California Air Resources Board

Public Hearing to Consider the Proposed Amendments to the On-Road Heavy-Duty Engine and Vehicle Omnibus, Low Carbon Fuel Standard Regulations, and to Permanently Adopt the Emergency Vehicle Emissions Regulations.

Staff Report: Initial Statement of Reasons

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Table of Contents

List of Tables

List of Figures

List of Acronyms and Abbreviations

Acronym/Abbreviation	Definition
%	Percent
°C	Degrees Celsius
°F	Degrees Fahrenheit
1B-MAW or 1-Bin MAW	Single-Bin Moving Average Window
2B-MAW	2-Bin Moving Average Window
3B-MAW	3-Bin Moving Average Window
2004-DTPS	California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Diesel Engines and Vehicles
2004-OTTO-TPS	California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Otto-Cycle Engines and Vehicles
2016 State SIP Strategy	2016 State Strategy for the State Implementation Plan
2022 State SIP Strategy	2022 State Strategy for the State Implementation Plan
2026-DTPS	California Exhaust Emission Standards and Test Procedures for 2004 through 2026 Model Heavy-Duty Diesel Engines and Vehicles
2026-OTTO-TPS	California Exhaust Emission Standards and Test Procedures for 2004 through 2026 Model Heavy-Duty Otto-Cycle Engines and Vehicles
2027-TPS	California Exhaust Emission Standards and Test Procedures for 2027 and Subsequent Model Heavy-Duty Engines, Vehicles and Hybrid Powertrains
ABT	Averaging, Banking, and Trading

Acronym/Abbreviation	Definition
ACF	Advanced Clean Fleets
ACT	Advanced Clean Trucks
APS	Auxiliary Power System
ASTM	American Society for Testing and Materials
BAR	Bureau of Automotive Repair
BenMAP-CE	Environmental Benefit Mapping and Analysis Program – Community Edition
bhp	Brake Horsepower
B20	20% Biodiesel content
CA-ABT	California-only ABT program
CARB or ARB or Board	California Air Resources Board
CBA	California Bus Association
CCR	California Code of Regulations
CEPAM	California Emission Projection Analysis Model
CEQA	California Environmental Quality Act
CFR	Code of Federal Regulations
CFV	Critical-Flow Venturi
CH_4	Methane
CI	Compression-Ignition
CIHD	Compression-Ignition and Heavy-Duty Certification
CLD	Chemiluminescent Detector
CO	Carbon Monoxide
CoC	Certificate of Conformity
COI	Cost of Illness
CO_2	Carbon Dioxide
CSERS	Cold Start Emission Reduction Strategy
CTP	Clean Truck Partnership
CVS	Constant-Volume Sampling

Acronym/Abbreviation	Definition
C_2H_6	Ethane
DDE	Durability Demonstration Engine
DDP	Durability Demonstration Program
DEC-ECU	Diagnostic or Emission Critical Electronic Powertrain Control Units
DEF	Diesel Exhaust Fluid
DMV	Department of Motor Vehicles
DPF	Diesel Particulate Filter
ECCD	Emissions Certification & Compliance Division
ED	Emergency Department
EF	Engine Family
EGR	Exhaust Gas Recirculation
EJ	Environmental Justice
EMA	Truck and Engine Manufacturers Association
EMFAC	CARB's Emissions Model or Emission FACtors Inventory Model
EO	Executive Order
EOE	Engine Output Energy
EPA-NOx rule	United States Environmental Protection Agency Clean Trucks Plan Final Rule for Control of Air Pollution from New Motor Vehicles: Heavy-Duty Engine and Vehicle Standards
ePTO	Electric Power Take-Off
EWIR	Emission Warranty Information Reporting
E-85	Mixture of Petroleum and Ethanol (85%)
E-100	Ethanol
FCL	Family Certification Level
FEL	Family Emission Limit
FFV	Flexible Fuel Vehicle

Acronym/Abbreviation	Definition
FID	Flame-Ionization Detector
Final LCFS EIA	Final Environmental Impact Analysis for the 2024 Amendments to the Low Carbon Fuel Standard Regulation
FR	Federal Register
FTIR	Fourier Transform Infrared
FTP	Federal Test Procedure
GBV	Great Basin Valleys
GEM	Greenhouse Gas Emissions Model
GHG	Greenhouse Gas
g/bhp-hr	Grams Per Brake Horsepower Hour
g/hp·hr or g/hp-hr	Grams Per Brake Horsepower Hour
g/hr	Grams Per Hour
GVWR	Gross Vehicle Weight Rating
HC	Hydrocarbon
HD	Heavy-Duty
HDDE	Heavy-Duty Diesel Engine
HDE	Heavy-Duty Engine
HDIUC	Heavy-Duty In-Use Compliance
HDIUT	Heavy-Duty In-Use Testing
HDV	Heavy-Duty Vehicle
HD-ZE	Heavy-Duty Zero-Emission
HD-ZEV	Heavy-Duty Zero-Emission Vehicle
HHE	Heavy-Haul Engine
hp	Horsepower
HSC	Health and Safety Code
H_2	Hydrogen
H_2O	Water

Acronym/Abbreviation	Definition
I/M	Inspection and Maintenance
IPT	Incidence-Per-Ton
IRP	International Registration Plan
ISOR or Staff Report	Initial Statement of Reasons
IUC	In-Use Compliance
IUMPR	In-Use Monitor Performance Ratio
lb	Pound or Pounds
LC	Lake County
LCFS	Low Carbon Fuel Standard
LD	Light-Duty
LEV	Low-Emission Vehicle
LLC	Low Load Cycle
LPG	Liquefied Petroleum Gas
LT	Lake Tahoe
MAC	Manufacturers Advisory Correspondence
MAW	Moving Average Window
MC	Mountain Counties
MD	Medium-Duty
MDE	Medium-Duty Engine
MDPV	Medium-Duty Passenger Vehicle
MDV	Medium-Duty Vehicle
MECA	Manufacturers of Emission Controls Association
mg	Milligrams
mg/hp·hr or mg/hp-hr	Milligrams Per Brake Horsepower Hour
mg/mi	Milligrams Per Mile
MIL	Malfunction Indicator Light
MJD	Mojave Desert
MST	Manufacturer Self-Testing

Acronym/Abbreviation	Definition
MY	Model Year
M-85	Mixture of Petroleum and Methanol (85%)
M-100	Methanol
NAAQS	National Ambient Air Quality Standards
NAICS	North American Industrial Classification System
NC	North Coast
NCC	North Central Coast
NDIR	Nondispersive Infrared
NDUV	Nondispersive Ultraviolet
NH_3	Ammonia
NMC	Nonmethane Cutter
NMHC	Nonmethane Hydrocarbon
NMHCE	Nonmethane Hydrocarbon Equivalent
NMNEHC	Nonmethane Nonethane Hydrocarbon
NMOG	Non-Methane Organic Gases
NOx	Oxides of Nitrogen
NP	Northeast Plateau
NTE	Not to Exceed
NV-RAM	Non-Volatile Random-Access Memory
NZEV	Near Zero-Emission Vehicle
N_2O	Nitrous Oxide
OBD	On-Board Diagnostic
OEM	Original Equipment Manufacturer
Omnibus	Heavy-Duty Engine and Vehicle Omnibus
OTA	Over-The-Air
O_2	Oxygen
PDP	Positive-Displacement Pump
PEMS	Portable Emissions Measurement System

Acronym/Abbreviation	Definition
PEVE	Production Engine/Vehicle Evaluation
PFD	Partial-Flow Dilution
PM	Particulate Matter
Pmax	Highest Value of Rated Power
$PM_{2.5}$	Fine Particulate Matter
POC	Proof of Correction
ppb	Parts Per Billion
PSIP	Periodic Smoke Inspection Program
PTO	Power Take-Off
PVE	Production Vehicle Evaluation
RAM	Random Access Memory
REAL	Real Emissions Assessment Logging
RMC	Ramped Modal Cycle
RNG	Renewable Natural Gas
SAE	SAE International
SC	South Coast
SCC	South Central Coast
SCR	Selective Catalytic Reduction
SD	San Diego County
SEA	Selective Enforcement Audit
SET	Supplemental Emission Test
SFB	San Francisco Bay
SI	Spark-Ignition
SJV	San Joaquin Valley
SMAD	Supplemental Monitor Activity Data
SOS	Sum-over-Sum
SS	Salton Sea
SSV	Subsonic Venturi

Acronym/Abbreviation	Definition
SULEV	Super Ultra-Low-Emission Vehicle
SV	Sacramento Valley
SVOC	Semi-Volatile Organic Compound
THC	Total Hydrocarbon
THCE	Total Hydrocarbon Equivalent
tpd	Tons Per Day
UL	Useful Life
ULEV	Ultra-Low-Emission Vehicle
U.S.	United States
U.S. EPA	United States Environmental Protection Agency
VIN	Vehicle Identification Number
VSL	Value of Statistical Life
VVT	Variable Valve Timing
WTP	Willingness-to-pay
ZEV	Zero-Emission Vehicle
ZrO_2	Zirconium Dioxide

Executive Summary

The proposal for the On-Road Heavy-Duty Engine and Vehicle Omnibus regulation (called "Omnibus" because it contains many elements) was presented at the August 2020 Board Hearing of the California Air Resources Board (CARB or Board). Given that the trucking sector was the largest contributor to smog forming oxides of nitrogen (NOx) emissions in California, the proposal included a comprehensive set of requirements to reduce emissions from heavy-duty (HD) trucks. These requirements included many elements such as more stringent NOx and particulate matter (PM) emission standards, enhanced in-use testing procedures, a new certification test cycle representative of stop and go operations in heavy traffic conditions, longer useful life (UL) periods that better represent real life trucking operations, and longer warranty periods that would ensure more reliable trucks operating on California roadways. The Omnibus regulation established a significant set of requirements designed to ensure that NOx emissions from heavy-duty engines (HDE) are significantly reduced from the time the vehicle/engine is first sold until the end of its UL.

