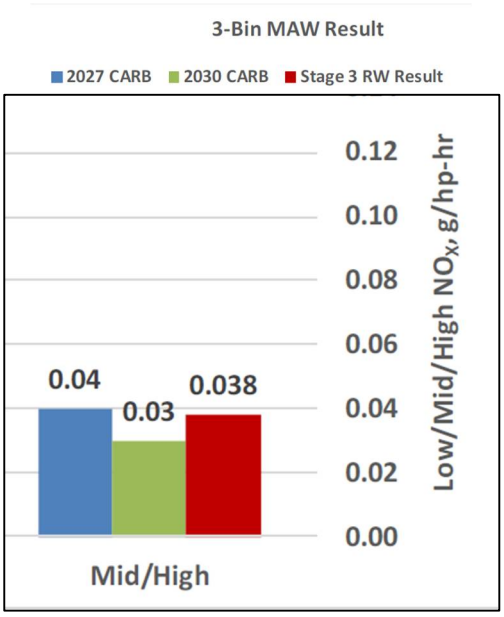


Proposed PEMs NOx zero-drift limit compared to in-use Medium/High Bin NOx standards.

The 3B-MAW Medium/High Bin NOx standards are so challenging that the SwRI Stage 3 engine and aftertreatment system developed and calibrated for the specific purpose of demonstrating the feasibility of the Omnibus Low NOx standards is actually incapable of meeting the 2031 and later in-use requirements for two of five routine road-cycle applications when assessed after 435,000 miles of aftertreatment aging (even before considering CARB's extended FUL and durability demonstration requirements). The Medium/High Bin results from SwRI's testing for the Drayage Cycle developed by West Virginia University are shown here:



The Medium/High Bin results from SwRI testing over a simulated European ISC route also developed by West Virginia University are shown here, and also reflect similar non-passing results:



The other three road cycles had minimal margins of compliance to the 2031 Bin 3 in-use NOx standard, specifically in the range of 0.012 to 0.014 g/bhp-hr, and *no* margin to the 2031 standard when tested on CARB's "Southern Route" that is routinely used for assessing manufacturer compliance to CARB's HDOH emission standards. These results are perhaps not surprising, since the Stage 3 engine was non-compliant with the 2027 FTP, RMC, and LLC standards after 290,000 miles of aftertreatment aging, despite the aftertreatment system performing at a remarkable 99.3% and 99.5% NOx conversion efficiency for the FTP and RMC cycles, respectively -- levels that will be extremely challenging, if not impossible, to ensure consistently in the field. All of these results clearly establish that highly accurate PEMS measurement capabilities are critical to any potential feasibility of the Omnibus Low NOx program, especially since CARB (unreasonably) does not intend to provide for any type of PEMS measurement allowance to compensate for measurement uncertainty.

Also, the PEMS drift limitations for NO, NO_2 and NOx do not place any limitations on span drift. Similarly, there are no limitations on drift correction (as are applied in the case of correction for other constituents, for example, according to §1065.550(b).). Discussions in the EMA Emissions Measurement and Testing Committee, and communications with PEMS manufacturers, have raised other issues related to measurement and correction processes. The setting of limits on drift and drift correction should also be informed by the results of the ongoing PEMS Measurement Allowance Study being conducted by SwRI.

The above open questions, in combination with the need for very accurate measurement capability at ultra-low NOx levels at issue, require that CARB state in the Final Statement of Reasons that they commit to reviewing, and revising as necessary, the provisions of §1065.935.B.2 and related regulations. Among other things, those revisions will be required to account for and incorporate any necessary measurement allowances and other test-procedure improvements that result from the collaborative and multi-stakeholder PEMS Measurement Allowance research project that Southwest Research Institute is currently conducting.

Recognizing that the final data, conclusions and recommendations from the PEMS Measurement Allowance project will not be available in time to make all of the required revisions to CARB's currently proposed PEMS NOx drift correction and validation procedures before the Omnibus Regulations are finalized, EMA recommends that proposed section §1065.935.B.2 be reworded as follows:

> For 2024 and subsequent model year engines, take the following steps after in-use emission sampling is complete.
>
> > For NO, NO2, and NOx measurements, instead of applying the drift validation criteria in §1065.550(b)(3)(i) or (b)(4), invalidate any data recorded between two consecutive zero-drift checks if either of them is not within +/-2.5 ppm of the pre-test zero. All valid NO, NO_2, and NOx data shall be drift-corrected using Eq. 1065-672-1 prior to calculating bin emissions as described in section 86.1370.B.6.6.
> >
> > Invalidate all NO, NO_2, and NOx data if the post-test gas analyzer response to the span gas concentration is not within ±4% of the pre-

test response.

