

California Air Resources Board

**Public Hearing to Consider the Proposed
Amendments to the Heavy-Duty Engine
and Vehicle Omnibus Regulation
Staff Report: Initial Statement of
Reasons**

Date of Release: August 1, 2023

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LIST OF ACRONYMS AND ABBREVIATIONS

Acronym/ Abbreviation	Definition
ACT	Advanced Clean Trucks
bhp	Brake Horsepower
CARB or Board	California Air Resources Board
CCR	California Code of Regulations
CEQA	California Environmental Quality Act
CTP	Clean Trucks Plan
DEF	Diesel Exhaust Fluid
EMA	Truck and Engine Manufacturers Association
FTP	Federal Test Procedure
g/bhp-hr	Grams Per Brake Horsepower-Hour
g/hr	Grams Per Hour
GHG	Greenhouse Gas
GVWR	Gross Vehicle Weight Rating
HD	Heavy-Duty
HDDE	Heavy-Duty Diesel Engines
HD-ZE	Heavy-Duty Zero-Emission
HD-ZEP	Heavy-Duty Zero Emission Powertrain
HD-ZEV	Heavy-Duty Zero Emission Vehicle
HHDD	Heavy Heavy-Duty Diesel
Health and Saf. Code	California Health and Safety Code
ISOR	Initial Statement of Reasons or Staff Report
lbs	Pounds
LEV III	Low Emission Vehicle III
LHDD	Light Heavy-Duty Diesel
LLC	Low Load Cycle
MD	Medium-Duty
Mg	Megagram
MHDD	Medium Heavy-Duty Diesel
MY	Model Year
NO _x	Oxides of Nitrogen
Omnibus	Heavy-Duty Engine and Vehicle Omnibus
PM	Particulate Matter
PM _{2.5}	Fine Particulate Matter
RMC	Supplemental Emission Test Ramped Modal Cycle
SCAQMD	South Coast Air Quality Management District
SIP	State Implementation Plan
U.S. EPA	United States Environmental Protection Agency

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Executive Summary

The Heavy-Duty Engine and Vehicle Omnibus (Omnibus) regulation was adopted by the California Air Resources Board (CARB or Board) on September 9, 2021. The Omnibus regulation primarily established more stringent exhaust emission standards for oxides of nitrogen (NOx) and particulate matter (PM) emission for new heavy-duty (HD) internal combustion engines for sale in California starting with the 2024 model year (MY). The Omnibus regulation currently includes a transitional program, known as the legacy engine provisions¹, for the first two MYs of the program to provide compliance flexibilities to manufacturers and to avoid any market disruption as manufacturers adjust to Omnibus standards. To qualify for the legacy engine provisions, a manufacturer must certify at least one engine family to Omnibus requirements.

The current legacy engine provisions are only applicable in MYs 2024 and 2025 and limit the number of such legacy engine sales up to 45 percent of the total California HD diesel sales in 2024, and 25 percent in 2025 MY for each HD diesel engine (HDDE) manufacturer. For example, a certifying engine manufacturer that sells a total of 100 HDDE in California in the 2024 MY would be allowed to sell 45 legacy engines for that MY in California. Any emission increases due to the legacy engine sales must be offset by using HD zero-emission (HD-ZE) credits, combustion credits, or by performing projects in disadvantaged communities.

A. Why is CARB staff proposing to amend the Omnibus regulation?

As 2024 model year certification approached, CARB staff became aware through manufacturer product plans for 2024 to 2026 that while the technology for diesel-fueled Omnibus compliant engines was available, manufacturers did not intend to produce such engines for some categories of trucks in California. Given the impacts to fleets manufacturers were projecting, additional flexibility was desired to enable a smoother transition to the Omnibus standards. CARB staff is introducing the proposed amendments which would provide additional flexibility to assure originally intended engine availability levels while maintaining the originally projected emissions reductions.

B. What are the proposed amendments to the existing Omnibus regulation?

CARB staff is proposing modifications to the existing legacy engine provisions that will provide engine manufacturers greater compliance flexibility. Specifically, the proposed amendments will allow engine manufacturers to choose between two legacy engine provision options. Option 1 keeps the existing legacy engine provisions for 2024 and 2025 MYs but extends the production period for legacy engines to 2026 MY. Option 2 is added for manufacturers that make medium heavy-duty diesel (MHDD) engines and products in other

¹ Legacy engine family is defined in Title 13, California Code of Regulations (CCR), Section 1956.8(a)(2)(C)3. A legacy engine family complies with today's 0.20 g/bhp-hr NOx standard.

HD diesel primary intended service class. For example, this applies to a certifying engine manufacturer that produces both MHDD and heavy heavy-duty diesel (HHDD) engines in 2024 MY. Additionally, to prevent any product availability issues, legacy engine families may be certified prior to the certification of the engine family that meets the full Omnibus requirements in 2024 MY. The proposed amendments additionally require that manufacturers electing to use either Option 1 or Option 2 must fully offset the emissions increases resulting from the sales of legacy engines.

The specific details of the proposed amendments are described in Chapter III of this Staff Report.

C. How would the proposed amendments impact the emissions inventory and the total cost of the program?

The proposed amendments to the Omnibus regulation would be emissions-neutral, as any increased emissions from additional legacy engine sales must be offset as described. In addition, there would be no substantive change to the way engine manufacturers would produce legacy engines. They would continue to use the same emission control systems and technology that are being used to meet the current emissions standards. Furthermore, the Omnibus regulation already includes the ability for manufacturers to sell legacy engines and offset excess emissions from such sales. The proposed amendments extend the legacy provisions to 2026 MY and increase the allowable sales percentage of such legacy sales but do not change the mechanism for offsetting emissions from such sales.

CARB staff does not anticipate any additional costs from this modification as this flexibility would allow manufacturers to continue selling HDDEs that meet the current emissions standards and requirements.

The environmental impact and economic impacts assessment of these proposed amendments are described in Chapters VI and VIII of this Staff Report.

D. What is CARB staff's recommendation?

CARB staff recommends that the Executive Officer approve the proposed regulation order and test procedures in Appendices A and B. The main body of this Staff Report provides further discussion and justification for CARB staff's proposal.

I. Introduction and Background

A. Introduction

This Initial Statement of Reasons (ISOR or Staff Report) presents CARB or Board staff's proposed amendments to the Omnibus regulation to provide engine manufacturers additional compliance flexibilities to meet the Omnibus regulation requirements, while also ensuring those flexibilities will not reduce the emissions benefits of that regulation. The Omnibus regulation established more stringent NO_x and PM exhaust emission standards from new HD internal combustion engines for sale in California starting in 2024 MY. The Omnibus regulation also provides engine manufacturers the flexibility to produce and certify limited quantities of 2024 and 2025 MY HD engines in California that meet the current NO_x emission standards of 0.20 gram per brake horsepower-hour (g/bhp-hr) provided those manufacturers offset any resulting emissions increases using HD-ZE credits, combustion credits, or doing projects in disadvantaged communities.

As 2024 model year certification approached, CARB staff became aware through manufacturer product plans for 2024 to 2026 that while the technology needed for diesel-fueled engines to comply with the Omnibus regulation was available, manufacturers did not intend to produce such engines for some categories of trucks in California. Given the impacts to fleets manufacturers were projecting, additional flexibility was desired to enable a smoother transition to the omnibus standards. CARB staff is introducing the proposed amendments which would provide additional flexibility to assure originally intended engine availability levels while maintaining the originally projected emissions reductions.

On March 23, 2023, Board delegated authority to the Executive Officer to consider approving or disapproving staff-proposed new, amended or revoked emissions standards, test procedures, compliance test procedures, and compliance flexibilities for new on-road motor vehicles, including 2024 through 2026 MY medium-duty (MD) and HD engines and vehicles, in order to provide engine and vehicle manufacturers additional compliance flexibilities so that such manufacturers can more easily transition to the more stringent requirements of applicable mobile source regulations, while also ensuring those flexibilities will not reduce the emissions benefits of CARB's mobile source regulations, with the delegated authority terminating on December 31, 2023 (CARB, 2023a).² The Executive Officer is therefore authorized to consider and adopt these proposed amendments.