The Omnibus regulation was designed to implement stringency in three separate steps. The first set of emission standards and requirements were designed to go into effect in model year (MY) 2024. The second set of requirements would become effective in 2027 MY, and the final step of the regulation would be implemented in 2031 MY. With each step of the program, the stringency of the emission standards and other requirements would increase.

On December 20, 2022, the United States Environmental Protection Agency (U.S. EPA) published its first phase of the Clean Trucks Plan, U.S. EPA Clean Trucks Plan Final Rule for Control of Air Pollution from New Motor Vehicles: Heavy-Duty Engine and Vehicle Standards (EPA-NOx rule). This regulation was subsequently published in the January 24, 2023 edition of the Federal Register (FR). The EPA-NOx rule mirrored the Omnibus regulation in many ways as it set more stringent emission standards and requirements for HD trucks at the national level for 2027 and subsequent MYs. The program included many of the elements that were included in the Omnibus regulation.

After the adoption of the EPA-NOx rule, many HDE manufacturers expressed concerns about the differences between the requirements in the Omnibus regulation and the EPA-NOx rule. There was a universal desire and interest in developing a single national program for limiting criteria pollutant emissions from HD trucks. With a single national program, HDE manufacturers would be able to design and offer a single engine platform which could be offered to customers nationwide.

Discussions between CARB, HDE manufacturers, and the Truck and Engine Manufacturers Association (EMA) in early 2023 led to the signing of the Clean Truck Partnership (CTP) in July of 2023 (CARB, 2023a). Under CTP, CARB agreed to propose amendments to the Omnibus regulation to address several industry concerns while largely aligning with the various elements of the EPA-NOx rule. In return, EMA, its member companies, and the Ford Motor Company agreed to comply with the requirements of the Omnibus regulation and the Advanced Clean Trucks (ACT) (CARB, 2025a) regulation in California regardless of the

outcome of any future lawsuits against these two regulations. The CTP agreement is intended to secure important emission benefits for California.

Based on the CTP agreement, staff proposed the first set of amendments (legacy amendments) to the Omnibus regulation at the October 2023 Executive Officer Hearing (CARB, 2023b). The legacy amendments adjusted the number of legacy engines[1] that an engine manufacturer would be able to sell in California in the 2024 through 2026 MY period. These legacy engine sales caps were negotiated among the engine manufacturers and CARB.

This Initial Statement of Reasons (ISOR or Staff Report) presents CARB staff's Proposed Amendments to the Omnibus regulation to implement the CTP commitment to largely align with the EPA-NOx rule for 2027 and subsequent MYs ("Proposed Amendments").[2] The proposal includes changes to many elements of the Omnibus regulation, including the emission standards, in-use test procedures, UL and warranty periods, and other regulatory changes, including amendments to the On-Board Diagnostic (OBD) regulations and the Emission Warranty Information Reporting (EWIR) program.

The Proposed Amendments result in a regulation that significantly reduces tailpipe NOx emissions from HD trucks in comparison to today's federal emission standards, albeit slightly less than the current Omnibus regulation. The Proposed Amendments are estimated to achieve approximately 2% less NOx emissions benefits cumulatively over the analysis period from 2027 to 2036 relative to the current Omnibus regulation, and will have a net cost of $14.5 million to implement during the same time period. Although the Proposed Amendments achieve slightly lower emissions benefits compared to the current Omnibus regulation, they do fulfill CARB's commitments within the CTP, which is ultimately intended to secure important emissions benefits in California.

Included as part of this rulemaking for administrative efficiency (but analyzed in an attachment to this ISOR), CARB is proposing amendments to the Low Carbon Fuel Standard (LCFS) regulation to allow book-and-claim accounting of renewable natural gas (RNG) to produce electricity for electric vehicle charging, if the electricity is generated using a linear generator. This proposal may increase the near-term availability of low-carbon intensity electricity for electric truck refueling in high demand freight corridors where trucks are operating and helps advance California's zero emission vehicle and carbon neutrality goals. For information supporting the proposed LCFS amendments, see Appendix F: Supplement to the Initial Statement of Reasons – Proposed Low Carbon Fuel Standard Amendments.

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[1] Legacy engine is an engine that is certified under Title 13, California Code of Regulations, Section 1956.8(a)(2)(C)3.

[2] While two other separate regulatory components are also included in this rulemaking package for administrative efficiency (as discussed below), the "Proposed Amendments" discussed in this ISOR refer specifically to the Proposed Amendments to the Omnibus regulation to implement the CTP commitment to largely align with the EPA-NOx rule for 2027 and subsequent MYs.

Also included as part of the rulemaking for administrative efficiency (but analyzed in an attachment to this ISOR), CARB is proposing to make permanent the Emergency Vehicle Emissions Regulations. These amendments confirm that, until a court resolves the uncertainty created by the federal government's actions purporting to disapprove three actions waiving preemption of multiple CARB vehicle emission control programs, CARB may implement its earlier-adopted programs that were displaced by the congressional actions and preserve its authority to enforce its programs if it prevails in its challenges to those federal actions. The amendments to the Advanced Clean Cars (ACC) would, primarily, extend the Low Emission Vehicle (LEV) III regulations beyond the 2025 model year as a protective measure to ensure that health protective standards are maintained while manufacturers have options for certifying their vehicles and engines during ongoing litigation. The medium- and heavy-duty amendments would similarly restore pre-Omnibus provisions and extend their applicability beyond the 2023 model year. These proposals ensure that health protective measures are maintained while resolving uncertainty for manufacturers regarding their options for certifying their vehicles and engines.

For information supporting the proposal to make permanent CARB's Emergency Vehicle Emissions Regulations, see Appendix G: Supplement to the Initial Statement of Reasons – Proposed Emergency Vehicle Emissions Regulations. CARB is proposing the Omnibus amendments, the proposed LCFS amendments, and the proposal to make permanent CARB's Emergency Vehicle Emissions Regulations together as one rulemaking package for administrative efficiency. However, these three regulations are separate programs. They are proposed in this package as three separate regulatory items which will be considered in three separate regulatory approval actions.

While they are packaged together here for administrative efficiency, CARB has independent reasons for developing each of these three regulatory proposals. For example, the LCFS-related amendments are being proposed to allow book and claim accounting of renewable natural gas (RNG) to produce electricity for electric vehicle charging, if the electricity is generated using a linear generator. By contrast, as described below in this ISOR, the Omnibus Amendments are being proposed primarily to largely align California's heavy-duty engine emission standards with the federal emission standards and test procedures for 2027 and subsequent MY heavy-duty engines. The Emergency Vehicles Emissions Regulation, by contrast, is for a different purpose: to ensure that new vehicles and engines can continue to be sold in California, despite the ongoing uncertainty created by the federal government's actions, which are certified to California's requirements for controlling harmful emissions to protect public health and the environment.

Each of these three proposals addresses a different program and policy need. Furthermore, none of the three distinct regulatory proposals is dependent on the other. Rather, they are packaged together here simply in the interest of administrative efficiency. CARB would move forward with the Omnibus amendments, the LCFS amendments, or the proposal to make permanent CARB's Emergency Vehicle Emissions Regulations independent of each other.

Therefore, the Omnibus amendments, the proposed LCFS amendments, and the proposal to make permanent CARB's Emergency Vehicle Emissions Regulations are three separate projects under the California Environmental Quality Act (CEQA). As such, CARB appropriately analyzed the Omnibus amendments, the proposed LCFS amendments, and the proposal to

make permanent CARB's Emergency Vehicle Emissions Regulations as separate projects under CEQA. Importantly, even if the three projects proposed as part of this APA rulemaking package were analyzed together under CEQA, there is no evidence to suggest there would be any potentially significant impacts.

I. Introduction and Background

A. Introduction

This Staff Report presents CARB staff's Proposed Amendments to the Heavy-Duty Engine and Vehicle Omnibus Regulation (Omnibus regulation). The proposed amendments to the Omnibus regulation would largely align with the EPA-NOx rule applicable to 2027 and subsequent MY HDEs and heavy-duty vehicles (HDV). CARB staff is additionally proposing other emission-related requirements for HDEs and HDVs, hereinafter comprehensively referred to as the "Proposed Amendments." The Proposed Amendments encompass the following elements:

- Amendments to the exhaust emission standards and test procedures for 2027 and subsequent MY HDEs;
- Amendments to the HD OBD system requirements;
- Amendments to the HD in-use testing (HDIUT) program;
- Amendments to the emissions warranty period and UL requirements;
- Amendments to the EWIR requirements and corrective action procedures;
- Amendments to the emissions averaging, banking, and trading (ABT) program;
- Amendments to the durability demonstration requirements and in-use emissions data reporting requirements; and
- Amendments to the transit agency diesel-fueled bus and engine exemption request process.