For criteria emissions other than NO, NO_2, and NOx, only drift-corrected data that meet the verification criteria of §1065.550(b)(3)(i)(A), and CO2 drift-corrected data that meet the verification criteria of §1065.550(b)(3)(ii), may be included in the bin emissions calculations described in section 86.1370.B.6.6.

These data-validation criteria will be revised in the future to account for any additional measurement allowances that may be required to ensure that the portable emissions measurements systems (PEMS) used to measure and quantify in-use emissions accurately account for the variability of such in-use measurements at the low emission levels and limits established for 2024 and subsequent model year engines, particularly with respect to NOx.

As results and recommendations become available through the pending PEMS Measurement Allowance research project, EMA will work with CARB staff to add appropriate drift limits, verification procedures, and measurement allowance factors to the NO, NO2 and NOx measurement procedures to include in the final Omnibus Low NOx Regulations.

EMA's Comments Related to Otto-Cycle Test Procedures

The Omnibus Low-NO_x Regulations introduce rigorous new in-use compliance procedures for gasoline engines involving binning of emissions captured over "moving average windows" ("B-MAW"). While EMA has numerous overarching concerns about CARB's B-MAW requirements, of note here is the fact that CARB has done little to demonstrate the feasibility of the B-MAW standards on gasoline engines. We recommend that CARB include commitments in the Final Statement of Reasons to monitor EPA's rulemaking activity regarding application of B-MAW to gasoline engines, and to subsequently harmonize with the EPA requirements.

§86.1370.B.1.3.2. requires that at least 2,400 valid windows be accumulated by the end of a test day, and that the vehicle must be tested for as many additional days as required until 2,400 valid windows in total are accumulated. The challenges of the 3B-MAW protocol to accumulate 2,400 windows in each bin over a test day are much greater than they are for an engine tested under the B-MAW protocol to accumulate at least that number of windows. It should be much easier to accumulate 2,400 windows within a test day under B-MAW requirements. This permits us to focus on the issue of having accumulated sufficient data to make a fair and reasonable assessment of the engine's emissions performance, with far less concern about being obligated to test additional days (due to insufficient window count in one of three bins). For this reason, EMA recommends that the B-MAW in-use test provisions require a minimum of 3 hours of non-idle operation in a test day, as is applied today for the NTE-based in-use testing protocol. EMA further recommends that the regulation permit that another vehicle or fleet may be tested if 3 hours of non-idle operation are not yet accumulated after two test-days, to avoid the risk of testing an application unlikely to reach the criteria after more than two days.

§86.1370.B.1.5.: The 30-Day Notice proposes that, for model years 2024 through 2026, gasoline-engine manufacturers may eliminate up to 5% of the data recorded while fuel enrichment is active before calculating the B-MAW emissions. EMA supports the provision as proposed. There is no justification, however, for sunsetting the 5% enrichment allowance after MY 2026. There are no practical solutions to eliminate enrichment as a means for preserving the efficacy of the emissions aftertreatment during high-load operation. CARB should adopt regulations reflecting that reality, and should include the enrichment exclusion without sunset. When viable alternatives are developed, CARB can modify those provisions as necessary.

In the same way that CARB has provided for a CO enrichment exclusion in the proposed amendments to the Otto-Cycle Test Procedures (§86.1370.B.1.5), CARB should also allow a limited NOx exclusion for spark-ignited engines during fuel enrichment employed to reduce NOx upon throttle tip-in after a motoring/fuel cut-out condition. During engine brake operation, air flow through a spark-ignited engine and catalyst is significantly higher than during other fuel cut-out events, causing the catalyst to oxidize and cool down at a faster rate. Restoring catalyst effectiveness is thereby even more challenging after braking events. The exclusion could be structured such that the raw data could be ordered from lowest to greatest NOx emissions rate (similar to the CO exclusion procedure), so that criteria pollutant data could be invalidated for the highest NOx data points up to the 5% limit. Allowing such an exclusion maintains a level-playing field across various spark-ignited applications and ensures that engine braking, a feature deemed critical by customers with certain duty cycles, remains an available option.