B. Background

On-road MD and HD vehicles that exceed 8,500 pounds (lbs) gross vehicle weight rating (GVWR) are a significant source of NO_x emissions in California and are responsible for nearly one-third of all statewide emissions of NO_x. The Omnibus regulation requires more stringent NO_x emissions standards for new HD diesel and Otto-cycle engines used in HD vehicles with

² (CARB, 2023a) Delegation of Authority to the Executive Officer to Consider Proposed Amendments to Mobile Source Regulations: [Resolution 23-15 \(ca.gov\)](#) March 23, 2023

GVWR greater than 14,000 lbs, and new MD diesel and Otto-cycle engines used in MD vehicles with GVWR between 10,001 and 14,000 lbs that optionally certify to the requirements in Title 13, California Code of Regulations, Section 1956.8 (13 CCR §1956.8).³

The first phase of the Omnibus regulation applies to new 2024 through 2026 MYs as shown in Table I-1. For diesel engines, the NOx standards for the HD transient Federal Test Procedure (FTP) and the Supplemental Emission Test Ramped Modal Cycle (RMC) are reduced by 75 percent from the current standard of 0.20 to 0.050 g/bhp-hr. In addition, the regulation reduces the idling NOx emission standard from 30 grams per hour (g/hr) to 10 g/hr and establishes a new NOx emission standard of 0.200 g/bhp-hr over the low load cycle for MD and HDDEs. Otto-cycle engines are also subject to the same FTP-NOx standard. The effective PM emissions standard is also reduced from 0.01 g/bhp-hr to 0.005 g/bhp-hr starting with the 2024 MY, yielding a 50 percent reduction.

Table I-1: 2024 through 2026 MYs NOx Emissions Standards for MD and HD Diesel and MD and HD Otto-Cycle Engines

MYs	Diesel Cycle FTP (g/bhp-hr)	Diesel Cycle RMC (g/bhp-hr)	Diesel Cycle LLC (g/bhp-hr)	Diesel Cycle Idling (g/hr)	Otto-Cycle FTP (g/bhp-hr)
2024 - 2026	0.050	0.050	0.200	10	0.050

The second phase of the Omnibus requirements apply to 2027 through 2030 MYs, and the third (final) phase of Omnibus requirements apply to 2031 and subsequent MYs. The applicable NOx emissions standards for phase 2 and 3 of Omnibus are shown in Tables I-2 and I-3 below.

Table I-2: 2027 and Subsequent MY NOx Emissions Standards for MD Diesel, Light Heavy-Duty Diesel, MHDD, and MD and HD Otto-Cycle Engines

MYs	Diesel Cycle FTP (g/bhp-hr)	Diesel Cycle RMC (g/bhp-hr)	Diesel Cycle LLC (g/bhp-hr)	Diesel Cycle Idling (g/hr)	Otto-Cycle FTP (g/bhp-hr)
2027 and Subsequent	0.020	0.020	0.050	5	0.020

For HHDD engines, the first set of standards correspond to an intermediate useful life of 435,000 miles, and the second at the end of the full useful life. For 2027 through 2030 MYs, the HHDD engine full useful life is 600,000 miles. For 2031 and subsequent MYs, the HHDD engine useful life is extended to 800,000 miles.

³ Medium-duty vehicles (from 8,501 to 14,000 lbs GVWR) are generally subject to the Low Emission Vehicle III (LEV III) chassis certification emission standards in 13 CCR § 1961.2, but manufacturers have the option to certify a subset of such engines that are used in incomplete Otto-cycle and incomplete and complete diesel-cycle medium-duty vehicles to the engine-dynamometer based emission standards in 13 CCR § 1956.8.

Table I-3: 2027 and Subsequent MY NOx Emissions Standards for HHDD Engines

Duty-Cycle	2027 – 2030 Intermediate Useful Life Standard	2027 – 2030 Full Useful Life Standard	2031 & Later Intermediate Useful Life Standard	2031 & Later Full Useful Life Standard
FTP/RMC (g/bhp-hr)	0.020	0.035	0.020	0.040
LLC (g/bhp-hr)	0.050	0.090	0.050	0.100
Idling (g/hr)	5	5	5	5

To further ease the transition to the Omnibus NOx emission standards, the regulation also provides manufacturers the option to certify 2024 and 2025 MY HDDEs rated below 525 bhp to the current NOx and PM exhaust emission standards of 0.20 g/bhp-hr (hereinafter, legacy engines), provided they offset any resulting NOx or PM deficits with credits obtained from the HD-ZE averaging set. If a sufficient number of credits from the HD-ZE averaging set is not available, or such credits are not available below a specified cost threshold, a manufacturer may use credits from the same combustion engine averaging set.

If a sufficient quantity of credits from the same combustion engine averaging set is not available, a manufacturer may carryover its NOx or PM deficit balance until the end of the 2026 MY but must then offset 1.25 times the amount of the deficit balance. Manufacturers that fail to offset their deficit balances by the end of the 2026 MY must provide documentation substantiating that they attempted to but were unable to purchase credits at a price below a specified threshold. Such manufacturers must also submit a plan demonstrating that any deficits will be offset in five years and that such reductions must benefit disadvantaged communities.

The current Omnibus regulation limits the number of legacy engine sales to 45 percent of a manufacturer’s total HDDEs sales in California in the 2024 MY, and 25 percent of a manufacturer’s total HDDE California sales in the 2025 MY. Furthermore, a manufacturer must certify one or more diesel engine families to the full Omnibus NOx standards specified in 13 CCR §1956.8(a)(2)(C)1 in the same year it is utilizing this option to certify legacy engines.

II. The Problem that the Proposal is Intended to Address

A. Need for the Proposed Amendments

The main intent of these amendments is to provide manufacturers additional compliance flexibility, and thereby ensure adequate availability of HDDEs in certain engine families within the California market for 2024 through 2026 MYs. This must be accomplished while still maintaining the emission benefits of the Omnibus regulation and ensuring that manufacturers that have invested significant resources to make Omnibus-compliant engines do not have the

market for them undercut. The legacy engine provisions in 13 CCR §1956.8(a)(2)(C)3 were introduced in the Omnibus regulation to ensure adequate product availability, and to provide manufacturers flexibility during the transitional period while the manufacturers design and produce Omnibus-compliant engines.

As 2024 model year certification approached, CARB staff became aware through manufacturer product plans for 2024 to 2026 that while the technology needed for diesel-fueled engines to comply with the Omnibus regulation was available, manufacturers did not intend to produce such engines for some categories of trucks in California. Given the impacts to fleets manufacturers were projecting, additional flexibility was desired to enable a smoother transition to the Omnibus standards.

The proposed amendments are fully emissions-neutral and do not pose any adverse impacts on the California emissions inventory. All excess NO_x and PM emissions deficits generated by the sale of legacy engines in California must be offset by using either credits from the HD-ZE averaging set (sale of HD-ZE vehicles), or credits derived from the same HDDE averaging set (selling engines that are cleaner than Omnibus standards). A third pathway for offsetting excess legacy engine NO_x and/or PM emissions is available by conducting projects in disadvantaged communities.

The proposed amendments also provide additional flexibility to the engine manufacturers by allowing them to certify and sell legacy engines prior to receiving the Executive Order for Omnibus-compliant engine family. Furthermore, the ability to start working on the projects as early as 2024 has also been incorporated in the proposed amendments.

B. Regulatory Authority

CARB has been granted both broad and extensive authority under the Health and Safety Code (Health and Saf. Code) to adopt the proposed amendments. The California Legislature has placed the responsibility of controlling vehicular air pollution on CARB, and has designated CARB as the state agency that is “charged with coordinating efforts to attain and maintain ambient air quality standards, to conduct research into the causes of and solution to air pollution, and to systematically attack the serious problems caused by motor vehicles, which is the major source of air pollution in many areas of the State” (Health and Saf. Code §§ 39002 and 39003). CARB is authorized to adopt standards, rules and regulations needed to properly execute the powers and duties granted to and imposed on CARB by law (Health and Saf. Code §§ 39600 and 39601). Health and Saf. Code §§ 43013 and 43018 broadly authorize and require CARB to achieve the maximum feasible and cost-effective emission reductions from motor vehicles, including the adoption and implementation of vehicle emission standards and in-use performance standards (Health and Saf. Code § 43013(a)) and by improving emission system durability and performance (Health and Saf. Code § 43018(c)(2)), resulting in an expeditious reduction of NO_x emissions from diesel vehicles, “which significantly contribute to air pollution problems” (Health and Saf. Code § 43013(h)).