This Staff Report is divided into 14 chapters and six appendices that describe the Proposed Amendments and its associated costs and impacts:

- Chapter I presents an overview of the Proposed Amendments and relevant background information such as existing regulations and amendments;
- Chapter II describes the specific problems the Proposed Amendments would address;
- Chapter III presents an overview of staff's proposed solutions to the specific problems;
- Chapter IV provides a listing of the specific purpose and rationale for each proposed amendment;
- Chapter V presents the benefits anticipated from the Proposed Amendments, i.e., benefits to the environment, public health, and businesses;
- Chapter VI discusses the expected air quality impacts associated with the Proposed Amendments in detail;
- Chapter VII presents an environmental analysis of the Proposed Amendments;
- Chapter VIII describes the environmental justice (EJ) aspects;
- Chapter IX includes the economic impact analysis/assessment, including a cost-effectiveness determination, and the fiscal impacts of the Proposed Amendments
- Chapter X contains an evaluation of the regulatory alternatives;
- Chapter XI presents the justification for the adoption of regulations that differ from federal regulations
- Chapter XII includes a description of the public process used for developing the Proposed Amendments;

- Chapter XIII indicates the references for sources of information used to develop the Proposed Amendments, which are incorporated by reference herein; and
- Chapter XIV lists the appendices for this Staff Report, which are incorporated by reference herein.
    - Appendix A includes the proposed changes to Title 13 and Title 17, California Code of Regulations;
    - Appendix B includes the proposed changes to the applicable test procedures;
    - Appendix C provides further details on the purpose and rationale of the proposed changes to the Omnibus regulations and test procedures;
    - Appendix D includes details on the costs and economic analysis;
    - Appendix E includes details on the emissions inventory analysis methods and results;
    - Appendix F includes the proposed changes to the LCFS regulation and associated details; and
    - Appendix G includes the proposal to make permanent the Emergency Vehicles Emissions Regulations.

B. Background

On-road HDVs exceeding 14,000 pounds (lb) gross vehicle weight rating (GVWR) are one of the largest contributors of NOx emissions in California. In order to achieve California's air quality goals, additional NOx reductions from these vehicles are needed.

On December 22, 2021, the Office of Administrative Law (OAL) approved the Omnibus regulation, which established more stringent emission standards and requirements for new 2024 and subsequent MY HDEs. The NOx and PM emission standards and associated requirements in the Omnibus regulation were designed to be implemented in three steps. The first set of emission standards would apply to 2024 through 2026 MY HDEs (Table I-1). In the second step, more stringent emission standards and requirements would apply to 2027 through 2030 MYs (Tables I-2 and I-3). The final step would go into effect starting with the 2031 MY (Table I-3).

In addition to reducing the NOx emission standards, the PM emission standard was also reduced by 50%, from 0.01 grams per brake horsepower hour (g/hp·hr) to 0.005 g/hp·hr starting with the 2024 MY. No changes were made to the hydrocarbon (HC) and the carbon monoxide (CO) emission standards. For certification of heavy-duty diesel engines (HDDE), manufacturers have to demonstrate compliance with the standards over the duty cycles such as the HD Transient Federal Test Procedure (FTP), the Supplemental Emission Test (SET), the Low Load Cycle (LLC), and the Clean Idle test. Whereas for HD Otto-cycle engines, manufacturers have to demonstrate compliance with the standards on only the FTP cycle. The LLC, a new test cycle, was introduced to demonstrate that the engine and aftertreatment system are effectively controlling emissions during sustained low load and transient operations that are representative of stop and go operations in heavy-traffic areas.

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

MY	Diesel Cycle FTP (g/hp·hr)	Diesel Cycle SET (g/hp·hr)	Diesel Cycle LLC (g/hp·hr)	Diesel Cycle Idling (g/hr)	Otto-Cycle FTP (g/hp·hr)
2024 - 2026	0.050	0.050	0.200	10	0.050

As shown in Tables I-2 and I-3, the second step of the Omnibus requirements applies to 2027 through 2030 MYs. Table I-3 shows the final step of Omnibus requirements, which apply to 2031 and subsequent MYs.

Table I-2: 2027 and Subsequent MY NOx Emission Standards for Light HDE, Medium HDE, and HD Otto-Cycle Engines

MY	Diesel Cycle FTP (g/hp·hr)	Diesel Cycle SET (g/hp·hr)	Diesel Cycle LLC (g/hp·hr)	Diesel Cycle Idling (g/hr)	Otto-Cycle FTP (g/hp·hr)
2027 and Subsequent	0.020	0.020	0.050	5	0.020

As shown in Table I-3, the NOx emission standards for heavy HDEs are tiered based on an intermediate UL of 435,000 miles and full UL of 600,000 miles for MYs 2027 through 2030, and 800,000 miles for 2031 and subsequent MYs.

Table I-3: 2027 and Subsequent MY NOx Emission Standards for Heavy HDEs

Duty-Cycle	2027 – 2030 Intermediate UL Standard	2027 – 2030 Full Useful UL Standard	2031 & Later Intermediate UL Standard	2031 & Later Full UL Standard
FTP/SET (g/hp·hr)	0.020	0.035	0.020	0.040
LLC (g/hp·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 several flexibilities to manufacturers. First, the Omnibus regulation contains an optional legacy engine provision for the 2024 through 2026 MY period that provides short-term flexibilities for manufacturers to certify HDDEs rated below 525 brake horsepower (hp) to the 2023 MY exhaust emission standards and requirements under title 13, California Code of Regulations, Section 1956.8 (title 13, CCR, section 1956.8), provided that manufacturers offset the resulting emissions deficits. In addition, the Omnibus' LLC emission standard and 3-bin

moving average window (3B-MAW) methodology for in-use testing would not apply to legacy engine families. Manufacturers of legacy engines must participate in the California-only averaging, banking, and trading (ABT) program and offset all NOx and PM emissions deficits created by legacy engine sales using emission credits from the HD zero-emission averaging set, combustion engine credits from the same averaging set, or by performing projects in California disadvantaged communities.[3]

The second flexibility provided to engine manufacturers in the Omnibus regulation pertains to HDDEs rated at or above 525 hp maximum power (heavy-haul engines or HHE)[4] for the 2024 through 2026 MY period. This optional provision allows HHEs to be certified to the applicable federal certification requirements, except that the HHE must also comply with the California 30 grams per hour (g/hr) NOx idling standard and the applicable California Step 1 emission warranty (CARB, 2018) requirements. In addition, the maximum number of HHEs that a manufacturer may sell in California in each applicable MY under this provision is 1.10 times the manufacturer's 2018 or 2019 MY California sales volume of HHEs, whichever is greater. Also, to qualify for this HHE provision, a manufacturer must have certified and sold HHEs in California in either the 2018 or 2019 MY.

The Omnibus regulation also provides the option to manufacturers of HD hybrid powertrains to certify hybrid powertrains to criteria pollutant emission standards using powertrain-based certification in California as opposed to engine-based certification. Under these test procedures, the conventional combustion engine and the hybrid components are certified together as a complete system. Hybrid powertrain manufacturers electing to use these hybrid powertrains must also comply with all other certification requirements applicable to HDEs such as warranty and UL requirements.

In addition, the Omnibus regulation provides the transit agencies subject to the Innovative Clean Transit regulation an opportunity to request exemptions to purchase, rent, lease, or operate exempt diesel buses with engines certified to the federal emission standards for 2022 and subsequent model diesel-fueled medium HDEs or heavy HDEs.

1. Clean Truck Partnership

Subsequent to the adoption of the Omnibus regulation, a series of events with wide implications on the implementation of the Omnibus regulation necessitated a recalibration of the regulatory approach in California. Those issues, summarized below, led to the initiation of a process for CARB and the affected industry to come together and negotiate an agreement that would address product availability and create a smooth transition process for implementing the Omnibus requirements.

1. The Omnibus regulation was adopted by the Board on September 9, 2021, and approved by OAL on December 22, 2021. On January 31, 2022, CARB submitted a request to the U.S. EPA to grant California a waiver of preemption under the Clean Air Act (CAA) for the Omnibus regulation as adopted on September 9, 2021 (CARB, 2022a).

[3] Title 13, California Code of Regulations, Section 1956.8(a)(2)(C)3.b.
[4] Title 13, California Code of Regulations, Section 1956.8(a)(2)(C)2.

2. On June 13, 2022, U.S. EPA started the process of considering CARB's request for a waiver of preemption by publishing in the FR a notice of public hearing and opportunity to submit written comments on CARB's request for a waiver of preemption (U.S. EPA, 2022a).

3. Accordingly, a hearing for CARB's waiver request was held on June 29, 2022 (U.S. EPA, 2022a). At the hearing and in a letter submitted to U.S. EPA on August 1, 2022, EMA objected to granting California a preemption waiver for the Omnibus regulation claiming that California failed to provide enough lead time as required by the CAA (EMA, 2022a; EMA, 2022b).

4. On December 20, 2022, U.S. EPA released the final version of the EPA-NOx rule (U.S. EPA, 2022b), and published it in the January 24, 2023, edition of the FR (U.S. EPA, 2023a). The EPA-NOx rule established more stringent standards for new 2027 and subsequent MY HDEs at the federal level. Although similar to the Omnibus regulation, the EPA-NOx rule was different in some ways. Given the differences between EPA-NOx rule and the Omnibus regulation, engine and vehicle manufacturers along with EMA expressed a strong desire for a single national program for the HD sector.

5. In early February 2023, CARB staff became aware that while the technology for Omnibus compliant diesel engines was available, manufacturers did not intend to produce such engines for some truck categories in California. Given the potential impacts to fleets and dealers, additional flexibility was desired to enable a smoother transition to the Omnibus standards.

6. In March 2023, Cummins and EMA submitted comments to U.S. EPA indicating their objections to CARB's request for a waiver for the Original Omnibus Regulation (Cummins, 2023; EMA, 2023).

7. In consideration of the above factors and requests by stakeholders and, in order to ensure that California will experience the maximum emissions benefits from its programs, on July 5, 2023, CARB reached an agreement with the EMA, the members of EMA that manufacture HD on road vehicles and engines, and the Ford Motor Company. That agreement has been referred to as the CTP (CARB, 2023a).

