



July 26, 2024

California Air Resources Board
1001 I Street
Sacramento, California 95814
Proposed Amendments to the Advanced Clean Cars II Amendments
(Submitted via <https://ww2.arb.ca.gov/public-comments/comment-log-advanced-clean-cars-ii-amendments-june-workshop>)

Comments of General Motors on CARB’s Workshop on Proposed Advanced Clean Cars II Amendments, Second Public Workshop

General Motors LLC (GM) appreciates the opportunity to offer comments on the California Air Resources Board’s (CARB) proposed Advanced Clean Cars II Amendments, Second Public Workshop (June 26, 2024), including discussion of the preliminary regulatory proposal for light- and medium-duty vehicle smog-causing criteria air pollutant requirements; and zero-emissions vehicle assurance measures.

If you have any questions, please contact me at 313-665-9967.

Sincerely,

Matthew Rudnick
Director – Climate, Environment & Energy Policy
Global Public Policy
General Motors

General Motors Company (“GM”), headquartered in Detroit, MI, is a global automotive manufacturer committed to positively impacting the communities where its customers live and work. In California, GM works with over 600 suppliers, and in 2023 GM delivered for sale more than 290,000 vehicles across more than 200 dealers.¹ GM is a full line vehicle manufacturer,² and GM is increasingly producing and delivering zero-emissions vehicles for sale.³

GM supports California’s authority to set state standards that will be at least as protective of public health and welfare as applicable Federal standards, as outlined in section 209(b) of the Clean Air Act.⁴ GM appreciates the ability to engage with CARB as California develops, proposes, finalizes, and ultimately seeks a waiver of Federal preemption to implement its regulations.

GM continues to support conversations with California as CARB develops, amends, and implements rulemakings, and we work together towards the shared goals of cleaner air, and safer, more reliable, and more affordable transportation. On June 28, 2023, GM affirmed its continued commitment to achieving significant reductions of air pollutants in California as a signatory to the Clean Truck Partnership Agreement (Agreement).⁵ GM is cooperating with California for the successful implementation of the Low NOx Omnibus rule,⁶ and the Advanced Clean Trucks rule;⁷ CARB has recently proposed to amend both rules,^{8,9} including amendments consistent with the Agreement. GM is hopeful that CARB will propose and finalize rules with administrative processes for initial reporting and certification, and ultimate compliance that are practical to administer and are not inconsistent with Federal regulations.

Federal agencies recently finalized updates to Federal emissions related regulations, in parallel with California rulemaking. U.S. Environmental Protection Agency (EPA) recently finalized emissions rules for light- and medium-duty,¹⁰ and heavy-duty vehicles,¹¹ and engine dynamometer certified powertrains.¹² U.S. Department of Transportation (DOT) has finalized light-, and medium-duty Corporate Average Fuel Economy and Corporate

¹ <https://www.gm.com/company/usa-operations/california>

² <https://www.gm.com/gm-brands>

³ <https://www.gm.com/innovation/electrification>

⁴ 42 U.S.C. § 7543.

⁵ Clean Trucks Partnership Agreement (July 5, 2023), [CARB and the Truck and Engine Manufacturers Association Agreement](#)

⁶ CARB Heavy-Duty Omnibus Regulation (December 22, 2021), <https://ww2.arb.ca.gov/rulemaking/2020/hdomnibuslownox>

⁷ CARB Advanced Clean Trucks Regulation (March 15, 2021), <https://ww2.arb.ca.gov/rulemaking/2019/advancedcleantrucks>

⁸ CARB Proposed Amendments to the Heavy-Duty Engine and Vehicle Omnibus Regulation (May 31, 2024), <https://ww2.arb.ca.gov/rulemaking/2023/hdomnibus2023>

⁹ CARB Proposed Amendments to the Advanced Clean Trucks Regulation and the Zero-Emission Powertrain Certification Test Procedure (March 25, 2024), <https://ww2.arb.ca.gov/rulemaking/2024/advancedcleantrucks>

¹⁰ (EPA Tier 4) U.S. EPA Final Rule: Multi-Pollutant Emissions Standards for Model Years 2027 and Later Light-Duty and Medium-Duty Vehicles (July 3, 2024), <https://www.epa.gov/regulations-emissions-vehicles-and-engines/final-rule-multi-pollutant-emissions-standards-model>

¹¹ (EPA HD Phase 3) U.S. EPA Final Rule: Greenhouse Gas Emissions Standards for Heavy-Duty Vehicles – Phase 3 (June 17, 2024), <https://www.epa.gov/regulations-emissions-vehicles-and-engines/final-rule-greenhouse-gas-emissions-standards-heavy-duty>

¹² (EPA HD Engine) U.S. EPA Final Rule and Related Materials for Control of Air Pollution from New Motor Vehicles: Heavy-Duty Engine and Vehicle Standards (January 11, 2024), <https://www.epa.gov/regulations-emissions-vehicles-and-engines/final-rule-and-related-materials-control-air-pollution>