CARB is further authorized to adopt and implement emission standards for new motor vehicles and new motor vehicle engines that are necessary and technologically feasible (Health and Saf. Code §43101), to adopt test procedures and any other procedures

necessary to determine whether vehicles and engines are in compliance with the emissions standards established under Part 5 of the Health and Saf. Code (Health and Saf. Code § 43104), and to not certify a new motor vehicle or motor vehicle engine unless the vehicle or engine meets the emission standards adopted by CARB pursuant to Part 5 of the Health and Saf. Code under test procedures adopted pursuant to section 43104. (Health and Saf. Code § 43102).

III. The Specific Purpose and Rationale of Each Adoption, Amendment, or Repeal

California Government Code section 11346.2(b)(1) requires a description of the specific purpose for each proposed adoption or amendment, as well as the description of the rationale for determining that each proposed adoption and amendment is reasonably necessary to both carry out the purposes of CARB staff's proposal and to address the problems described in Chapter II.

The main purpose of the proposed amendments is to assure originally intended engine availability levels and associated emissions reductions and provide a smooth transition as manufacturers adjust to the new lower Omnibus NOx emission standards. CARB staff is proposing to amend the legacy engine provisions in the Omnibus regulation to provide additional compliance flexibility to assist manufacturers to produce and certify greater number of 2024 through 2026 MY legacy engines. CARB staff is proposing two options for manufacturers to choose from.

Option 1 would keep the existing legacy engine sales limits of 45 percent for MY 2024 and 25 percent for MY 2025 and extends the applicability to MY 2026 with a 10 percent California sales limit. If a manufacturer exceeds the legacy engine sales limits, deficits from the additional one percent sales volume above the limit would have to be offset at four times the deficit balance. Any legacy engine sales exceeding the production and sales limits including the additional one percent volume would be considered as non-compliant engine sales.

Option 2 would apply to manufacturers that produce and sell MHDD engines. Under this option, MHDD legacy engine sales would be limited to 60 percent in each of MYs 2024 and 2025. The sales limits for the combined light heavy-duty diesel (LHDD) and HHDD engines would be 15 percent in 2024 MY and 8 percent in 2025 MY. If a manufacturer exceeds the legacy engine sales limits, deficits from the additional five percent sales volume above the limit for MHDDs and additional one percent sales volume above the limit for LHDDs and HHDDs would have to be remediated at four times the deficit balance. Any legacy engine sales above the production limits including the additional allowed exceedances would be considered as non-compliant engine sales.

The pathways for offsetting legacy engine emission deficits would remain the same as in the existing Omnibus regulation. In addition, the proposed amendments include other flexibilities including the ability to certify a legacy engine family before certification of Omnibus-compliant engine family and the ability to start working on projects in

disadvantaged communities as early as 2024. Furthermore, engine manufacturers would also be required to indicate on the engine label that these engines were accounted for in their emissions offset program.

Appendix C: Purpose and Rationale presents the summary of each proposed amendment and describes its purpose and rationale.

IV. Benefits Anticipated from the Regulatory Action, Including the Benefits or Goals Provided in the Authorizing Statute

A. Emissions and Health Benefits

As discussed above, the proposed amendments require manufacturers to offset any excess NO_x and/or PM emissions deficits generated from the additional legacy engine sales using the same pathways that currently exist in the Omnibus regulation. As a result, the proposed amendments are emissions-neutral, that is they are not projected to provide any additional emission reductions, nor are they expected to result in any emissions increases. Emissions and health benefits expected from the Omnibus regulation as initially adopted would remain the same.⁴

B. Benefits to Typical Businesses

If not for the proposed amendments, both small and typical businesses would likely have difficulty obtaining some HD vehicles and engines for the 2024-2026 MY period. The proposed amendments will help ensure that the supply of HD engines is not interrupted, which will provide significant benefits to the businesses in California who typically purchase HD engines and vehicles. The proposed amendments are expected to be cost neutral to manufacturers because the technology cost savings gained from the sale of legacy engines will be offset by the cost for the credits or projects needed to offset the legacy engine excess emissions deficits. There will be an operational cost savings to the fleet operators due to the decreased use of diesel exhaust fluid (DEF) in legacy engines valued at approximately \$60 to \$200 per engine on an annual basis. CARB staff expects fleets to purchase new legacy engines at an increased cost between \$600 and \$2,000 so they may utilize DEF savings. The savings and costs to the fleet owners are expected to have a net zero change over the years between 2026 through 2035. A detailed assessment of the economic impacts of the proposed regulatory action can be found in the Economic Impact Analysis section (Chapter VIII) of this document.

⁴ (CARB, 2020b) Final Statement of Reasons for Rulemaking. "[Public Hearing to Consider the Proposed Heavy-Duty Engine and Vehicle Omnibus Regulation and Associated Amendments](#)," Public Hearing Date: August 27, 2020. pp. 247, 343-345

V. Air Quality

As discussed above, the proposed amendments are intended to provide additional compliance flexibility to assist manufacturers as they transition through the 2024 to 2026 MY Omnibus requirements by increasing the California sales limits for 2024 and 2025 MY legacy engines and extending the provisions through 2026 MY. Similar to the existing legacy engine provisions, manufacturers would be required to offset any excess NOx and/or PM emissions generated from legacy engine sales by using credits from the HD-ZE averaging set. If sufficient credits from the HD-ZE averaging set are not available, then upon approval by CARB's Executive Officer, the manufacturer may offset the deficits using credits from the same HDDE averaging set. Again, if sufficient credits from the HD-ZE and the same HDDE averaging sets are not available, then upon approval by CARB's Executive Officer, the manufacturer may offset the legacy engine NOx/PM deficits by performing projects in disadvantaged communities. As a result, the proposed amendments are emissions-neutral, that is they are not projected to provide any additional emission reductions beyond those projected in the Omnibus regulation, nor are they expected to result in any emissions increases. The emission benefits expected from the Omnibus regulation as initially adopted would remain the same. Tables V-1 and V-2 of the Final Statement of Reasons for Rulemaking (CARB, 2020b)⁵ provide updated projected NOx emission benefits from the Omnibus requirements for statewide, the South Coast and San Joaquin Valley Air Basins.

VI. Environmental Analysis

A. Introduction

This chapter provides the basis for CARB's determination that the proposed amendments are exempt from the requirements of the California Environmental Quality Act (CEQA). A brief explanation of this determination is provided in section B below. CARB's regulatory program, which involves the adoption, approval, amendment, or repeal of standards, rules, regulations, or plans for the protection and enhancement of the State's ambient air quality, has been certified by the California Secretary for Natural Resources under Public Resources Code section 21080.5 of CEQA (14 CCR 15251(d)). Public agencies with certified regulatory programs are exempt from certain CEQA requirements, including, but not limited to, preparing environmental impact reports, negative declarations, and initial studies. CARB, as a lead agency, prepares a substitute environmental document (referred to as an "Environmental Analysis" or "EA") as part of the Staff Report prepared for a proposed action to comply with CEQA (17 CCR 60000-60008). If the proposed amendments are finalized, a Notice of Exemption will be filed with the Office of the Secretary for the Natural Resources Agency for public inspection.

⁵ (CARB, 2020b) Final Statement of Reasons for Rulemaking. "[Public Hearing to Consider the Proposed Heavy-Duty Engine and Vehicle Omnibus Regulation and Associated Amendments](#)," Public Hearing Date: August 27, 2020, Tables V-1 and V-2, pp. 343-345.

B. Analysis

CARB has determined that the proposed amendments are exempt from CEQA under the “general rule” or “common sense” exemption (14 CCR 15061(b)(3)). The “common sense” exemption states a project is exempt from CEQA if “the activity is covered by the general rule that CEQA applies only to projects which have the potential for causing a significant effect on the environment. Where it can be seen with certainty that there is no possibility that the activity in question may have a significant effect on the environment, the activity is not subject to CEQA.”

As discussed in more detail in Chapter III, CARB staff is proposing amendments to the existing legacy engine provisions in the HD Omnibus regulation. CARB staff is proposing to increase the sales caps for legacy engines and extend the provisions through 2026 MY. These amendments would enable CARB to ensure adequate availability of HDDEs in MYs 2024 through 2026 in California. The proposed amendments are not anticipated to result in any new emissions or environmental impacts, as explained below.