The CTP agreement specified, in pertinent part, that CARB staff commits to propose amendments to the Omnibus regulation legacy engine provisions to provide greater flexibility in meeting the Omnibus requirements for the 2024 to 2026 MY period. The CTP agreement also specified, in pertinent part, that CARB staff commits to propose amendments to the Omnibus regulation that will generally align the emission standards, test procedures, and accompanying enforcement provisions for 2027 and subsequent MY engines and vehicles with the corresponding provisions in the EPA-NOx rule. Furthermore, CARB agreed to work collaboratively with manufacturers to provide more lead time to meet CARB's existing regulatory requirements before imposing new regulations and to support the development of necessary zero-emission infrastructure. In exchange, the CTP signatories committed to meet the requirements under the Omnibus and ACT regulations regardless of the outcome of any litigation challenging the waivers/authorizations for those regulations or CARB's overall authority to implement those regulations.

Pursuant to the CTP agreement, on August 1, 2023, CARB staff posted the proposed legacy amendments to provide additional compliance flexibility to engine manufacturers while ensuring no net reductions to the emissions benefits of the program (CARB, 2023b). On October 20, 2023, an Executive Officer Hearing[5] was held to consider the adoption of the proposed legacy amendments (CARB, 2023c). On December 28, 2023, CARB's Executive Officer adopted the legacy amendments, and on May 31, 2024, OAL approved the rulemaking and filed it with the Secretary of State with an effective date of May 31, 2024 (CARB, 2023c).

The legacy amendments allow engine manufacturers to choose between two options to produce legacy engine families. Option 1 keeps the original legacy engine provisions for 2024 and 2025 MYs, but it extends the production period for legacy engines to the 2026 MY. Option 2 is added for manufacturers that make medium HDEs in addition to products in other HD diesel primary intended service classes. For example, this applies to a certifying engine manufacturer that produces both medium HDEs and heavy HDEs in the 2024 and 2025 MYs.

Table I-4: Percentage of Legacy Engines Allowed in the Legacy Engine Provisions

MY	2024	2025	2026
Original Omnibus	45%	25%	0%
Legacy Amendments – Option 1	45%	25%	10%
Legacy Amendments – Option 2	Medium HDEs - 60% Other Engine Classes - 15%	Medium HDEs - 60% Other Engine Classes - 8%	0% 0%

Pursuant to the second commitment in the CTP agreement, on March 20, 2024, CARB staff held a public workshop to discuss Proposed Amendments to the Omnibus regulation to largely align with the EPA-NOx rule with some modifications for new 2027 and subsequent MY HDEs (CARB, 2024).

2. Waiver of CAA Preemption for the Omnibus Regulation

On July 8, 2024, CARB requested U.S. EPA to grant California a waiver and authorization for its Omnibus regulation, as it was initially adopted in 2021 and later amended in 2023. After considering all submitted comments, on January 6, 2025, U.S. EPA granted California the CAA waiver for the Omnibus regulation allowing California to enforce its own stricter HDE emission standards (U.S. EPA, 2025a).

3. On-Board Diagnostics Requirements

OBD systems are self-diagnostic systems incorporated into a vehicle's on-board computer. They are comprised mainly of software designed to detect emission-control system

[5] On March 23, 2023, the Board by its *Resolution 23-15* (CARB, 2023d), delegated to the Executive Officer the authority to adopt, amend, and revoke emission standards and test procedures, compliance test procedures, and compliance flexibilities for new on-road motor vehicles with the delegation of power terminating on December 31, 2023.

malfunctions as they occur. This is done by monitoring virtually every component and system that can cause increases in emissions, thus maintaining low emissions throughout the vehicle's life as malfunctions are identified and repaired. For major emission control components like PM filters and catalysts, the OBD system is required to detect malfunctions of such components before emissions exceed required "emission thresholds," which are typically either a multiple of the exhaust emission standard (e.g., 2.0 times the applicable standard) or an additive value above the standard (e.g., 0.20 g/hp·hr above the applicable standard). For other components and systems like temperature sensors, the OBD system is required to detect malfunctions if the component or system is no longer properly functioning. The OBD system continuously works in the background during vehicle operation to monitor emission-related components and alerts the vehicle operator of detected malfunctions by illuminating the malfunction indicator light (MIL) on the vehicle's instrument panel. Additionally, the OBD system stores important information, including identification of the faulty component or system and the nature of the fault, which allows for quicker diagnosis and proper repair of the problem by technicians. This helps vehicle owners experience less expensive repairs and promotes repairs being done correctly the first time. Due to these attributes, OBD systems have become the basis for emission inspection programs in California and throughout the nation.

The OBD system also stores data that provides valuable information to assist CARB in other emission-related programs. They include data for how often certain auxiliary emission control devices are active and data (i.e., real emissions assessment logging (REAL) data) that characterize how much NOx and CO_2 emissions are emitted during various engine operating conditions.

The OBD II regulations in title 13, CCR, sections 1968.2 and 1968.5 require all 1996 and newer MY passenger cars, light-duty (LD) trucks, and medium-duty vehicles (MDV) and medium-duty engines (MDE) to be equipped with OBD II systems, while the HD OBD regulations (title 13, CCR, sections 1971.1 and 1971.5) require 2010 and newer MY HDEs to be equipped with HD OBD systems.

The Omnibus regulation reduced the NOx emission standards to a tenth of the previous 0.20 g/hp·hr standard and the PM emission standards to one half of the previous standards for MDEs and HDEs. Given that the OBD emission thresholds are based on a multiple of or an additive value above the emission standard, manufacturers expressed concerns regarding not knowing with certainty at what emission levels their OBD systems will be able to detect malfunctions. Therefore, CARB staff concurrently adopted amendments to the OBD II and HD OBD regulations to provide an interim level of relief to MDE and HDE manufacturers by maintaining OBD emission thresholds for NOx and PM effectively at the same levels as required for the previous standards. CARB staff expects to track manufacturers' progress at these lower emission standards and pursue adoption of more revised malfunction emission thresholds where appropriate at a future OBD regulatory update.

For the legacy amendments to the Omnibus regulation, amendments were adopted in title 13, CCR, section 1956.8(a)(2)(C)3 to extend the "legacy engine" provisions by one additional MY

to the 2026 MY. Therefore, CARB staff also adopted amendments to the HD OBD regulations to extend the use of OBD provisions applicable to legacy engines by an additional year. Specifically, the amendments allow 2026 MY legacy engines, in addition to the already allowed 2024 and 2025 MY legacy engines, to comply with the OBD requirements of a 2023 MY engine in lieu of the applicable MY OBD requirements. CARB staff also adopted amendments to align with the provisions of title 13, CCR, section 1956.8(a)(2)(C)2, which allow engines certified to this subsection to comply with either the federal requirements (e.g., the federal OBD requirements) or the California requirements (e.g., the California OBD requirements in title 13, CCR, section 1971.1).

4. EWIR Requirements and Corrective Action Procedures

The Omnibus regulation included EWIR Requirements and Corrective Action amendments that would require HD manufacturers to file emission related reports and potentially take corrective actions based on the trigger level according to title 13, CCR, Section 2143. As shown in the following Table I-5, these requirements would initially affect new 2024 through 2026 MYs in the first phase. The second phase would affect new 2027 through 2030 MY HDVs, and new 2031 and subsequent MY HDVs would be affected in the final phase.

Table I-5: Original Omnibus title 13, CCR, section 2143 trigger levels affecting new HD Diesel and HD Otto-Cycle engines

MY	Failure Levels Triggering Recall and Corrective Action
2024 - 2026	• 4% or 25 (whichever greater)
2027 - 2030	• 4% or 25 (whichever greater) for first 5 years of the warranty period • 5% or 35 (whichever greater) for years 6 through 7 of the warranty period
2031+	• 4% or 25(whichever greater) for first 5 years of the warranty period • 5% or 35 (whichever greater) for years 6 through 7 of the warranty period • 7% or 50 (whichever greater) for years 8 through 10 of the warranty period

CARB has historically adopted requirements for conducting EWIR Requirements and Corrective Action for HDVs and HDEs. The purpose of these requirements is to ensure effective recalls with high capture rates. Critical requirements include proper notification of owners, the use of recall repair labels to indicate that a vehicle had a recall repair performed, and manufacturers using the California Department of Motor Vehicles (DMV) registration tie-in program to prevent owners from renewing registration until all open recall repairs have been performed.

Manufacturers must notify vehicle owners of emission-related recalls through customer notification letters. These letters are meant to inform vehicle owners of nonconformities affecting their vehicle and provide information regarding the recall process. As part of the notification, manufacturers must provide owners with a card that has paid postage that vehicle

owners can use to provide new owner contact information to the manufacturer if the vehicle has been sold.

To ensure high capture rates for recalls, CARB requires manufacturers to utilize the California DMV registration tie-in program, which requires vehicle owners to have open recall repairs performed on their vehicles prior to renewing vehicle registration. Upon completion of a recall repair, vehicle owners are provided with a proof of correction (POC) certificate, which they can submit to the DMV in order to have open recall registration holds removed.

Additionally, recall repair labels must be affixed to vehicles to indicate that a vehicle has had a recall repair performed. This provides a simple way for owners, technicians, inspectors, etc. to determine whether recall repairs have been carried out on a vehicle.

Chapter II below discusses the need to revise certain EWIR requirements and corrective action requirements. Chapter III describes the proposed EWIR requirements and corrective action amendments.