Average Fuel Consumption rules.¹³ Final rule corrections and technical amendments are still pending on some of these Federal rules. In combination, these rules set ambitious and challenging Federal standards for greenhouse gas emissions and fuel consumption, and for criteria emissions from new motor vehicles, consistent with Biden-Harris Executive Order on Strengthening American Leadership in Clean Cars and Trucks.¹⁴

Against this backdrop, CARB is workshopping and proposing amendments to the Advanced Clean Cars II (ACC II) / Low Emissions Vehicle IV (LEV IV) future light- and medium-duty ZEV and emissions regulations. GM supports CARB's decision to evaluate, propose, finalize amendments to ACC II/LEV IV, and to seek a waiver to enforce the final regulations. ACC II/LEV IV amendments provide CARB the opportunity to consider recently finalized Federal standards and updates to other CARB regulations, and to streamline light- and medium-duty requirements.

GM is hopeful that, with CARB ACC II/LEV IV amendments, GM will be able to certify vehicles with the same hardware and same test procedures in all 50-states. Absent modifications to CARB ACC II/LEV IV, misalignments in useful life, warranty, test requirements and certification categories with Federal standards will create duplicative laboratory work and undermine economies of scale in engineering and production, for marginal emissions benefit in California. The regulatory landscape for Class 2b-3 vehicles, and internal combustion engine, plug-in hybrid, and zero-emission powertrains installed Class 2b-5 applications is particularly complex.

As CARB chooses to add requirements via amendments, GM is hopeful CARB will provide sufficient notice of requirements and sufficient lead-time for manufacturers to develop products that comply with the updated regulations. Insufficient lead-time or unclear communication of regulatory requirements increases risk of product outages or restricted sales volumes in California, which is an outcome GM hopes to avoid.

GM maintains its commitment to increasingly bringing to market and delivering for sale vehicles with zero-emissions technologies and affirms its commitment to a successful Clean Trucks Partnership Agreement. Convenience, affordability, and reliability of zero-emissions vehicle (ZEV) refueling infrastructure will play a critical role in winning over customers with zero-emissions vehicle technology, as will State and Federal purchase incentives for ZEV technologies. GM looks forward to opportunities to review these comments and proposed amendments with CARB staff and to further discuss our shared emissions reductions goals.

¹³ (DOT CAFE/CAFC) National Highway Traffic Safety Administration Corporate Average Fuel Economy and Fuel Consumption Standards (June 7, 2024), <https://www.nhtsa.gov/laws-regulations/corporate-average-fuel-economy#light-duty-vehicles>

¹⁴ Executive Order on Strengthening American Leadership in Clean Cars and Trucks (August 5, 2021), <https://www.whitehouse.gov/briefing-room/presidential-actions/2021/08/05/executive-order-on-strengthening-american-leadership-in-clean-cars-and-trucks/>

Summary of GM Technical Comments and Recommendations in Response to California Air Resources Board’s (CARB) Workshop on Proposed Advanced Clean Cars II Amendments (Second Public Workshop)

Table 1. Summary of GM Technical Comment Appendices and Recommendations.