Under the existing regulation, the legacy engine provisions provide flexibilities that allow manufacturers to certify a certain fraction of their 2024 and 2025 MY HD engines to the current exhaust emission standards, provided that the manufacturer offsets the legacy engine emission deficits using credits from the HD-ZE averaging set. The HD Omnibus regulation contains provisions allowing the generation of credits from 2022 through 2026 MY heavy-duty zero-emission powertrains (HD-ZEP) (CARB, 2021a)⁶, and these credits can be used to offset emission deficits from legacy engines. If sufficient HD-ZE credits are not available at the cost thresholds specified in the regulation, a manufacturer may submit a request to CARB’s Executive Officer to use credits from the same HDDE averaging set. If the manufacturer is unable to find credits from the HDDE averaging set, the manufacturer can carry over its legacy engine emissions deficit balance until the end of 2026 MY and then offset 1.25 times the deficits using either HDDE or HD-ZE credits or by conducting projects in disadvantaged communities. To be eligible for this provision, the existing regulation requires that a manufacturer certify at least one engine family to the HD Omnibus standards.

As part of the proposed amendments, CARB staff is proposing to increase the percentage of legacy engines a manufacturer would be allowed to distribute in California, as well as extend the legacy engine provisions to include MY 2026. The proposed amendments are emissions-neutral, since all excess emissions from additional legacy engine sales would have to be offset using the same compliance methods currently existing in the regulation. In addition, there would be no substantive changes to the way engine manufacturers would produce legacy engines. They would continue to use the same engine and emission control system architecture they are currently using to meet the current emissions standards. They

⁶ (CARB, 2021a) Section I.15.B.3.(j) of "[California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Diesel Engines and Vehicles](#)," as amended September 9, 2021

would also have to comply with the Phase 2 greenhouse gas (GHG) standards (CARB, 2018a)⁷ and therefore, no impacts on GHG emissions are expected, since that regulation continues to reduce GHG emissions from these engines over time.

The use of HD-ZE credits is the primary method of compliance to offset deficits from legacy engines. CARB staff believes that the proposed amendments would not impact heavy-duty zero-emission vehicle (HD-ZEV) sales for 2024 through 2026 MYs. In the absence of these amendments, fleets would likely consider options with lower upfront costs, including the following: keeping their trucks for a longer period, ordering rebuilt engines, purchasing second-hand trucks from out-of-state, or switching to natural gas-powered trucks. All of these options present lower upfront costs compared to purchasing a new HD-ZEV. Therefore, CARB staff believes that the proposed amendments would not impact the projected HD-ZEV penetration rates. As a result, the legacy engine related amendments are not expected to impact HD-ZEV sales; therefore, the proposed amendments also would not increase overall emissions from legacy engine-powered HD vehicles or from the HD fleet as a whole, as the amendments would not increase the current share of the existing fleet powered by legacy engines, and any legacy engines would need to comply with the most current NOx and PM standards applicable to 2010 MY HDDEs.⁸ The proposed amendments also reference a provision in the existing regulation specifying that if sufficient HD-ZE or HDDE credits are not available to offset the deficits, a manufacturer may seek to develop projects targeted at California disadvantaged communities. The proposed amendments will also allow flexibility to start working on projects in disadvantaged communities as early as 2024 MY.⁹ Because it is unknown whether this provision would be used, and even if so, it is unknown which types of projects manufacturers may seek to perform to offset deficits, it would be speculative for CARB staff to attempt to analyze the impacts of potential compliance responses associated with currently undefined future emissions reduction efforts.

The proposed amendments are not expected to result in changes to HD engine manufacturing facilities or processes to comply with the HD Omnibus standards nor to produce credit generating HDDEs with a NOx family emission limit of less than or equal to 0.10 g/bhp-hr. The technologies needed to build low NOx Omnibus-compliant HD engines are incremental improvements to existing technologies, and therefore no new or modifications to existing manufacturing facilities would be anticipated to be required.

The proposed amendments also include an additional flexibility, the ability to certify a legacy engine family before certification of Omnibus-compliant engine family. This additional

⁷ (CARB, 2018a) "[Proposed California Greenhouse Gas Emissions Standards for Medium- and Heavy-Duty Engines and Vehicles \(Phase 2\) and Proposed Amendments to the Tractor-Trailer GHG Regulation](#)," California Air Resources Board, February 8, 2018

⁸ (13 CCR 1956.8) [Title 13, California Code of Regulations, §1956.8\(a\)\(2\)\(A\) and §1956.8\(h\)\(2\)](#)

⁹ The manufacturer is required to submit a plan to the Executive Officer and demonstrate that the project will provide enough emission reductions to offset the excess NOx and PM emissions within 5 years and that the reductions occur in communities with higher pollution exposure, including communities of minorities and low-income population disproportionately impacted by air pollution. At the end of the five-year period, the manufacturer is required to submit information documenting that the excess emissions have been offset. Failure to do so would result in the revocation of the Executive Order of the legacy engines.

flexibility would not have any detrimental impacts on the California emissions inventory, nor would it result in any new or modified facilities as a result of implementation.

In summary, based on CARB's review, the proposed amendments would not result in increased criteria or toxics pollutant emissions, nor GHG emissions, compared to existing conditions, as explained above. The proposed amendments would not result in any new or modified facilities, nor any other types of construction or operational-related impacts that could lead to potential adverse environmental impacts. It can therefore be seen with certainty that there is no possibility that the proposed amendments may result in a significant adverse impact on the environment; therefore, this activity is exempt from CEQA.

VII. Environmental Justice

State law defines environmental justice as the fair treatment and meaningful involvement of people of all races, cultures, incomes, and national origins, with respect to the development, adoption, implementation, and enforcement of environmental laws, regulations, and policies (Government Code, § 65040.12, subd. (e)(1)). Environmental justice includes, but is not limited to, all of the following: (A) The availability of a healthy environment for all people. (B) The deterrence, reduction, and elimination of pollution burdens for populations and communities experiencing the adverse effects of that pollution, so that the effects of the pollution are not disproportionately borne by those populations and communities. (C) Governmental entities engaging and providing technical assistance to populations and communities most impacted by pollution to promote their meaningful participation in all phases of the environmental and land use decision making process. (D) At a minimum, the meaningful consideration of recommendations from populations and communities most impacted by pollution into environmental and land use decisions (Government Code, § 65040.12, subd. (e)(2)). The Board approved its Environmental Justice Policies and Actions (Policies) on December 13, 2001, to establish a framework for incorporating environmental justice into CARB's programs consistent with the directives of State law. These policies apply to all communities in California but are intended to address the disproportionate environmental exposure burden borne by low-income communities and communities of color. Environmental justice is one of CARB's core values and fundamental to achieving its mission.

Over the past 30 years, CARB, local air districts, and federal air pollution control programs have made substantial progress towards improving air quality in California and achieved ahead of schedule the statutory target of reducing GHG emissions to 1990 levels by 2020 (CARB, 2022).¹⁰ Despite this progress, some areas in California still exceed health-based air quality standards for ozone and PM. One of the most important factors for identifying disadvantaged communities is disproportionate effects of environmental pollution and other hazards that can lead to negative public health effects, exposure, or environmental degradation.

¹⁰ (CARB 2022) "[2022 Scoping Plan for Achieving Carbon Neutrality](#)," California Air Resources Board, November 16, 2022

HD trucks are significant contributors to California's air pollution problems. They are an important source of toxic diesel PM emissions and emit significant quantities of NOx and PM, which result in the formation of ambient ozone and fine particulate matter (PM2.5) in California. HD trucks are the predominant means of distributing goods and services. Their prevalence can be seen at distribution centers, ports, warehouses, and along major roadways, all of which are commonly located around more densely populated urban areas, including low-income and disadvantaged communities.

The Omnibus regulation was designed to result in significant emission reductions contributing to the overall reduction of public exposure to criteria air pollutants from HD vehicles operating throughout the state. In particular, the regulation is projected to provide significant air quality benefits to communities located in proximity to major freight corridors such as ports and railyards, distribution centers, truck stops, and other places where a high density of trucks operate. Many such communities are environmental justice areas that are already affected by the cumulative impact of air pollution from multiple mobile, commercial, industrial, area-wide, and other sources.

The proposed amendments would still preserve NOx emissions benefits and still prevent PM emission increases from 2024-2026 MY HD trucks as projected in the Omnibus regulation while also providing compliance flexibilities needed for manufacturers to make available HD engines and vehicles to California businesses. The proposed NOx offsetting mechanisms including the proposed requirement that projects be conducted in environmental justice communities affirm Board's commitment to the fair treatment of all people throughout California and may result in additional benefits in such communities. The proposed amendments are not expected to have any negative impacts to CARB's environmental justice policy of reducing exposure to harmful pollutants.