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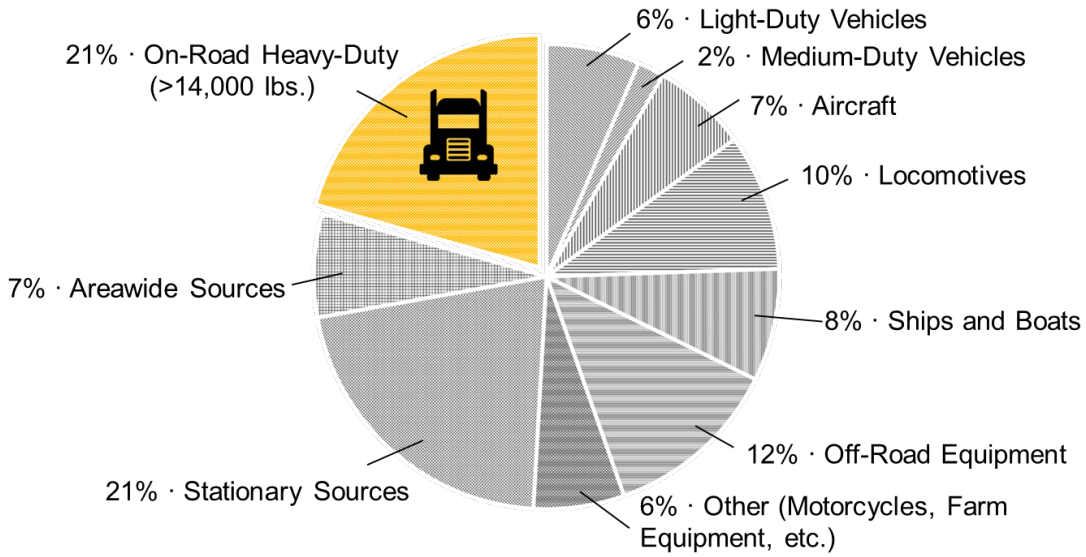
II. The Problem that the Proposal is Intended to Address

A. Need for the Proposed Amendments

On-road HDVs are one of the largest sources of NOx emissions in California, contributing 21% of the entire statewide NOx emissions inventory (CARB, 2025b), as shown in Figure II-1. As a result, California needs significant emission reductions from on-road HDVs in order to meet the National Ambient Air Quality Standards (NAAQS) for ozone and fine particulate matter ($PM_{2.5}$) and protect public health.

Figure II-1. Distribution of NOx Emissions from Various Sources in California - 2024[6]



In March 2017, the Board adopted the 2016 State Strategy for the State Implementation Plan (2016 State SIP Strategy) (CARB, 2017), which described the measures needed to achieve the reductions necessary from mobile sources, fuels, and consumer products to meet federal ozone and $PM_{2.5}$ standards over a 15-year period. The Low-NOx Engine Standard and parts of the Lower In-Use Emission Performance Level are two measures (known as the Omnibus regulation today) in the 2016 State SIP Strategy designed to introduce lower emission engine technologies that will substantially reduce NOx emissions from new on-road HDVs and ensure that those HDVs continue to operate at their cleanest possible levels throughout their UL.

Accordingly, the Omnibus regulation, as adopted on December 22, 2021 (CARB, 2020a; CARB, 2020b) and amended on December 28, 2023 (CARB, 2023b; CARB, 2023c), was developed to achieve such needed emission reductions by requiring HDEs to meet stricter emissions requirements beginning with MY 2024.

As described in Chapter I, in the CTP, CARB agreed to align nearly all parts of the Omnibus regulation with the EPA-NOx rule beginning with MY 2027. The Proposed Amendments to the existing Omnibus regulation are primarily to align most of the Omnibus regulation's requirements for new 2027 and subsequent MY HDEs with the corresponding provisions of the EPA-NOx rule, as stated in the CTP agreement (CARB, 2023a). CARB staff proposes to align with the certification emission standards and test procedures for criteria pollutants for compression-ignition (CI) and spark-ignition (SI) engines, durability demonstration provisions, merging the California-Averaging, Banking, and Trading (ABT) program with the federal-ABT program, UL values and warranty periods for mileage, years, and hours, and 2-bin moving average window (2B-MAW) methodology and off-cycle standards. In addition to the proposed

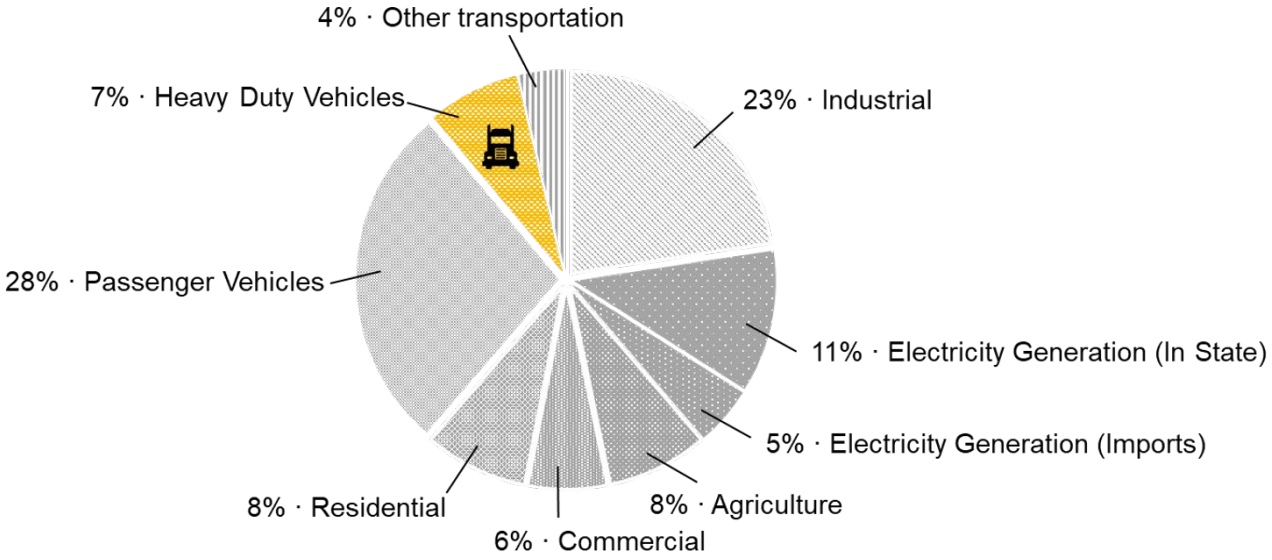
[6] Generated using CARB's California Emission Projection Analysis Model (CEPAM), *CEPAM2019v1.04 - Standard Emission Tool* (CARB, 2025b).

alignment, CARB staff proposes ending the applicability of the transit agency exemption process beginning in the 2027 MY.

In 2022 (the latest set of available numbers), on-road HDVs were estimated to contribute to 7% of all statewide CO_2 emissions inventory (California's AB 32 greenhouse gas (GHG) Emissions Inventory) as shown in Figure II-2. In 2018, CARB aligned with most of the federal Phase 2 GHG standards. This action allowed manufacturers to continue building a single fleet of vehicles and engines for the U.S. market.

In this rulemaking, CARB staff is not proposing any changes to the current engine GHG emission standards. However, CARB staff is proposing to move the engine GHG emission standards for 2027 and subsequent MYs from title 13, CCR, section 1956.8 to title 13, CCR, section 1956.8.2. This is done to consolidate the 2027 and subsequent MY criteria and GHG emission standards for MDE and HDEs in one location. This would make it easier for stakeholders to look up both criteria and GHG engine emission standards for 2027 and subsequent MYs in one location.

Figure II-2. Distribution of CO_2 Emissions from Various Sources in California - 2022[7]



B. On-Board Diagnostic Requirements

As mentioned above, most of the Proposed Amendments to the existing Omnibus regulation are primarily to align the requirements for new 2027 and subsequent MY HDEs with the corresponding provisions of the EPA-NOx rule as stated in the CTP agreement. Therefore, CARB staff is proposing amendments to the OBD requirements (title 13, CCR, sections 1968.2, 1968.5, 1971.1, and 1971.5) to align with the U.S. EPA's rule. The amendments include changes to the required emission thresholds for certain monitors to account for the proposed reduction in the non-methane hydrocarbons (NMHC) and CO emission standards for

[7] Generated using *California's AB 32 GHG Emissions Inventory by IPCC Category (CARB, 2025c).*

2027 and subsequent MY MDEs and HDEs. As CARB had provided interim relief for the OBD NOx and PM emission thresholds when the NOx and PM standards were similarly reduced in the Omnibus requirements adopted in 2021, the engine manufacturers have requested interim relief regarding the NMHC and CO emission thresholds until they have more certainty on what emission thresholds are achievable. CARB staff concurs that the requested relief is reasonable and needed, and is proposing the same emission thresholds as those required by U.S. EPA in the federal OBD regulation for 2027 and subsequent MY HDEs (Title 40, Code of Federal Regulations, § 1036.110 (40 CFR § 1036.110)).

In addition to amendments that align with the EPA-NOx rule, CARB staff is also proposing amendments at the request of manufacturers to address implementation concerns and provide immediate relief for a few OBD requirements. These issues mostly relate to diesel engine requirements that manufacturers have been having issues trying to meet and believe should be addressed now instead of during a future, stand-alone OBD rulemaking update so that they are able to certify their upcoming products.

C. Emission Warranty Information Reporting Requirements and Corrective Action Procedures

Since the adoption of the Omnibus regulation, several issues have arisen within the EWIR program that require amendments to the existing program. Given that EWIR requirements apply to the same manufacturers and engines as the Omnibus regulation, changes to the EWIR program are included within this rulemaking.