TOPIC	Recommended Action
APPENDIX A Certification Bins for light- and medium-duty vehicles	<ul style="list-style-type: none"> • As CARB proposed - Absent harmonized bins in the CARB program with the EPA, allow certification to lower Federal bins, consistent with eliminating the “Cleaner Car” provision for light-duty vehicles. • Allow same provision for medium-duty vehicles (including Class 3, Bin 170 / Bin 175).
APPENDIX B Particulate Matter (PM) standards for light- and medium-duty vehicles	<ul style="list-style-type: none"> • As CARB proposed – 0.5 mg/mi in MY 2030+ for LD, including vehicles 6,001 lbs. – 8,500 lbs. GVWR and MDPV’s • As CARB proposed – 0.5 mg/mi in MY 2031+ for MDV
APPENDIX C High Altitude emissions requirements and certification procedures	<ul style="list-style-type: none"> • Provide relief for high-altitude emissions requirements relative to sea level standards.
APPENDIX D Medium Duty Vehicle Chassis / Engine Dyno certification	<ul style="list-style-type: none"> • Allow manufacturers to optionally engine dyno certify equipment over 22,000 lbs. GCWR to ‘EPA HD Engine’ requirements, per ‘EPA Tier 4’ rule. Engine dyno certified vehicles would not be subject to chassis certification criteria emissions targets.
APPENDIX E NMOG+NOx stringency and emissions systems hardware	<ul style="list-style-type: none"> • Maintain Class 3 ICE standard at Bin 175 in MY 2030+. • Maintain Class 2b ICE standard at Bin 150 in MY 2030+. • Do not combine Class 2b/3 standards prior to MY 2031.
APPENDIX F In use test procedures and emissions requirements	<ul style="list-style-type: none"> • As CARB proposed – Align with ‘EPA HD Engine’, which is also aligned with forthcoming proposed amendments to ‘HD Omnibus standards’
APPENDIX G Warranty and useful life for engines and emissions systems	<ul style="list-style-type: none"> • Allow manufacturers to harmonize on useful life and warranty with Federal standards (‘EPA Tier 4’, ‘EPA HD Engine’), depending on chassis dyno or engine dynamometer certification path.
APPENDIX H Interoperability of charging infrastructure	<ul style="list-style-type: none"> • Allow manufacturers to adopt ISO 15118-20 without requiring them to do so or precluding that option with new interoperability requirements.
APPENDIX I PHEV test procedures	<ul style="list-style-type: none"> • As CARB proposed – Test and set standards assuming charge sustaining mode for PHEVs. • Continue to work with EPA to streamline PHEV laboratory test procedures.
APPENDIX J Battery durability, battery aging, PHEV real-world emissions and certification considerations	<ul style="list-style-type: none"> • Substitute rated kWh battery pack size by application for all-electric mileage requirements. • Account for battery capacity degradation over useful life when determining utility factors.
APPENDIX K Lead time and the Clean Trucks Partnership Agreement	<ul style="list-style-type: none"> • Provide 4-years lead time and 3-years regulatory stability for vehicles 8,501 lbs. – 14,000 lbs. GVWR. • No additional requirements for MDVs until MY 2031, based on rule-making timeline shared in the workshop.
APPENDIX L Medium Duty Vehicle ZEV assurance requirements	<ul style="list-style-type: none"> • Do not require MDV ZEVs to meet ACC II ZEV requirements for MDV ZEVs that certify and earn credits under the Advanced Clean Trucks rule. • If additional ZEV assurance requirements are added for MDV ZEVs certifying to the Advanced Clean Trucks rule, incorporate requirements in ACT amendments (or “ACT 2”).

APPENDIX A: Certification Bins for light- and medium-duty Vehicles

APPENDIX A: Background

As part of criteria emissions regulations in both EPA and CARB programs, certification bins are common constructs. Lower bin levels are typically aligned with lower emissions levels. Discrete (vs. continuous) bin structure is a practical way to account for some test-to-test or product-to-product variation without over-complicating certification, and by offering some common requirements for on-board diagnostic systems. Bins are used when calculating NMOG+NOx fleet averages and certifying to lower bins for vehicles with outstanding emissions performance may provide additional compliance benefits in some regulatory programs. Regulators often phase-out higher certification bins over time to prevent backsliding on criteria emissions.

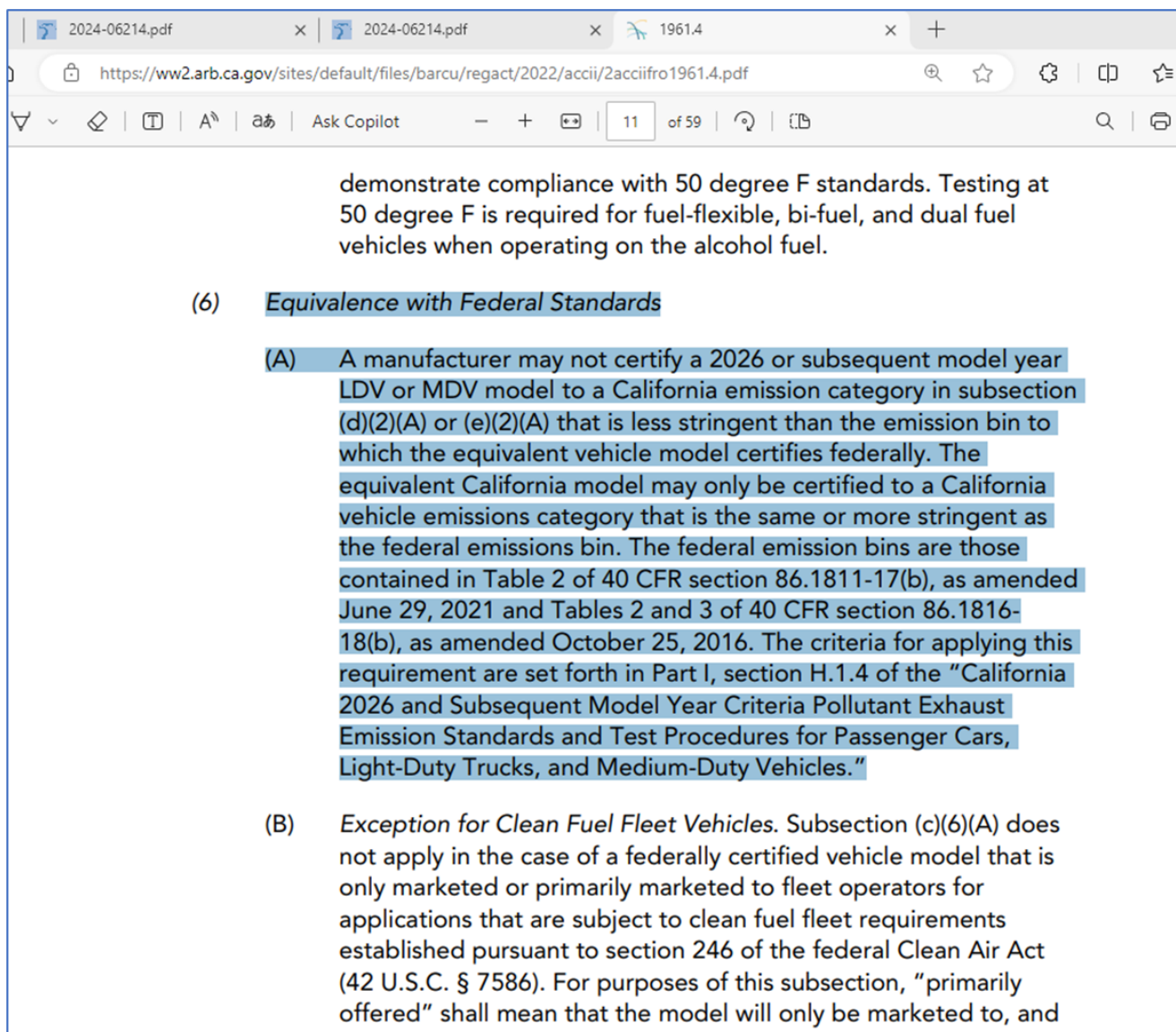
As part of EPA Tier 4, EPA introduced additional certification bins for both light- and medium-duty vehicles. The EPA Tier 4 bins provided additional granularity compared to both prior EPA regulations, and CARB LEV IV. In many cases, EPA bins were slightly lower than the closest bin offered under the CARB LEV IV regulation. Previously, CARB prohibited a manufacturer from certifying to a bin less stringent than the Federal bin.