VIII. Economic Impacts Assessment

The proposed amendments are expected to be cost neutral to manufacturers because the technology cost savings gained from the sale of legacy engines will be offset by the additional cost for purchasing emissions credits or performing projects in disadvantaged communities. Since there will also be operational cost savings to fleet operators due to the decreased use of DEF by legacy engines, CARB staff anticipates fleets to pay a premium price for purchasing new legacy engines which would later be offset by savings from lower DEF consumption. The savings and costs to the fleet owners are expected to offset each other and have a net zero change over calendar years 2024 through 2035.

A. Statewide Costs and Benefit Analysis

The cost analysis was performed by using the expected vehicle sales volumes in 2026 for the baseline scenario and Option 1. The baseline scenario for the statewide cost analysis assumes implementation of all CARB adopted regulations that apply to on-road HD engines, including the Omnibus and the Advanced Clean Trucks Rule in 2022 dollars (2022\$).

The proposed amendments provide manufactures two flexibility options to sell legacy engines in California between 2024 and 2026 MYs. Of the two options offered, CARB staff

believes Option 1 to be the one most likely to be chosen by manufacturers. Therefore, the cost and benefit impact analysis assume full implementation of Option 1, which keeps legacy caps unchanged for MYs 2024 and 2025 but provides additional flexibility to manufacturers to produce and sell up to 10 percent HD legacy engines in MY 2026. Table VIII-1 provides a summary of the projected statewide sales volumes of HDDEs by service class for 2026 MY, as well as the engine population corresponding to the ten percent Option 1 legacy engine sales cap.

Table VIII-1: Engine Sales Volumes for 2026 Model Year by Vehicle Class¹¹

Vehicle Class	LHDD	MHDD	HHDD
GVWR – Diesel (lbs)	14,001-19,500	19,501-33,000	>33,000
Statewide HDDE Sales Volume	5,130	7,085	9,669
Applicable Legacy Engine Sales Volume (10 percent of Statewide Sales)	513	708	967

1. Costs and Benefits to Manufacturers

The manufacturers will have cost savings from making lower cost legacy engine technology rather than cleaner low NOx Omnibus-compliant engines. The estimated incremental increase in cost between a legacy engine and a low NOx Omnibus-compliant engine is approximately \$1,993 to \$4,565 per HD engine. This results in a total savings of \$7.5 million if the legacy cap of 10 percent is fully utilized in MY 2026. Table VIII-2 provides a summary of the amount of cost savings manufacturers are expected to have from selling legacy engines instead of low NOx Omnibus-compliant engines in 2026, assuming all manufacturers fully utilize Option 1.

Table VIII-2: Manufacturing Cost Savings for 2026 Legacy Engines

Vehicle Class	LHDD	MHDD	HHDD	Total
GVWR – Diesel (lbs)	14,001-19,500	19,501-33,000	>33,000	>14,000
Manufacturing Cost Savings per Engine	\$1,993	\$2,877	\$4,565	N/A
Manufacturing Cost Savings for Statewide Volumes	\$1,022,286	\$2,038,332	\$4,413,894	\$7,474,511

Legacy engines have higher emission levels compared to Omnibus-compliant engines and manufacturers must offset any excess emissions from the sale of legacy engines.

¹¹ HD engine classes are defined as follows: Light heavy-duty diesel (LHDD) engines are used in vehicles with a gross vehicle weight rating (GVWR) of 14,001-19,500 pounds (lbs), MHDD engines are used in vehicles with a GVWR of 19,501-33,000 lbs and HHDD engines are used in vehicles with a GVWR >33,000 lbs.

Manufacturers have three options to offset the excess emissions. They can use credits from HD-ZE averaging set; they can use credits from the same HDDE averaging set; and they can use emission reductions gained from projects in disadvantaged communities. However, the projects must be approved by the Executive Officer and offset 125 percent of the excess legacy engine emissions. Engine manufacturers would be required to indicate on the engine label that these engines were accounted for in their emissions offset program. No costs were estimated for adding offset program information on the engine label because the engine labels are an already existing requirement under current regulations and adding offset program information is not expected to result in quantifiable increases in materials, staff time, or workload to the manufacturers.

The costs for credit trading between different manufacturers is considered as confidential business information and is driven by market forces. Likewise, the cost of potential projects is currently unknown. CARB staff expects that market forces will control the costs to offset excess emissions and what fleet owners are willing to pay for a legacy HDDE. It is unlikely that manufacturers would produce legacy engines if the cost of HD-ZE credits exceeded the incremental increase in cost to manufacturer an Omnibus-compliant engine in 2026. Therefore, the cost to offset legacy engine emissions must be less than or equal to the technology costs savings from producing a legacy engine to make the legacy engine a viable option. For this reason, the market prices for a 2026 MY legacy engine versus an Omnibus-compliant engine of the same size are anticipated to be similar.

2. Costs and Benefits to Fleet Owners and Operators

Omnibus-compliant engines use more DEF than legacy engines, and therefore have a greater operational cost. Likewise, fleet owners who operate legacy engines benefit from DEF costs savings. The per engine annual cost savings from legacy engine DEF consumption is expected to range from \$61 to \$204 with the lifetime savings of \$606 to \$2,044 depending on the vehicle class.

Equation VIII -1 shows the methodology used to estimate the annual incremental savings from DEF consumption per legacy engine. Table VIII -3 provides the input variables, definitions and final cost savings by vehicle class for legacy engine reduced DEF use.

Equation VIII -1. Annual Incremental Savings Calculation for DEF Consumption per Legacy Engine

$$ADC \left[\frac{\$}{yr} \right] = AM \left[\frac{mi}{yr} \right] \times \frac{1}{FE} \left[\frac{gal Diesel}{mi} \right] \times DDCR \left[\frac{gal DEF}{gal Diesel} \right] \times DP \left[\frac{\$}{gal DEF} \right] \times PRD [\%]$$

where,

ADC is the Annual DEF consumption cost in \$ per year,

AM is the annual mileage in miles per year,

FE is the fuel economy in miles traveled per gallon diesel consumed,

DDCR is the DEF to Diesel Consumption Ratio in gallons DEF consumed per gallon diesel consumed,

DP is the diesel price in dollars per gallon, and PRD is the percent reduction in DEF consumption compared to Omnibus-compliant engine in percent.

Table VIII-3: Summary of Per Engine Incremental Cost, Inputs and Assumptions for Legacy Engine DEF Savings

Vehicle Class	LHDD	MHDD	HHDD
GVWR – Diesel (lbs)	14,001-19,500	19,501-33,000	>33,000
Annual milage (AM) [mi/year] ¹²	28,197	28,459	69,154
Fuel economy (FE) [mi/gal] ¹³	9.9	10	7.2
DEF/diesel consumption ratio (DDCR) [gal/gal] ¹⁴	5%	5%	5%
DEF price (DP) [\$ /gal] ¹⁵	\$7.95	\$7.95	\$7.95
Percent reduction in DEF (PRD) consumption for legacy engine compared to baseline [%] ¹⁶	-5.36%	-5.36%	-5.36%
Annual DEF cost (ADC) [\$ /yr]	-\$60.62	-\$60.57	-\$204.41
Savings through useful life ¹⁷	-\$606.2	-\$605.7	-\$2,044.1

Legacy engines are more appealing to fleet owners due to the cost savings from the reduced DEF consumption; therefore, fleet owners may be incentivized to purchase legacy engines at a premium. It is expected that market forces may cause a fleet to be willing to purchase legacy engines at a premium price estimated to be \$606.2 to \$2,044.1, equal to the DEF cost savings per legacy engines. For this reason, there is estimated to be a \$0 net impact on the cost to purchase and operate legacy engines for fleets.

¹² (CARB, 2020a) Annual mileage estimates are taken from *Omnibus ISOR*

¹³ (CARB, 2021b) Fuel economy data are estimated using *CARB Emissions Inventory Model EMFAC2021*

¹⁴ Industry published DEF consumption estimate ratio ranges between 3-5% gal DEF per gal Diesel. (Cummins, 2016) <https://www.cummins.com/news/2016/01/04/6-answers-about-diesel-exhaust-fluid>

¹⁵ DEF cost from online retailers surveyed in 2023 (DEF Price Online Survey, 2023)

¹⁶ Percent reduction in DEF consumption is estimated using methodology used in *Control of Air Pollution from New Motor Vehicles: Heavy-Duty Engine and Vehicle Standards, Regulatory Impact Analysis*. EPA-420-R-22-035. (U.S. EPA, 2022), pp. 349-352

¹⁷ The savings presented are based on operating equipment within the regulatory useful life for legacy engines in bought 2026.