1. Incomplete emissions issue reporting guidance for longer warranty periods for 2027 through 2030 MYs.

The EWIR reporting program requires manufacturers to report emissions-related issues through warranty claims and assess their emissions impact. Manufacturers are required to take corrective actions as needed when the reporting issues exceed the trigger levels as specified in title 13, CCR, section 2143. Starting in the 2027 MY, the proposed warranty periods would increase to 10 years as part of the EPA-NOx rule harmonization. The current title 13, CCR, section 2143 does not provide directions for manufacturers to report issues in years 8 through 10. This would potentially affect the number of issues that could have been reported and analyzed, which, if not addressed, could have a detrimental impact on the environment. CARB staff is therefore proposing to amend the trigger rate level starting with the 2027 MY.

2. Postcards with paid postage may no longer be the only effective way to collect new owner information.

Manufacturers are required to provide a card with paid postage that vehicle owners can use to provide the new owner contact information if the vehicle has been sold. Obtaining new owner information is critical so that manufacturers can notify new owners of open emission-related recalls. The proliferation of internet availability and technology has provided manufacturers

with many different alternatives to collect new owner information from previous owners. CARB staff is proposing to modify existing requirements to allow manufacturers to utilize additional methods of collecting new owner information.

3. Providing proof of correction certificates for over-the-air recalls is challenging for manufacturers as vehicle owners do not visit service centers to have recall repairs performed.

The POC certificate requirement was developed to provide proof that vehicles or engines brought to a service center had the recall repair work completed. However, due to the advent of over-the-air (OTA) technology, it is now possible for manufacturers to perform OTA recalls remotely for recalls involving software updates, eliminating the need for the consumer to bring their vehicles or engines to a service center. In order to comply with the POC certificate requirements for OTA recalls, manufacturers must email or physically mail POC certificates to owners. This process creates a burden for manufacturers if the owners do not visit service centers. Therefore, it is necessary to update the POC requirements to accommodate OTA emission-related recalls.

4. Affixing recall repair labels for over-the-air recalls is challenging for manufacturers as vehicle owners do not visit service centers to have recall repairs performed. Repair labels are not as critical as they once were for software-only emission-related recalls.

The recall repair label requirements were developed to show that vehicles or engines brought to a service center had the recall repair work performed. OTA recalls usually involve software updates applied remotely, eliminating the need for the consumer to bring their vehicles or engines to a service center. However, manufacturers are still required to mail repair labels to vehicle owners, along with instructions on how to affix the label, which creates a burden for manufacturers. The proliferation of scan tool devices allows for the calibration version to be easily determined, and authorized service centers now share information regarding the calibration versions installed on vehicles or engines at their locations. Hence, it is necessary to update the recall repair label requirements in the regulations, as it is no longer necessary to require recall repair labels for recalls that only involve software updates and do not make modifications to hardware.

D. Regulatory Authority

CARB has been granted both broad and extensive authority under the California Health and Safety Code (HSC) 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” (HSC §§ 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 (HSC §§ 39600 and 39601).

HSC §§ 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 (HSC § 43013(a)) and by improving emission system durability and performance (HSC § 43018(c)(2)), resulting in an expeditious reduction of NOx emissions from diesel vehicles, "which significantly contribute to air pollution problems" (HSC § 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 (HSC §43101). CARB also has the authority to adopt test procedures and any other procedures necessary to determine whether vehicles and engines are in compliance with the emission standards established under Part 5 of the HSC (HSC § 43104). Finally, CARB has the authority 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 HSC under test procedures adopted pursuant to section 43104. (HSC § 43102).

III. Overview of Proposed Regulation

This chapter provides an overview of the Proposed Amendments to the Omnibus and HD OBD regulations and to the EWIR Requirements and Corrective Action Procedures.

A. Proposed Amendments to the Omnibus Regulation

The primary goal of the Proposed Amendments is to largely align with the federal emission standards and test procedures for 2027 and subsequent MY HDEs. Harmonization with the federal requirements would enable manufacturers to design and produce a single product line of engine families that comply with both the U.S. EPA and CARB emission standards. This single platform would then be available for sale in all 50 states, thereby reducing costs of compliance for the industry and improving the cost-effectiveness of the regulations. Harmonization would also enable technology suppliers and manufacturers to efficiently produce a single set of reliable and compliant products. The Proposed Amendments include changes to the exhaust emission standards, amendments to the ABT requirements, amendments to the emissions warranty and UL period requirements, and amendments to the in-use testing requirements.

1. Exhaust Emission Standards

CARB staff is proposing to align with U.S. EPA's exhaust emission standards for NOx, HC, PM, and CO emissions. The proposed exhaust emission standards would apply to 2027 and subsequent MY HD CI and SI engines used in vehicles with GVWR greater than 10,000 lb. For certification, manufacturers would be required to demonstrate compliance with the exhaust emission standards over the duty cycles shown in Table III-1 for HD CI engines and Table III-2 for HD SI engines.

Exhaust Emission Standards for HD CI engines:

For certification of new HD CI engines, manufacturers would have to demonstrate compliance with the exhaust emission standards over existing duty cycles shown in Table III-1. The proposed NOx emission standards are slightly less stringent than those in the original

Omnibus regulation,[8] while the proposed HC and CO standards are more stringent. The PM emission standard remains the same as the existing standard at 5 milligrams per horsepower hour (mg/hp·hr) over the three duty cycles, namely the FTP, SET, and LLC. Additionally, HD CI engines would also have to meet the Clean Idle NOx standard of 10 g/hour, which, for CARB, is a mandatory certification requirement, unlike U.S. EPA's voluntary requirement.

Table III-1: HD CI Engine Standards for Duty Cycle Testing

Duty cycle	NOx mg/hp·hr	HC mg/hp·hr	PM mg/hp·hr	CO g/hp·hr
SET and FTP	35	60	5	6.0
LLC	50	140	5	6.0

Exhaust Emission Standards for SI HDEs:

Similarly, for certification of HD SI engines, manufacturers would have to demonstrate compliance with the exhaust emission standards over the duty cycles shown in Table III-2. The proposed NOx emission standards are slightly less stringent than those in the current Omnibus regulation.[9] The PM emission standard remains the same as the original Omnibus regulation, while the proposed HC and CO standards are more stringent than those in the original Omnibus regulation.

Manufacturers of HD SI engines would also be required to demonstrate compliance with the standards over the new SET duty cycle. The rationale for this is that HD SI engines are increasingly being used in larger HDVs and are likely to be subject to higher load operations not covered by the FTP cycle. Therefore, to ensure engines are designed to control emissions at higher loads, manufacturers of HD SI engines would be required to demonstrate compliance with the new standards over the SET duty cycle.

Table III-2: HD SI Engine Standards for Duty Cycle Testing

Duty cycle	NOx mg/hp·hr	HC mg/hp·hr	PM mg/hp·hr	CO g/hp·hr
SET	35	60	5	14.4
FTP	35	60	5	6.0

Optional Low NOx Standards:

The proposed optional low NOx standards would provide manufacturers with a mechanism that would allow them to optionally certify HDEs to standards more stringent than the proposed primary NOx emission standards. To the extent manufacturers choose to certify to the proposed optional low NOx standards, this certification pathway would provide California with additional NOx emissions benefits. HD trucks that use HDEs certified to the proposed optional

[8] The 2027 and subsequent MY HDE emission standards currently in the Omnibus regulation are shown in Tables I-2 and I-3.

[9] The 2027 and subsequent MY HDE emission standards currently in the Omnibus regulation are shown in Tables I-2 and I-3

low NOx standards could be eligible for incentive funding on a case-by-case basis. However, those engine families would not be eligible to participate in the NOx ABT program.

Tables III-3 and III-4 show the proposed optional low NOx emission standards for 2027 and subsequent MYs for HD CI and HD SI engines with GVWR over 14,000 lb. For both HD CI and SI engines, Options 1 and 2 would allow manufacturers to certify products at an FTP/SET NOx emission standard of either 10 or 20 mg/hp·hr, which are below the primary NOx emission standard of 35 mg/hp·hr.

Engines certified to these optional low NOx standards would also be required to meet all other requirements associated with the proposed primary NOx standards including proposed standards for HC, CO, PM, in-use testing and OBD requirements, and the proposed Clean Idle NOx standard, as applicable.

Table III-3: Optional Low NOx Exhaust Emission Standards – HD CI Engines over 14,000 lb GVWR

Duty cycle	Option 1 NO_X mg/hp·hr	Option 2 NO_X mg/hp·hr	HC mg/hp·hr	PM mg/hp·hr	CO g/hp·hr
SET and FTP	10	20	60	5	6.0
LLC	15	30	140	5	6.0

Table III-4: Optional Low NOx Exhaust Emission Standards – HD SI Engines over 14,000 lb GVWR

Duty cycle	Option 1 NO_X mg/hp·hr	Option 2 NO_X mg/hp·hr	HC mg/hp·hr	PM mg/hp·hr	CO g/hp·hr
FTP	10	20	60	5	6.0
SET	10	20	60	5	14.4

End the applicability of Transit Agency Diesel-Fueled Bus and Engine Exemption beginning MY 2027:

The existing Omnibus regulation includes a provision that allows qualifying transit agencies to request an exemption to purchase, rent, or lease exempt diesel-fueled buses, or contract for service, or re-power buses with engines that are certified to federal emission standards for 2022 and subsequent model medium HDEs or heavy HDEs. Given that the Proposed Amendments would harmonize California and federal emission standards and requirements beginning with MY 2027, this special provision would no longer be needed since manufacturers would produce and distribute 50-state engine families that comply with both U.S. EPA and CARB emission requirements. As a result, CARB staff is proposing to end the applicability of the existing transit agency exemption provision at the end of MY 2026.