Table 2: Certification Bins by Regulation

NMOG+NOx (mg/mi, on FTP)								
EPA Tier III, Class 3 ^a	CARB ACC II, MDVs ^b (10,001 – 14,000 lbs. GVWR)	EPA Tier III, Class 2b ^c	CARB ACC II, MDVs ^d (8,501 – 10,000 lbs. GVWR)	EPA Tier III, LDV, LDT, MDPV ^e	CARB ACC II, LDVs ^f (< 8,500 lbs. GVWR)	EPA Final Tier IV, Class 3 ^{g,h} (10,001 lbs- 14,000 lbs. GVWR)	EPA Final Tier IV, Class 2b ^{g,h} (8,500 lbs. – 10,000 lbs. GVWR)	EPA Final Tier IV, Light-Duty ^{g,h} (<8,500 lbs. GVWR)
400	400*							
270	270*							
		250	250*					
230	230							
200	200	200	200*					
	175							
		170	170			170	170	
				160	160*			
	150	150	150			150	150	
	125		125	125	125*	125	125	
	100		100			100	100	
			85			85	85	
			75			75	75	
				70	70	70	70	70
						65	65	65
					60	60	60	60
						55	55	55
				50	50	50	50	50
						45	45	45
					40	40	40	40
						35	35	35
				30	30	30	30	30
					25	25	25	25
				20	20	20	20	20
					15	15	15	15
						10	10	10
0		0		0		0	0	0

^a 40 CFR 86.1618-18, Table 3: Tier 3 Bin Standards – Class 3
^b <https://ww2.arb.ca.gov/sites/default/files/barcu/regact/2022/accii/2acciifro1961.4.pdf>, page 50-51
^c 40 CFR 86.1618-18, Table 2: Tier 3 Bin Standards – Class 2b
^d <https://ww2.arb.ca.gov/sites/default/files/barcu/regact/2022/accii/2acciifro1961.4.pdf>, page 50
^e 40 CFR 86.1811-17, Table 2: Tier 3 FTP Bin Standards
^f <https://ww2.arb.ca.gov/sites/default/files/barcu/regact/2022/accii/2acciifro1961.4.pdf>, page 20
* These vehicle emissions categories are only applicable for the 2026 through 2028 model years
^g <https://www.govinfo.gov/content/pkg/FR-2024-04-18/pdf/2024-06214.pdf>, page 321-322/374, 40 CFR 86.1611-27 (b)(4)(ii) - (iii)
^h <https://www.govinfo.gov/content/pkg/FR-2024-04-18/pdf/2024-06214.pdf>, page 91-92/374

Figure 1: CARB "Cleaner Car" Provision¹⁵



APPENDIX A: Discussion

CARB is correct to identify misalignment of Bins between the EPA and CARB programs as a topic to be addressed in amendments. To meet EPA fleet average standards, manufacturers are likely to use additional bins provided.