3. Summary of Statewide Cost and Benefit Impacts

Table VIII-4 summarizes the cost and savings impacts to both manufacturers and fleet owners between 2026 and 2035 due to the proposed amendments. The manufacturers, who are located outside of California, are estimated to have about a \$7.5 million technology costs savings from producing legacy engines in 2026 MY in lieu of Omnibus-compliant engines. In turn, manufacturers must offset those increased emissions; CARB staff estimates the cost to offset these emissions is \$7.5 million, equal to the cost savings.

The fleets operating legacy engines will have an estimated annual savings of \$270,000 from lower DEF use, totaling of \$2.7 million over the lifetime of those legacy engines. These cost savings will incentivize fleet owners to purchase legacy engines in 2026. However, fleets are expected to pay a premium in 2026 of \$2.7 million to buy the legacy engines.

In summary, the proposed amendments are expected to have a statewide net impact of \$2.4 million in 2026, and -\$0.27 million each year from 2027 to 2035, which leads to a \$0 net impact of the lifetime of the regulation between 2026 and 2035.

Table VIII-4: Summary of Estimated Statewide Costs and Savings to Manufactures and Fleets Owners¹⁸

Calendar Year	Technology Savings to Manufacturers	Offset Cost to Manufacturers	DEF Consumption Savings to Fleets	Expected Purchase Price Mark-Up due to DEF	Net Impact (Cost - Saving)
2026	-\$7,474,511	\$7,474,511	-\$271,650	\$2,716,500	\$2,444,850
2027			-\$271,650		-\$271,650
2028			-\$271,650		-\$271,650
2029			-\$271,650		-\$271,650
2030			-\$271,650		-\$271,650
2031			-\$271,650		-\$271,650
2032			-\$271,650		-\$271,650
2033			-\$271,650		-\$271,650
2034			-\$271,650		-\$271,650
2035			-\$271,650		-\$271,650
Total	-\$7,474,511	\$7,474,511	-\$2,716,500	\$2,716,500	\$0

¹⁸ Negative cost values represent savings.

Although not outlined here, an analysis of Option 2 would yield the same zero net change to statewide costs as option presented above for Option 1. In Option 2, the sales caps for legacy engines and the timelines are slightly different depending on the engine service class each year, but the engine manufacturers and fleet owners will have zero net change over the lifetime impact of the proposed amendments. Manufacturers will still use either credits or projects to offset excess emissions from legacy engines valued equivalent to the savings to produce legacy engines over low NOx Omnibus-compliant engines. Under Option 2, fleets would save on DEF consumption and would likely purchase legacy engines with an increase in cost similar to the savings.

B. The Creation or Elimination of Jobs Within the State of California.

Over the regulatory lifetime of the proposed amendments, a net zero change is expected. The proposed amendments are not expected to impact creation or elimination of jobs within the state.

C. The Creation of New Business or the Elimination of Existing Businesses Within the State of California.

The main intent of these amendments is to provide manufacturers additional compliance flexibility, and thereby ensure adequate availability of HDDEs in certain engine families within the California market for 2024 through 2026 MYs. Over the regulatory lifetime of the proposed amendments, a net zero change is expected. The proposed amendments are not expected to impact the creation of new businesses or elimination of existing businesses within the state.

D. The Expansion of Businesses Currently Doing Business Within the State of California.

The main intent of these amendments is to provide manufacturers additional compliance flexibility, and thereby ensure adequate availability of HDDEs in certain engine families within the California market for 2024 through 2026 MYs. Over the regulatory lifetime of the proposed amendments, a net zero change is expected. The proposed amendments are not expected to impact the expansion of businesses currently doing business within the state.

E. Significant Statewide Adverse Economic Impact Directly Affecting Business, Including Ability to Compete

Over the regulatory lifetime of the proposed amendments, a net zero change is expected. The proposed amendments are not expected to impact or cause any adverse economic impact directly affecting businesses or the ability to compete.

F. The Benefits of The Regulation to The Health and Welfare of California Residents, Worker Safety, and the State's Environment.

As described in Section V, the proposed amendments would maintain the emissions and health benefits achieved by the Omnibus regulation and allow flexibilities for manufacturers to utilize legacy engines by balancing emissions through HD-ZE credits and projects. The proposed amendments achieve this while not impacting costs to the end users, statewide emissions, and statewide health benefits.

IX. Evaluation of Regulatory Alternatives

Government Code section 11346.2, subdivision (b)(4) requires CARB to consider and evaluate reasonable alternatives to the proposed regulatory action and provide reasons for rejecting those alternatives. This section discusses alternatives evaluated and provides reasons why these alternatives were not included in the proposal. As explained below, no alternative proposed was found to be less burdensome and equally effective in achieving the purposes of the regulation in a manner that ensures full compliance with the authorizing law. Board has not identified any reasonable alternatives that would lessen any adverse impact on small business.

A. Alternative 1: No Action

CARB staff considered Alternative 1, i.e., not making any changes to the Omnibus regulation, including its legacy engine provisions. Alternative 1 is the same as the baseline scenario and thus would not be expected to cause any changes to the benefits in terms of emissions, health benefits or costs. Alternative 1 would result in \$0 benefits and \$0 costs.

Alternative 1 was rejected because it would not ensure adequate availability of HDDEs in the California market for the 2024 through 2026 MYs. As described above, in February, CARB staff was informed that a major HDDE manufacturer has changed its product offerings and will not offer any diesel-fueled Omnibus-compliant engines in California for the 2024 and 2025 MYs. Selecting Alternative 1 and maintaining the baseline would not ensure adequate availability of HDDEs in the California market for the 2024 through 2026 MYs. For this reason, Alternative 1 was rejected.

B. Alternative 2: Delay Omnibus Requirements in 2024

Alternative 2 assumes one year delay of Omnibus from the 2024 MY to 2025. This would provide greater flexibility to manufacturers and result in a higher number of 2024 MY legacy engines in California, which would alleviate HDDE availability concerns in 2024. Alternative 2 would essentially allow 100 percent of the California engine sales volume, 22,881 units, to be legacy engines. Alternative 2 would not require any offsets of the increased emissions of legacy engines sold in 2024. In this analysis the costs and benefits of the regulation are tracked for ten years of the 2024 MY engines useful life between 2024 through 2033. The

time frame is slightly different from the proposed amendments because the engine MYs affected are different in the proposed amendments and Alternative 2.

1. Savings

The total costs of Alternative 2 were assessed using the same modeled baseline conditions used for the proposed amendments. Without the requirement to offset excess emissions from legacy engine sales, the legacy engine provisions would yield a cost savings to produce engines which would be passed onto the fleets. Fleets would additionally have savings from decreased DEF consumption as described in section VIII. Fleets would be expected to save approximately \$107 million statewide between 2024 and 2033. The annual savings for Alternative 2 are summarized in Table IX-1.

Table IX-1: Summary of Benefits Associated with Alternative 2

Calendar Year	Technology	Annual DEF Consumption	Total Savings
2024	\$78,340,550	\$2,853,739	\$81,194,289
2025		\$2,853,739	\$2,853,739
2026		\$2,853,739	\$2,853,739
2027		\$2,853,739	\$2,853,739
2028		\$2,853,739	\$2,853,739
2029		\$2,853,739	\$2,853,739
2030		\$2,853,739	\$2,853,739
2031		\$2,853,739	\$2,853,739
2032		\$2,853,739	\$2,853,739
2033		\$2,853,739	\$2,853,739
Total	\$78,340,550	\$28,537,391	\$106,877,941

2. Emissions Costs

Alternative 2 would allow manufacturers to build engines that do not comply with the Omnibus requirements for the 2024 MY. The legacy engines bought during that period would result in increased NOx emissions.

The net impacts to the California emissions inventory for Alternative 2 were evaluated against the baseline scenario for the analysis period from 2024 through 2033 because the useful life used for 2024 MY engines is ten years. The baseline vehicle inventory includes the vehicle sales and population growth assumptions currently reflected in CARB’s emissions inventory

model (EMFAC) for combustion engines certified and intended for use in vehicles greater than 14,000 pounds GVWR. The current EMFAC model reflects implementation of currently existing state and federal laws and regulations including the Truck and Bus Regulation, Drayage Truck Regulation, idling regulation, Phases 1 and 2 GHG Regulations, Innovative Clean Transit regulation, the Optional Low NOx Program, the Advanced Clean Trucks regulation, and the Omnibus regulation.