2. Feasibility of the Proposed Standards

The following paragraphs briefly discuss the technologies that manufacturers will likely utilize to comply with the Proposed Amendments. More detailed descriptions of these technologies are provided in the Staff Report for the Omnibus regulation (CARB, 2020a; CARB, 2020c) as well as in U.S. EPA's Preamble (U.S. EPA, 2023a) and other supporting documents in both CARB and U.S. EPA's regulations (U.S. EPA, 2022b).

***Overview of Existing Strategies*:**

In California, manufacturers are currently certifying HD CI engines to the 2024 through 2026 MY NOx standards of 0.050 g/hp·hr on the FTP and SET cycles, a 0.200 g/hp·hr NOx on the LLC, and a 10 g/hour NOx on the Clean Idle Test. For HD SI engines, manufacturers are required to certify to a NOx emission standard of 0.050 g/hp·hr NOx on the FTP. HDEs are also certified to a 0.005 g/hp·hr PM emission standard on all the certification duty cycles. The 2024 MY NOx and PM FTP standards are, respectively 75% and 50% below the corresponding federal emission standards for the same MY. CARB has to-date certified several 2024 MY (CARB, 2025d) and 2025 MY (CARB, 2025e) HD CI and SI engine families that meet the Omnibus standards of 0.050 g/hp·hr NOx standard.

To meet the Omnibus NOx emission standard, manufacturers are utilizing both engine and aftertreatment system control strategies for both CI and SI combustion engines. For HD CI engines, manufacturers are using urea-based selective catalytic reduction (SCR) systems in a heated-SCR or dual-SCR aftertreatment architecture. The heated-SCR aftertreatment architecture refers to the configuration where the exhaust aftertreatment components include electric heater, diesel oxidation catalyst (DOC), diesel particulate filter (DPF), SCR system, and ammonia oxidation catalyst (AMOX). The electric heater provides a mechanism for increasing the exhaust gas temperature, thereby increasing the SCR conversion efficiency, during cold engine operations. Both Paccar (CARB, 2025f) and Volvo (CARB, 2025g) have certified 2025 MY engine families that utilize the heated-SCR technology.

The dual-SCR aftertreatment architecture consists of a small light-off SCR close-coupled to the engine for low temperature performance, and a larger downstream aftertreatment system with a DOC, DPF, SCR, and AMOX. Cummins has certified 2025 MY engine families (CARB, 2025h) using the dual-SCR technology.

Furthermore, some manufacturers may also use heated diesel exhaust fluid (DEF) dosing strategies to improve NOx reduction efficiency, especially at low exhaust temperatures. The AMOX catalysts are utilized to minimize ammonia slip from the SCR system. In addition to these aftertreatment strategies, manufacturers are also using engine control strategies such as cooled exhaust gas recirculation (EGR) (with or without bypass), variable geometry turbochargers (VGT), high pressure fuel injection, and other associated electronic controls.

To comply with the 2024 MY HD SI engine standards, manufacturers are using engine controls such as EGR rate control, air-fuel ratio control, heated oxygen sensors, cooled EGR and other associated electronic controls and aftertreatment strategies such as a three-way catalyst (TWC). As mentioned above, one manufacturer has already certified HD SI engine families (EF) to a family emission limit (FEL) of 0.020 g/hp·hr, which is 60% below the CARB 2024 MY FTP NOx standard of 0.050 g/hp·hr (CARB, 2025i; CARB, 2025j). Moreover, since 2016, with

better air-fuel ratio controls and increased TWC volume, manufacturers have been certifying natural gas (NG) and liquified petroleum gas (LPG) fueled HD SI engines to the optional low NOx standard of 0.02 g/hp·hr NOx, which is 60% below the CARB 2024 MY NOx standard or 90% below the 2024 MY federal NOx standard.

Feasibility of the Proposed Emission Standards:

As discussed in detail in the supporting materials for the CARB Omnibus and the EPA-NOx rule, the proposed standards for 2027 and subsequent MY HDEs are technically feasible. As described further below, CARB and U.S. EPA demonstration programs with Southwest Research Institute (SwRI) clearly demonstrated the feasibility of NOx, HC, PM, and CO standards that are significantly lower than CARB's 2024 MY standards.

HD CI Engines:

Beginning with the 2027 MY, HD CI engines are required to comply with the more stringent NOx emission standards of 35 mg/hp·hr on the FTP and SET and 50 mg/hp·hr on the LLC. To comply with these standards, manufacturers would likely utilize advanced engine control and aftertreatment strategies. Manufacturers are likely to continue utilizing either a heated-SCR or a dual-SCR system with a heated DEF system. The heated DEF system would enable DEF injection at exhaust temperatures as low as 140 °F. Additionally, the DEF injector would also enable mixing of the DEF and the exhaust gas within a shorter distance of the DEF mixer allowing for compact packaging of the SCR compared to a system without a heated DEF system. Additional improvements in the SCR system may also be needed to improve catalyst conversion efficiency and durability over the proposed longer useful lives. Such catalyst improvements may include an increase in the SCR catalyst volume and improved catalyst substrates such as high cell density and thinner, durable, substrate walls and combined-SCR systems consisting of both iron and copper catalysts. As a compliance strategy to meet the 2027 NOx emission standards, one manufacturer has indicated a solution that utilizes an aftertreatment system with 5 kilowatt electric heaters, located at the inlet of each assembly, allowing for precise temperature control (Cummins, 2025).

Engine control strategies include software-based engine calibration strategies as well as hardware-based control strategies. These systems increase combustion efficiency and reduce engine-out emissions while improving thermal management of the aftertreatment system performance over a wide range of vehicle operations. Engine calibration strategies such as increased idle speed, increased EGR rates, intake and exhaust throttling, and phased fuel injection can be used to increase the exhaust temperature and accelerate aftertreatment warm-up and reduce engine-out NOx during cold start conditions.

Engine hardware strategies may include EGR pump, variable valve actuation (VVA) strategies including cylinder deactivation (CDA), and bypass for EGR cooler, charge air cooler, or turbocharger. The use of these strategies would be effective under certain engine operating conditions such as during cold start, extended idle, and light load operations. A detailed discussion of the individual technologies and strategies that could be implemented to further reduce NOx emissions at the tailpipe are discussed in Appendix I of the Omnibus regulation Staff Report (CARB, 2020c).

In late calendar year 2013 through 2020, CARB, in partnership with local air districts, U.S. EPA, and industry including engine and emission control system manufacturers, funded several projects with SwRI to evaluate various advanced engine and aftertreatment technologies and demonstrate the feasibility of the NOx standards in the Omnibus regulation. In these demonstration programs, referred to as CARB Stage 1 (Sharp et al., 2017), CARB Stage 2 (Sharp, 2020), and CARB Stage 3 (Sharp, 2021), SwRI evaluated the performance of various engine calibration and hardware strategies and advanced aftertreatment strategies to lower NOx emissions on certification cycles such as the FTP, SET, and the Clean Idle test and on a newly developed LLC and other in-use vocational test cycles.

Subsequently, as a follow-up to CARB Stage 3, U.S. EPA also funded a project with SwRI (herein after referred to as EPA Stage 3) to conduct emissions performance evaluation of additional aftertreatment technologies up to an extended UL of 800,000 miles. The EPA Stage 3 engine included improvements beyond the CARB Stage 3 engine, including replacing the zone coated catalyzed soot filter with a separate DOC and DPF and improving the mixing of the DEF with the exhaust gas for the downstream SCR catalyst. These improvements lowered the emissions on the SET, FTP, and LLC below what was measured with the CARB Stage 3 engine. U.S. EPA used the results from these tests to establish the feasibility of the final 2027 standards for HD CI engines. Results from testing the EPA Stage 3 engine on the FTP, SET, and LLC, aged to an equivalent of 435,000, 600,000 and 800,000 miles, are shown in Table III-5, Table III-6, and Table III-7. Table III-8 represents emissions performance at the proposed UL of 650,000 miles determined by interpolating the tests at the equivalent of 600,000 and 800,000 miles (U.S. EPA, 2023a).

Table III-5: EPA Stage 3 Engine Emissions at 435,000 Mile Equivalent Test Point Without Infrequent Regeneration Adjustment Factors (IRAF) or Crankcase Emissions

Duty cycle	NO_X (mg/hp·hr)	PM (mg/hp·hr)	NMHC (mg/hp·hr)	CO (g/hp·hr)	CO_2 (g/hp·hr)	N_2O (g/hp·hr)
SET	17	1	1	0.030	455	0.024
FTP	20	2	12	0.141	514	0.076
LLC	29	3	35	0.245	617	0.132

Table III-6: EPA Stage 3 Engine Emissions at 600,000 Mile Equivalent Test Point Without Adjustments for IRAF or Crankcase Emissions

Duty cycle	NO_X (mg/hp·hr)	PM (mg/hp·hr)	NMHC (mg/hp·hr)	CO (g/hp·hr)	CO_2 (g/hp·hr)	N_2O (g/hp·hr)
SET	24	1	1	0.015	460	0.030
FTP	27	1	9	0.144	519	0.058
LLC	33	4	16	0.153	623	0.064

Table III-7: EPA Stage 3 Engine Emissions at 800,000 Mile Equivalent Test Point Without Adjustments for IRAF or Crankcase Emissions

Duty cycle	NO_X (mg/hp·hr)	PM (mg/hp·hr)	NMHC (mg/hp·hr)	CO (g/hp·hr)	CO_2 (g/hp·hr)	N_2O (g/hp·hr)
SET	30	2	1	0.023	458	0.028
FTP	37	1	14	0.149	520	0.092
LLC	34	1	40	0.205	629	0.125

Table III-8. EPA Stage 3 Engine Emissions at 650,000 Mile Equivalent Test Point Without Adjustments for IRAF or Crankcase Emissions (Based on Interpolation of Data)

Duty cycle	NO_X (mg/hp·hr)	PM (mg/hp·hr)	NMHC (mg/hp·hr)	CO (g/hp·hr)	CO_2 (g/hp·hr)	N_2O (g/hp·hr)
SET	26	1	1	0.017	460	0.030
FTP	30	1	10	0.145	519	0.067
LLC	33	3	22	0.166	625	0.079

In establishing the final 2027 MY HD CI engine NOx standards, U.S. EPA evaluated the test results from the EPA Stage 3 engine and other available data and made adjustments as appropriate, including for changes in emissions levels during infrequent regeneration of the aftertreatment system (known as Infrequent Regeneration Adjustment Factors or IRAF (CARB, 2025k)) and crankcase emissions. In addition to NOx, U.S. EPA's final HC and CO standards for HD CI engines are feasible on all three test cycles since the demonstrated HC and CO emission results from the EPA Stage 3 engine shown in Table III-8 are below the final standards shown in Table III-2.