[[[REDACTED]

¹⁵ Source: LEV IV final rule, <https://ww2.arb.ca.gov/sites/default/files/barcu/regact/2022/acii/2acciifro1961.4.pdf>, page 11/59

APPENDIX A: Recommendations

GM encourages CARB to align with EPA Tier 4 bins. If CARB cannot align with the bin structure offered for chassis certification under the EPA program, GM supports CARB's proposal to eliminate the "Cleaner Car" provision for light-duty. While unclear from the workshop slides if CARB would eliminate the "Cleaner Car" provision for light- and medium-duty, GM encourages CARB to eliminate the "Cleaner Car" provision for both classes.

Separate from chassis certification bins, GM also encourages CARB to allow manufacturers to follow engine dynamometer certification requirements for MDVs over 22,000 lbs. GCWR, for both Class 2b and Class 3 vehicles, to comply with LEV IV and to align with the Federal test procedures.

APPENDIX B: Particulate Matter (PM) standards for light- and medium-duty vehicles

APPENDIX B: Background

Particulate matter (PM) is commonly regulated in criteria emissions programs. The CARB LEV IV regulation set stringent PM standards that varied by Vehicle Type, with separate targets on FTP for light- and medium-duty vehicles, and with some relief for US06.

As part of EPA Tier 4, EPA finalized standards of 0.5 mg/mi, with light-duty vehicles phasing into this requirement by MY 2030, and medium-duty vehicles phasing into this requirement by MY 2031.

APPENDIX B: Discussion

[[[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
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APPENDIX B: Recommendations

GM supports CARB’s proposal to adopt 0.5 mg/mi tailpipe PM standards in MY 2030 for light-duty vehicles (8,500 lbs. GVWR and less, and Medium Duty Passenger Vehicles).

GM support CARB’s proposal to adopt 0.5 mg/mi tailpipe PM standards in MY 2031 for medium-duty vehicles (8,501 lbs. GVWR – 14,000 lbs. GVWR, excluding Medium Duty Passenger Vehicles).

GM encourages CARB to allow vehicles over 22,000 lbs. GCWR to optionally engine dyno certify, and to meet ‘EPA HD Engine’ standards, for both Class 2b and Class 3 vehicles.

APPENDIX C: Recommendations

GM recommends CARB provide criteria emissions standard relief for high altitude on all test cycles.

GM recommend CARB allow engine dynamometer certification option for Medium Duty Vehicles (MDV) and eliminate the US06 high altitude requirement for MDV chassis certification.

APPENDIX D: Medium Duty Vehicle Chassis / Engine Dyno certification

APPENDIX D: Background

Class 2b and Class 3 complete vehicles have historically used chassis dynamometer certification to evaluate criteria emissions performance. Over time, vehicles in this segment significantly increased towing capability, and the chassis dynamometer testing and test cycles were not well suited to evaluate high-load, high-speed emissions performance. Engine dynamometer testing is commonly used to measure and certify emissions in more capable applications. Falling under different regulations, chassis dynamometer and engine dynamometer testing often have different warranty and useful life requirements, and set stringency for criteria emissions at different limits, subject to different test procedures. Additionally, on-board diagnostic requirements for rules referencing different test procedures may not always be compatible.

CARB and EPA have taken regulatory actions to assess and control high-load, high-speed emissions performance, albeit with different methods. CARB introduced in-use requirements, via portable emissions measurement systems (PEMs) in both LEV IV and Low NOx Omnibus. EPA encouraged manufacturers to shift to engine-dyno certification, per 'EPA HD Engine' procedures and emissions stringency, for MDVs over 22,000 lbs. GCWR in the 'EPA Tier 4' final rule, or to use PEMs in addition to chassis certification procedures. PEMs test procedures and moving average windows varied significantly between CARB and EPA programs.

CARB proposes to partially align with EPA's optional engine dynamometer certification in LEV IV amendments, allowing engine dyno certification for only Class 3 diesel and incomplete gasoline vehicles. Additionally, CARB proposes to require full US06 cycle (high speed, high load) for class 2b and 3 chassis certified MDVs beginning with MY 2030. CARB proposes to require chassis dynamometer certification for gasoline vehicles, and Class 2b diesel vehicles, and CARB does not indicate plans to offer manufacturers an engine dynamometer certification option for these vehicles.

APPENDIX D: Discussion

Neither the CARB LEV IV amendments proposal, nor the existing CARB LEV IV rule are well aligned with the test procedures allowed in the 'EPA Tier 4' final rule, and the proposal if finalized will require significant investment in laboratory upgrades, and significant, unique investment in internal combustion engine technologies and hardware to meet LEV IV amended standards.

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APPENDIX D: Recommendations

GM recommends that CARB provide manufacturers the option to use engine dynamometer certification for vehicles over 22,000 lbs. GCWR and align stringency and test procedures for such vehicles with EPA HD Engine / Clean Trucks Partnership.

GM recommends that CARB not implement additional requirements for MDV's prior to MY 2031 to provide 4-years lead time.