Table IX -2 summarizes the statewide daily and annual NOx emissions disbenefits statewide due to Alternative 2. Alternative 2 would result in approximately 1,400 tons of excess NOx emissions between 2024 to 2033.

Table IX-2: Projected Statewide NOx Emission Disbenefits from Alternative 2 (tons/year)

Calendar Year	NOx Disbenefit (tons/day)	Annual NOx Disbenefit (tons/year)
2024	0.36	111
2025	0.65	202
2026	0.69	215
2027	0.60	188
2028	0.51	160
2029	0.45	140
2030	0.39	120
2031	0.34	106
2032	0.32	99
2033	0.30	93
Total		1,436

3. Health Costs

Alternative 2 would cause approximately 1,400 tons of excess NOx emissions and thereby increase the secondary formation of PM2.5, resulting in health disbenefits for individuals in California. The value of these health disbenefits is due an increase of instances of premature mortality, increase in hospital and emergency room visits, and additional lost days of work. As part of setting the National Ambient Air Quality Standards for Ozone, U.S. EPA quantifies

the health risk from exposure to PM_{2.5},¹⁹ and CARB relies on the same health studies for this evaluation. The evaluation method used in this analysis is the same as the one used for CARB's proposed Low Carbon Fuel Standard 2018 Amendments²⁰, the Heavy-Duty Vehicle Inspection Program and Periodic Smoke Inspection Program²¹, and the ACT Regulation.²²

CARB staff analyzed the value associated with five health outcomes for the business-as-usual scenario and Alternative 2: cardiopulmonary mortality, hospitalizations for cardiovascular illness, hospitalizations for respiratory illness, emergency room visits for respiratory illness, and emergency room visits for asthma. These health outcomes were selected because U.S. EPA has identified these as having a causal or likely causal relationship with exposure to PM_{2.5}.²³ U.S. EPA examined other health endpoints such as cancer, reproductive and developmental effects, but determined there was only suggestive evidence for a relationship between these outcomes and PM_{2.5} exposure, and insufficient data to include these endpoints in the national health assessment analysis routinely performed by the U.S. EPA.

U.S. EPA has also determined a causal relationship between non-mortality cardiovascular effects and short and long-term exposure to PM_{2.5}, and a likely causal relationship between non-mortality respiratory effects (including worsening asthma) and short and long-term PM_{2.5} exposure. These outcomes lead to hospitalizations and emergency room visits and are included in this analysis.

In general, health studies have shown that populations with low socioeconomic standings are more susceptible to health problems from exposure to air pollution. However, the models currently used by U.S. EPA and CARB do not have the granularity to account for this impact. The location and magnitude of projected emission reductions resulting from Alternative 2 are not known with sufficient accuracy to account for the socioeconomic impacts, and an attempt to do so would produce uncertainty ranges so large as to make conclusions difficult. CARB acknowledges this limitation.

Table IX -3 shows the estimated statewide-avoided premature mortality, hospitalization, and emergency room visits for each air basin with the 95-percent confidence interval in parenthesis. Alternative 2 is expected to cause approximately 14 additional deaths.

¹⁹ (U.S. EPA, 2010) "Quantitative Health Risk Assessment for Particulate Matter," United States Environmental Protection Agency, EPA-452/R-10-005, June 2010.

https://www3.epa.gov/ttn/naaqs/standards/pm/data/PM_RA_FINAL_June_2010.pdf

²⁰ (CARB, 2018b) Staff Report: Initial Statement of Reasons for the Rulemaking: "*Public Hearing to Consider Proposed Regulation to The Low Carbon Fuel Standard Regulation and To The Regulation On Commercialization Of Alternative Diesel Fuels*", California Air Resources Board, March, 6, 2018.

²¹ (CARB, 2018c) Staff Report: Initial Statement of Reasons for the Rulemaking: "*Proposed Regulation to The Heavy-Duty Vehicle Inspection Program and Periodic Smoke Inspection Program*", California Air Resources Board, April 3, 2018.

²² (CARB, 2019) Staff Report: Initial Statement of Reasons, "*Public Hearing to Consider the Proposed Advanced Clean Trucks Regulation*," California Air Resources Board, October 22, 2019.

²³ In this document, we have quantified health benefits due to the reduction in secondary PM 2.5 expected from the Proposed Regulation. We expect the Proposed Regulation would also lead to additional, smaller health benefits due to ambient ozone reductions, but they are not quantified here.

Alternative 2 may also increase the occupational exposure of air pollution on California HD vehicle operators and other employees who work around vehicle traffic. However, CARB staff cannot quantify the potential effect of this occupational exposure due to lack of data on typical occupational exposure for these types of workers.

Table IX-3: Additional Statewide Mortality and Morbidity Incidents Under Alternative 2 (95 percent confidence intervals)

Calendar Year	Cardiopulmonary Mortality	Hospitalizations for Cardiovascular Illness	Hospitalizations for Respiratory Illness	Emergency Room Visits
2024	1 (1 - 1)	0 (0 - 0)	0 (0 - 0)	0 (0 - 1)
2025	2 (1 - 2)	0 (0 - 0)	0 (0 - 1)	1 (1 - 1)
2026	2 (2 - 2)	0 (0 - 1)	0 (0 - 1)	1 (1 - 1)
2027	2 (1 - 2)	0 (0 - 0)	0 (0 - 1)	1 (1 - 1)
2028	2 (1 - 2)	0 (0 - 0)	0 (0 - 0)	1 (0 - 1)
2029	1 (1 - 2)	0 (0 - 0)	0 (0 - 0)	1 (0 - 1)
2030	1 (1 - 1)	0 (0 - 0)	0 (0 - 0)	1 (0 - 1)
2031	1 (1 - 1)	0 (0 - 0)	0 (0 - 0)	0 (0 - 1)
2032	1 (1 - 1)	0 (0 - 0)	0 (0 - 0)	0 (0 - 1)
2033	1 (1 - 1)	0 (0 - 0)	0 (0 - 0)	0 (0 - 1)
Total	14 (11 - 15)	2(0 - 2)	2(0- 3)	6 (3 - 10)

*Rounded to whole numbers

Statewide valuation of health benefits was calculated by multiplying the value per incident in Table IX-4 by the statewide total number of incidents for 2024 through 2033. A summary of the cost analysis for monetized health benefits is provided in Table IX-4. The value for avoided premature mortality is based on willingness to pay, which is a statistical construct based on the aggregated dollar amount that a large group of people would be willing to pay for a reduction in their individual risks of dying in a year.²⁴

Unlike mortality valuation, the cost-savings for avoided hospitalizations and ER visits are based on a combination of typical costs associated with hospitalization and the willingness of surveyed individuals to pay to avoid adverse outcomes that occur when hospitalized.

²⁴ U.S. EPA, An SAB Report on EPA's White Paper Valuing the Benefits of Fatal Cancer Risk Reduction (EPA-SAB-EEAC-00-013), 2000 (web link: <https://nepis.epa.gov/Exe/ZyPDF.cgi/P100JOK2.PDF?Dockey=P100JOK2.PDF>, last accessed April 2023).

These include hospital charges, post-hospitalization medical care, out-of-pocket expenses, lost earnings for both individuals and family members, lost recreation value, and lost household production (e.g., valuation of time-losses from inability to maintain the household or provide childcare).²⁵ The estimated total statewide health benefits derived from criteria emission reductions is estimated to be \$152 million.

Table IX-4: Statewide Valuation from Additional Mortality and Morbidity Incidents Under Alternative 2

Outcome	Value Per Incident (2022\$)	Avoided Incidents	Total Valuation (2022\$)
Avoided Premature Mortality	\$11,222,126	14	\$151,872,411
Avoided Cardiovascular Hospitalizations	\$66,288	2	\$123,914
Avoided Acute Respiratory Hospitalizations	\$57,820	2	\$129,016
Avoided Emergency Room Visits	\$949	7	\$6,191
Total		24	\$152,131,532

4. Reason for Rejection

Alternative 2 provides flexibility to provide legacy engine sales to the public by halting enforcement of 2024 MY Omnibus requirements. Along with flexibility to meet manufacturer product plans, Alternative 2 also provides savings to the manufacturers and the fleet owners statewide by approximately \$107 million between 2024 and 2033. Alternative 2 achieves this at the cost of 1,400 tons in excess NOx emissions causing an estimated 14 premature deaths and other hospital visits valued at 152 million dollars in costs statewide. The net disbenefit to the state would be valued at \$45 million dollars between 2024 and 2033.