Other provisions: The following 30-Day Changes relate to the Otto-Cycle requirements, and are directly related to the referenced provisions from the "Diesel Test Procedures" cited here. The EMA comments in the "Diesel Test Procedures" section therefore have direct applicability to the following provisions of the "Otto-Cycle Test Procedures":

Regarding provisions in the "Otto-Cycle Test Procedures"	See EMA Comments related to provisions in the "Diesel Test Procedures" section above.	Issue (see referenced Section from EMA Comments to "Diesel Test Procedures" for full explanation of concerns and recommendations).
§86.xxx-15.B.2.i	§86.xxx-15.B.3.(j)	ZEV NOx credits should sunset after MY 2030, not MY 2026
§86.xxx-15.B.3.	§86.007-15.B.4.	Clarify that multipliers apply in MY 2022 and MY 2023 for FELs to 0.20 g/bhp-hr NOx, NTE requirements, and related standards for those model years.
§86.xxx-25.A.1.11.	§86.004-25.A.(b)(7)(ii)	Request for new emissions-related maintenance without Executive Officer approval, or at least with lesser requirements than "detailed evidence supporting the need"
§86.xxx-30.B.1.	§86.xxx-30.B.1. (same)	Full Useful Life warranty for carry-over/carry-across certificates should be managed on a case-by-case basis
§86.1370.B.1.2.	§86.1370.B.6.2.	Concatenation limits require revision
§86.1370.B.1.2.6.	§86.1370.B.6.2.6.	Engine Coolant Temperature parameters for invalid data are supported, but should not sunset after MY 2026.
§86.1370.B.1.2.7.	§86.1370.B.6.2.8.	Key-off as invalid data is supported
§86.1370.B.1.3.1.	§86.1370.B.6.3.1.	Amend requirements for Executive Officer approval for potential cases where Engine Coolant Temperature exceeds 86 deg F at start of test. Otto-Cycle exceptions to the requirement should be same as those for Diesel engines.
§86.1370.B.1.3.3.	§86.1370.B.6.3.3.	Minimum 10% average power for test day: Manufacturer should have the option to submit the data. Alternative vehicles may be sought if criteria not met after 2 test days.
§86.1370.B.1.4.	§86.1370.B.6.6.	MY 2024-2029 Conformity Factors are supported.

EMA's Comments Related Greenhouse Gas Provisions

The Omnibus Low-NO_x Regulations include proposed modifications to the Greenhouse Gas Test Procedures and to the Diesel Test Procedures, and the Otto-Cycle Test Procedures (Appendices B-3, B-1 and B-2 of the 30-Day changes.) The proposed modifications are closely aligned with EPA's recently signed Technical Amendment package (EPA Pre-publication version, March 10, 2021.)

We appreciate and fully support CARB's efforts to maintain alignment with the EPA Technical Amendment package. Further to that effort we have identified several areas of non-alignment and request that CARB adopt all EPA technical amendments as described in the EPA Pre-publication version, March 10, 2021. We would like to highlight the following provisions that are not aligned with EPA:

§1036.150(q) and §1036.235(c): CARB should align with EPA's March 10, 2021 Technical Amendments for these provisions related to fuel map confirmatory test procedures.

§1036.701(j): CARB should allow for carry-over of Phase 1 vocational engine credits when recalculated against the revised Phase 2 baseline, in alignment with EPA's March 10, 2021 Technical Amendments.

§1037.501(i): CARB should align with EPA provisions related to declared GEM inputs and compliance margins.

§1037.660: CARB should align with EPA provisions related to partial credits for neutral-at-idle technology and should include the additional stop-start overrides, in alignment with EPA.

EMA appreciates the opportunity to provide the foregoing comments for CARB's consideration. If you have any questions, or if there is any additional information we could provide, please do not hesitate to contact Steve Berry at sberry@emamail.org.

Respectfully submitted,

TRUCK & ENGINE MANUFACTURERS ASSOCIATION