APPENDIX E: NMOG+NOx stringency and emissions systems hardware

APPENDIX E: Background

NMOG+NOx is a commonly regulated criteria pollutant. ‘EPA Tier 4’, ‘CARB LEV IV’, ‘EPA HD Engine’, and ‘CARB Low NOx Omnibus’ all set standards for NMOG+NOx emissions, though these programs use different test cycles, set different fleet average stringencies, and define different fleet averaging set compositions. EPA allows zero-emissions vehicles to average into fleet averages in some averaging sets, and not others, while CARB has not historically included zero-emissions vehicles in averaging sets.

CARB proposes to amend fleet average NMOG+NOx targets for class 2b and class 3 vehicles, combining averaging sets, and reducing fleet average requirements. In the CARB workshop slides, CARB incorrectly showed a ‘Bin 170’ fleet average for LEV IV in MY 2030 for class 3 vehicles (the fleet average is ‘Bin 175’). LEV IV MDV NMOG+NOx fleet average targets would apply to vehicles required to chassis dynamometer certify, or for vehicles manufacturers choose to chassis dynamometer certify.

APPENDIX E: Discussion

Medium-duty vehicle aftertreatment systems are architected to optimize emissions control performance across the full range of operation of these highly capable vehicles. Catalysts are placed to ensure component durability over the lifetime of the vehicle. The closer to the engine catalysts are placed, the more exposed the catalysts are to thermal degradation under high load operation and corresponding loss of emissions control performance. For spark-ignited engine powered vehicles, catalyst thermal degradation under normal operating conditions approaches the thermal degradation of components aged to the OBD emissions threshold. Catalyst degradation at this level can approach durability limits of the catalyst washcoat and makes robust detection of failed catalysts challenging. Similarly, for compression ignition engine powered vehicles, placement of an SCR catalyst too close to engine out may also result in thermal degradation and corresponding loss of NOx emissions control performance under high load operation.

[[[REDACTED]

Figure 2. [REDACTED]

Figure 3. [REDACTED]

Figure 4. [REDACTED]

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APPENDIX E: Recommendations

GM encourages CARB to maintain Bin 175 Class 3, and Bin 150 Class 2b standards in MY 2031 and beyond for chassis dyno certified applications.

GM encourages CARB to expand manufacturers' option to engine dyno certify powertrains in vehicles over 22,000 lbs. GCWR., including Class 2b vehicles.

GM encourages CARB to focus on the success of ZEVs penetrating the market, and not to continue to make significant changes to NMOG+NOx emissions standards for internal combustion engine vehicles in years so close to proposed 100% ZEV requirements.

APPENDIX F: In use test procedures and emissions requirements

APPENDIX F: Background

In use testing, or testing using portable emissions measurement systems (PEMs), may be used to evaluate the real-world emissions performance of vehicles. To conduct these tests, PEMs instrumentation is fitted to a vehicle, and the instrumentation measures real-time emissions. Due to the mobile, compact nature of this equipment, the measurement precision and accuracy of these systems is typically less capable than state-of-the-art laboratory facilities. Still, these testing methodologies may be useful to evaluate off-cycle emissions in real world operating conditions.

PEMs produces real-time samples that may be aggregated over time and grouped by operating mode. Policy makers often use PEMs to evaluate start-up, low load, and high load emission, or a blend of all types of emissions over the course of the day. Samples may be segmented into moving average windows (MAW) into “bins” based on time and operating mode, and the aggregated emissions from a moving average window may be compared to an emissions limit. While many regulations incorporate a PEMs requirement, commonly regulations have used unique definitions for moving average windows or provided (or not provided) conformity factors to account for ambient temperatures or altitude.

CARB LEV IV does include an in-use standard, and CARB is proposing to update the LEV IV bin structure to align with proposed amendments to HD Omnibus standards.

APPENDIX F: Discussion

The Clean Trucks Partnership agreement, and subsequent forthcoming HD Omnibus standards, incorporate improvements to PEMs procedures that consider operating conditions that may marginally deteriorate emissions, and by setting in-use stringency at levels appropriate for the capability of PEMs equipment, and consistent with the ambitious emissions targets in the ‘EPA HD Engine’ rule.

GM supports the incorporation of in-use requirements in MDV criteria emissions regulations, and GM appreciates the efforts for CARB and EPA to increasingly use similar test procedures and requirements for in-use emissions on medium- and heavy-duty vehicles.

APPENDIX F: Recommendations

GM supports CARB’s proposal to align PEMs test procedures (“MDV Moving Average Window (MAW) In-Use Standard) with forthcoming amendments to HD Omnibus standards, per the Clean Trucks Partnership Agreement.

APPENDIX G: Warranty and useful life for engines and emissions systems

APPENDIX G: Background

Under the authority of the Clean Air Act, EPA and CARB have often set warranty and useful life requirements (age in years, mileage) for emissions equipment. Regulations often set different warranty and useful life requirements than other regulations, and often vary requirements by the type and capability of the vehicle or engine.