Alternative 2 was rejected because it is less effective in reducing emissions of criteria pollutants than the Omnibus regulation. As discussed above, Alternative 2 results in an additional 1,400 tons of statewide NOx emissions between 2024 and 2033, compared to the Omnibus regulation. This factor is critical because California needs to achieve the greatest degree of emissions reductions of criteria pollutants such as NOx and PM in order to reduce the serious risks to the health and welfare of Californians posed by such pollutants, and to attain state and federal ambient air quality standards as soon as possible. This Alternative therefore does not ensure that the proposed amendments would provide compliance

²⁵ Chestnut, L.G., et. al. (2008) The Economic Value of Preventing Respiratory and Cardiovascular Hospitalizations. <https://doi.org/10.1093/cep/byj007>

flexibility to manufacturers while also ensuring the amendments will not reduce the emissions benefit of the Omnibus regulation. Furthermore, Alternative 2 is not both as effective in carrying out the purpose for which the amendments are proposed, and less burdensome to affected private persons than the proposed amendments, and is not more cost effective to affected private persons and equally effective in implementing the statutory policies and provisions of law authorizing CARB to enact the Omnibus regulation.

C. Small Business Alternative

Board has not identified any reasonable alternatives that would lessen any adverse impact on small business.

D. Performance Standards in Place of Prescriptive Standards

The flexibilities and options in the proposed amendments are performance-based standards referring to legacy engines meeting the 2010 emission standards during 2024 and later years where the Omnibus Regulation emission requirements are implemented.

E. Health and Safety Code section 57005 Major Regulation Alternatives

The proposed regulation will not result in a total economic impact on state businesses of more than \$10 million in one or more years of implementation. Therefore, this proposal is not a major regulation as defined by HSC section 57005.

X. Justification for Adoption of Regulations Different from Federal Regulations Contained in the Code of Federal Regulations

This chapter is intended to satisfy Government Code section 11346.2, subdivision (b)(6), which requires CARB to describe its efforts to avoid unnecessary duplication or conflicts with federal regulations that address the same issues. As explained further below, within this Staff Report, CARB staff is proposing regulations different from federal regulations contained in the code of federal regulations addressing the same issues because it is necessary, authorized by law, and justified by the benefit to the health of Californians.

Both California and U.S. EPA have comparable, yet distinct authorities to set emission standards for new motor vehicles and for new motor vehicle engines. CARB's legal authority to set emission standards and other emission-related requirements for new motor vehicles and new motor vehicle engines are described in Chapter II, Section B. U.S. EPA's authority to set comparable emission standards and emission-related requirements is contained in Section 202(a)(1) of the Clean Air Act.

For the past several decades, California and U.S. EPA HD engine emission standards and other emission-related requirements have largely been harmonized, to enable the regulated industry to design and produce a single product line of engines and vehicles which can be certified to both U.S. EPA and CARB emission standards and sold in all 50 states. These so-

called “50-state” standards enable technology suppliers and manufacturers to efficiently produce a single set of reliable and compliant products.

However, HD vehicles comprise the largest NO_x emission source category in California, and as a result California urgently needs to achieve significant emission reductions from on-road HD vehicles in order to meet the State’s SIP commitments and protect public health. Accordingly, the Omnibus regulation, as adopted on December 22, 2021, was developed to achieve such needed emission reductions by requiring HD engines meet stricter requirements beginning with MY 2024. CARB staff’s proposed amendments to the Omnibus regulations and test procedures are found in Appendices A and B.

On January 24, 2023, U.S. EPA finalized the Clean Trucks Plan (CTP) NO_x rule which sets stricter emission standards for new 2027 and later MY HD engines (U.S. EPA, 2023).²⁶ In general, although the CTP NO_x rule contains nearly all the same elements as the Omnibus regulation and is similar in stringency, CARB’s 2031 and later MY Omnibus standards and test procedures are more stringent than those of the CTP NO_x rule. Furthermore, U.S. EPA currently does not have emission standards or emission-related requirements that are as stringent as CARB’s 2024 through 2026 MY Omnibus requirements.

XI. Public Process for Development of the Proposed Action (Pre-Regulatory Information)

Consistent with Government Code sections 11346, subdivision (b), and 11346.45, subdivision (a), and with Board’s long-standing practice, CARB staff held public workshops and had other meetings with interested persons during the development of the proposed regulation. These informal pre-rulemaking discussions provided CARB staff with useful information that was considered during development of the regulation that is now being proposed for formal public comment.

On February 13, 2023, CARB staff conducted a virtual and in-person public workshop to discuss the proposed amendments and solicit feedback from stakeholders about the proposed changes (CARB, 2023b).²⁷ Attendees included engine and vehicle manufacturers, trade associations, component suppliers, members of academia, non-governmental organizations, and members of the general public. The workshop was held in person in Sacramento and online via Zoom.

In addition, CARB staff also held meetings virtually multiple times with engine manufacturers individually and as a group. CARB staff also met with the Truck and Engine Manufacturers Association and other interested stakeholders including environmental organizations and the South Coast Air Quality Management District.

²⁶ (U.S. EPA, 2023) [Control of Air Pollution from New Motor Vehicles: Heavy-Duty Engine and Vehicle Standards. Final rule](#). Federal Register Vol. 88, No. 15, January 24, 2023. (Accessed 4/18/2023)

²⁷ (CARB, 2023b) [Proposed Advanced Clean Fleets \(ACF\) Regulation Preliminary Language Revisions Workshop](#). February 23, 2023.

XII. References

1. (13 CCR 1956.8) *Title 13, California Code of Regulations, §1956.8*
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3. (CARB, 2018b) Staff Report: Initial Statement of Reasons for the Rulemaking: "*Public Hearing to Consider Proposed Regulation to the Low Carbon Fuel Standard Regulation and to the Regulation On Commercialization of Alternative Diesel Fuels*", California Air Resources Board, March, 6, 2018
4. (CARB, 2018c) Staff Report: Initial Statement of Reasons for the Rulemaking: "*Proposed Regulation to The Heavy-Duty Vehicle Inspection Program and Periodic Smoke Inspection Program*", California Air Resources Board, April, 3, 2018.
5. (CARB, 2019) Staff Report: Initial Statement of Reasons, "*Public Hearing to Consider the Proposed Advanced Clean Trucks Regulation*," California Air Resources Board, December 12, 2019
6. (CARB, 2020a) Staff Report: Initial Statement of Reasons, "*Public Hearing to Consider the Proposed Heavy-Duty Engine and Vehicle Omnibus Regulation and Associated Amendments*," California Air Resources Board, August 27, 2020
7. (CARB, 2020b) Final Statement of Reasons for Rulemaking. "*Public Hearing to Consider the Proposed Heavy-Duty Engine and Vehicle Omnibus Regulation and Associated Amendments*," Public Hearing Date: August 27, 2020.
8. (CARB, 2021a) "*California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Diesel Engines and Vehicles*," as amended September 9, 2021
9. (CARB, 2021b) EMFAC2021_Running Operation Only - *CARB Emissions Inventory Model EMFAC2021* (ver. 1.02)
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12. (CARB, 2023b) Workshop Presentation, "*Proposed Advanced Clean Fleets (ACF) Regulation Preliminary Language Revisions Workshop*," California Air Resources Board. February 23, 2023

13. (Chestnut, 2006) Chestnut, L. G., M. A. Thayer, J. K. Lazo, and S. K. Van Den Eeden, "[The Economic Value of Preventing Respiratory and Cardiovascular Hospitalizations](#)," Contemporary Economic Policy (ISSN 1074-3529) Vol. 24, No. 1, January 2006, 127-143
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17. (U.S. EPA, 2010) "[Quantitative Health Risk Assessment for Particulate Matter](#)," U.S. EPA, EPA-452/R-10-005, June 2010.
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19. (U.S. EPA, 2023) "[Control of Air Pollution from New Motor Vehicles: Heavy-Duty Engine and Vehicle Standards. Final rule](#)," Federal Register Vol. 88, No. 15, January 24, 2023

XIII. Appendices

Appendix A-1: Proposed Title 13 Regulation Order

Appendix A-2: Proposed Title 13 Regulation Order (Accessible Format)

Appendix B-1: Proposed Amendments to the Diesel Engine Test Procedures

Appendix B-2: Proposed Amendments to the Diesel Engine Test Procedures (Accessible Format)

Appendix C: Purpose and Rationale for each Regulatory Provision