APPENDIX G: Discussion

'EPA Tier 4', 'EPA HD Engine', 'CARB LEV IV', and 'CARB Low NOx Omnibus' all have different warranty and useful life requirements. Engine families in medium duty vehicles may be subject to all these requirements.

[[[REDACTED]

Figure 5. [REDACTED]

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GM encourages Federal and State regulators to harmonize aging requirements, and warranty and useful life requirements for chassis certification, and separately for engine dyno certification.

APPENDIX G: Recommendations

GM encourages regulators to allow manufacturers to harmonize on useful life and warranty with Federal standards ('EPA Tier 4', 'EPA HD Engine'), depending on chassis dyno or engine dynamometer certification path.

APPENDIX H: Interoperability of charging infrastructure

The CARB workshop included a proposal to require implementation of DIN SPEC 70121 and ISO 15118-2, highlighting the Plug and Charge feature for all MY 2028 and subsequent battery electric vehicles and fast charge capable plug-in hybrid electric vehicles (PHEVs). CARB also proposes requiring a conformance test to the DIN and ISO standard at the time of certification. GM appreciates the opportunity to propose feedback and seek clarity to the ACC II proposal working with CARB’s Staff.

APPENDIX H: Background

Charging interoperability is a known challenge across the electric vehicle charging industry. The California Energy Commission has noted that interoperability problems contribute to a suboptimal driver experience, reliability challenges, and failed charging sessions.¹

Interoperability encompasses a broad ecosystem for functionality that goes beyond the vehicle, the EV charger(s), the charging station operators (CSO), the charging networks or eMobility Service Providers (eMSP), and the grid. Business agreements need to be in place between the stakeholders (CSO & eMSP) before a driver can leverage the functionality of accessing charging stations in a reliable and seamless way. A key area of focus is related cybersecurity and exchanging information for payment, billing, and power transfer. Public Key infrastructure (PKI) is important to manage digital certificates and keys for secure and confidential communication for payments and contracts per business agreements.

An industry-led example for addressing security and interoperability gaps for the emerging EV charging ecosystem is the SAE EV PKI project in SAE International’s Cooperative Research Program. Working independent of regulation through SAE EV PKI, the industry-led initiative designed and tested an inclusive, protocol-neutral, worldwide EV charging industry PKI platform.² SAE EV PKI will facilitate Plug and Charge Interoperability by publishing a list of Trusted Root Certificates or commonly known as Certificate Trust List (CTL) that will enable all OEM vehicles and CSOs implementing ISO 15118 -2 or ISO 15118 - 20 in North America to authenticate and authorize charging using secure digital certificates emanating from the Trusted Roots.

APPENDIX H: Discussion

We are seeking additional clarity on CARB’s vision for interoperability related to CARB’s proposal on regulations for charging interoperability.

As a global automaker, GM recommends expanding to DIN SPEC 70121 or ISO-15118–2 or ISO 15118–20 without mandating compliance to one technology. [[

[REDACTED]

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[REDACTED]

3) [REDACTED]

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Implementation of Plug and Charge should not be limited to ISO 15118, but the Plug and Charge experience should be inclusive of all technologies. The market is developing rapidly and there can be unintended consequences of mandating technical standards without consideration for business implications and evolving technology. [[

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In alignment with comments from the Automotive Alliance for Automotive Innovation, we are committed to working with CARB Staff through the SAE process to identify the specific features in the DIN SPEC 70121 and ISO 15118-2, and -20 that should be included, and the associated conformance testing that would appropriately verify those features are properly implemented. For conformance testing, additional clarity is needed regarding if CARB is interested in conformance testing against technical standards (to DIN and ISO), or interoperability (EV, EVSE, networks and operators, etc.). We recommend implementation of a self-certification process in collaboration with SAE J2953/3 best practices as automakers currently all self-certify existing standards as an industry practice for regulatory standards (i.e. emissions).

APPENDIX H: Recommendations

GM encourages CARB to provide manufacturers the flexibility to adopt different business models and protocols within the charging ecosystem, and advises CARB not to be overly prescriptive in specification of requirements, especially if providing short lead time.

APPENDIX I: Plug-in Hybrid Electric Vehicle (PHEV) test procedures

APPENDIX I: Background

As part of recent EPA and CARB light- and medium-duty vehicle rulemakings, the agencies are increasingly requiring manufacturers to include additional tests to certify vehicles.

Separately, plug-in hybrid vehicles have their own complexities in laboratory test procedures, including pre-conditioning, and tests in variety of operating conditions (charge-sustaining mode, charge-depleting mode, etc.).

EPA is currently holding monthly meetings on plug-in hybrid test procedures, and the agency has indicated the possibility of adjusting test requirements or test procedures for PHEVs in a future rulemaking.

APPENDIX I: Discussion

The combination of increasing the required certification tests, and tests for plug-in hybrid vehicles taking longer to administer by the nature of the tests required is adding up. Whereas today, an internal combustion engine vehicle may take a few shifts to complete all required certification tests, in the future plug-in hybrids may take a month or more to complete certification tests.

Additionally, new requirements on batteries for zero-emissions vehicles may (or may not) overlap with PHEV battery packs, adding to the administrative burden to certify PHEVs.

APPENDIX I: Recommendations

GM supports the use of charge sustaining mode for PHEVs when setting standards and certifying emissions.

GM encourages CARB to work with EPA to streamline PHEV laboratory test procedures and use common test procedures between the agencies.

APPENDIX J: Battery durability, battery aging, PHEV real-world emissions and certification considerations

APPENDIX J: Background

As part of ACC II, CARB recognizes that batteries for ZEVs may lose energy storage capacity over time as the equipment ages and is used. Similarly, batteries in PHEVs may lose some energy storage capacity over their useful life.

Commonly, regulators consider a “utility factor” for plug-in hybrid certification to account for the emissions benefit of all electric operations. With this approach, PHEVs with more capable battery packs are assumed to have lower emissions.

Regulations often require manufacturers to maintain emissions performance over the useful life of the equipment.

APPENDIX J: Discussion

If a battery marginally loses some charge carrying capacity, that may marginally decrease estimated all electric range. A PHEV with a different all electric range could have a different estimated “utility factor”, which could confound in use emissions estimates over the useful life.

PHEV all electric range may be difficult to estimate, especially for test groups with a wide range of trims and options. A commonly specified battery pack may be installed in vehicles with a wide range of optional equipment. Vehicle configurations may lead to marginally higher or lower road loads, which could affect estimates of all electric range.

Unlike all electric range, battery pack rated carrying capacity is more straightforward to estimate and measure.

APPENDIX J: Recommendations

GM recommends regulations should make explicit in the regulations how to account for battery capacity degradation over useful life when determining PHEV utility factors, certified emissions values, in-use emissions audits over the useful life.

GM encourages regulators to consider substituting rated kWh battery pack size by application for all-electric mileage requirements, or allowing an optional menu to do so, to simplify certification procedures and useful life requirements.

APPENDIX K: Lead time and the Clean Trucks Partnership Agreement

APPENDIX K: Background

In July 2023, CARB and manufacturers announced the Clean Trucks Partnership agreement. This agreement created a pathway forward to resolve administrative, testing, and stringency issues that risked the success of the CARB Low NOx Omnibus regulation and the CARB Advanced Clean Trucks regulation. Included in this agreement:

“5. In recognition of the OEMs desire for regulatory leadtime and stability, CARB’s Executive Officer will direct the CARB staff to propose, and recommend that the CARB Board adopt, minimum four (4) year leadtime and three (3) year stability periods for future criteria emissions regulations affecting new HDOH engines and vehicles. The Executive Officer’s direction above also will apply to CARB’s planned ACT 2 rulemaking.”

GM was a signatory to the Clean Trucks Partnership agreement, and GM affirms its commitment to a successful Clean Trucks Partnership agreement.

APPENDIX K: Discussion

[[[REDACTED]

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Figure 6. 

Figure 7. 

Figure 8. 

Figure 9. 

Figure 10. 

Figure 11. 

Figure 12. 

Figure 13. 

Figure 14. 

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APPENDIX K: Recommendations

GM recommends CARB provide 4-years of lead time, and 3-years of regulatory stability in rule-making proposals for vehicles and engines in families subject to EPA HDOH test procedures, including vehicles over 22,000 lbs. GCWR.

APPENDIX L: Medium Duty Vehicle ZEV assurance requirements

APPENDIX L: Background

ACC II includes various ZEV assurance requirements, including requirements for battery labeling, charge cords, and other monitoring requirements.

The Advanced Clean Trucks (ACT) rule does not include these requirements.

Medium Duty Vehicles that are Zero Emissions Vehicles or Plug-in Hybrid Vehicle’s may earn zero emissions vehicle credits, or near-zero emissions vehicle credits in either ACC II or ACT, but not both.

APPENDIX L: Discussion

[[[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
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[REDACTED]
[REDACTED]
[REDACTED]]]

If ZEV assurance measures will be required for vehicles certifying to the Advanced Clean Trucks rule, those requirements should be set forth in the regulations, with sufficient notice and lead time (consistent with the Clean Trucks Partnership agreement), as part of amendments to the ACT CARB rulemaking.

APPENDIX L: Recommendations

GM recommends CARB affirm that an MDV ZEV is not required to meet ACC II ZEV requirements to certify under the Advanced Clean Trucks rule and to earn credits under that regulation. Additionally, GM recommends CARB affirm that the choice for MDV ZEVs to meet ACC II ZEV requirements is optional and contingent upon the vehicle being certified to ACC II credits and deficits instead of ACT credits and deficits.

GM recommends that If additional ZEV assurance requirements are added for MDV ZEVs certifying to the Advanced Clean Trucks rule, incorporate requirements in ACT amendments (or "ACT 2").