HD SI Engines:

The feasibility of standards for HD SI engines are based on U.S. EPA's program with SwRI, which investigated emissions performance of current HD SI engine technologies as well as advanced TWC aftertreatment technologies and strategies. The demonstration included the use of advanced catalyst technologies artificially aged to the equivalent of 250,000 miles and engine down-speeding. The test results shown in Table III-9 (Ross, 2022; U.S. EPA, 2023a), indicate that emissions on the FTP duty cycle are below the standards, showing the feasibility of the FTP standards.

Table III-9: Exhaust Emission Results from FTP Duty Cycle Testing in the U.S. EPA HD SI Technology Demonstration

	NOx (mg/hp·hr)	PM (mg/hp·hr)	HC (mg/hp·hr)	CO (g/hp·hr)
Final Standards MY 2027 and later	35	5	60	6
Test Program Base Engine with Advanced Catalyst	19	48	32	49
Test Program Down-sped Engine with Advanced Catalyst	18	45	35	25

To address HD SI operation under extended high-load conditions, U.S. EPA also finalized new SET standards on the SET duty cycle applicable to 2027 and subsequent MY HD SI engines. Compliance with the SET standards would ensure that emission controls are properly functioning in the high load and speed conditions covered by the SET.

The U.S. EPA HD SI technology demonstration program evaluated emission performance over the SET duty cycle, and the results are shown in Table III-10 (Ross, 2022; U.S. EPA, 2023a). The NOx and NMHC emissions over the SET duty cycle were significantly lower than the emissions from the FTP duty cycle. NMHC emissions were very low, and with engine down-speeding, improved levels of CO emissions were achieved while NOx and PM also remained low.

Table III-10: Exhaust Emission Results from SET Duty Cycle Testing in the U.S. EPA HD SI Technology Demonstration

	NOx (mg/hp·hr)	PM (mg/hp·hr)	HC (mg/hp·hr)	CO (g/hp·hr)
Final Standards MY 2027 and later	35	5	60	14.4
Test Program Base Engine with Advanced Catalyst	8	7	6	36.7
Test Program Down-sped Engine with Advanced Catalyst	5	3	1	7.21

3. In-Use Requirements and Test Procedures

In accordance with the CTP agreement, CARB staff proposes to harmonize with the federal in-use off cycle standards with minor changes to the in-use temperature adjustment and the NOx compliance allowance as described in the CTP for 2027 and subsequent MYs. The Proposed Amendments also include provisions to allow in-use testing of trucks with diesel fuel that contains up to 20% biodiesel content. Finally, the Proposed Amendments also include provisions for CARB staff to conduct in-use idle emissions testing using either a chassis dynamometer or portable emissions measurement systems (PEMS).

The Proposed Amendments incorporate Subpart E of 40 CFR § 1036 which describes the federal in-use testing procedures. This subpart includes an overview of the manufacturer-run field testing program, selection and screening process for vehicles and engines, engine preparation and testing procedures, pass/fail criteria for individual engines and engine families, reporting requirements, recordkeeping requirements, and warranty obligations related to in-use testing.

Under the Proposed Amendments, the California-only 3B-MAW methodology for analyzing in-use test data would end the applicability by the end of the 2026 MY. For 2027 and subsequent MYs, the in-use emissions compliance testing for HD CI engines would be based on analysis of data collected in two bins. Bin 1 would represent idle operations, and Bin 2 would represent non-idle truck operations. The proposed new in-use emission standards for the two bins are shown in Table III-11. For Bin 1, the only off-cycle emission standard applies to NOx. For Bin 2, in-use off-cycle emission standards apply to NOx, PM, HC and CO

emissions. The mathematical process for evaluating compliance with the Bin 1 and Bin 2 off-cycle emission standards is known as the 2B-MAW methodology.

Table III-11: In-Use Off-Cycle Emission Standards

Off-Cycle Bin	NOx	HC (mg/hp·hr)	PM (mg/hp·hr)	CO (g/hp·hr)
Bin 1	10.0 g/hr	-	-	-
Bin 2	58 mg/hp·hr	120	7.5	9

To determine the feasibility of Bin 1 and Bin 2 off-cycle standards, U.S. EPA evaluated the performance of the EPA Stage 3 engine on five different cycles that covered a wide range of vehicle operations. Testing was conducted with the aftertreatment system aged to 435,000 miles and 800,000 miles. U.S. EPA evaluation found that the NOx emissions from the EPA Stage 3 engine at the two test points were well below the finalized Bin 1 and Bin 2 off-cycle standards with margin, concluding that the off-cycle standards are technically feasible (U.S. EPA, 2023a).

The Proposed Amendments include an ambient temperature based in-use NOx adjustment as described in the CTP agreement. For 2027 to 2030 MYs, the ambient temperature adjustment is added to the off-cycle NOx standard when the mean ambient temperature over a shift-day is less than 20.0°C. For 2031 and subsequent MYs, the temperature adjustment is added to the off-cycle NOx standard when the mean ambient temperature of the shift-day is less than 5.0°C. The equations to calculate the NOx emissions temperature adjustment are provided in tables III-12 and III-13 for the two phases.

Table III-12: Temperature Based NOx Adjustment Factor for 2027 to 2030 MY Engines[10]

Off-Cycle Bin	NOx adjustment
Bin 1	(20.0-T_{amb})*0.33
Bin 2	(20.0-T_{amb})*2.93

Table III-13: Temperature Based NOx Adjustment Factor for 2031 and subsequent MY Engines[11]

Off-Cycle Bin	NOx adjustment
Bin 1	(5.0-T_{amb})*0.40
Bin 2	(5.0-T_{amb})*3.0

The Proposed Amendments also include an interim NOx compliance allowance for in-use testing. As described in CARB staff's comments (CARB, 2022b) to U.S. EPA's notice of

[10] T_{amb} is the mean ambient temperature for the shift day.
[11] T_{amb} is the mean ambient temperature for the shift day

proposed rulemaking (U.S. EPA, 2022c), the interim compliance allowance is provided to address the uncertainty during the early production years in how the emissions control technologies deteriorate beyond current UL on a variety of HD vehicle applications. Thus, CARB staff is proposing a 15 mg/hp·hr compliance allowance that would apply for any in-use testing of medium HDEs and heavy HDEs for 2027 through 2034 MYs. Consistent with the CTP, for 2035 and subsequent MYs, the interim compliance allowance would no longer be applicable as manufacturers would have gained more experience in calibrating their products.

The compliance determination for in-use testing would be based on the in-use emissions threshold, a sum of the in-use off cycle standard, temperature adjustment, and compliance allowance, as applicable. The number of engines to test, how to determine pass or failure of a single test, and number of tests for a particular EF will be harmonized with the federal program. A single engine would fail an in-use test when the sum-over-sum (SOS) emissions are greater than the in-use emissions threshold. An EF would fail an in-use emissions test set if the arithmetic mean for 10 engines' SOS emissions were greater than the in-use emissions threshold for any bin. For 2027 and 2028 MYs, manufacturers may test between 10 to 15 engines for compliance demonstration. An EF would fail if the arithmetic mean of the emissions from all engine tests is greater than the in-use emissions threshold.

CARB staff is also proposing to amend the biodiesel fuel blend provisions. Biodiesel fuel blends up to 20% (B20) are common and commercially available in California. Under the federal program, a manufacturer has the option of specifying the biodiesel content which would represent misfueling. Under the Proposed Amendments, manufacturers cannot specify maintenance instructions or warranty manuals that prohibit the use of biodiesel fuel blends up to B20. Consequently, California's in-use testing program would not consider engines to be misfueled for biodiesel fuel blends up to B20.

Finally, CARB staff proposes to update and include the idle test procedures applying to 2027 and subsequent MY engines. The purpose of the idle test is to determine emissions compliance with the NOx idle emission standard during engine idling. The test procedure describes preconditioning, engine warm up, measurement method, minimum measurement duration, and pass/fail criteria for an engine and engine families. This idle test procedure is not required for the manufacturer-run in-use testing program. CARB staff may utilize the in-use idle test procedure for the CARB-run in-use compliance (IUC) testing.

4. Proposed Amendments to the Warranty Period Requirements

CARB staff is proposing to amend the criteria pollutant emissions warranty requirements in title 13, CCR, sections 2035, 2036, 2037, 2038, and 2039, for 2027 and subsequent MY California-certified HDVs and HDEs. The Proposed Amendments for warranty periods, shown in Table III-14, would align with the federal warranty period requirements for 2027 and subsequent MY HDEs. For 2027 through 2030 MY light HDEs, medium HDEs, SI HDEs, and all MDEs, the proposed warranty periods would be longer than the corresponding warranty periods in the original Omnibus regulation. This would result in higher emissions benefits from alignment with the federal program. For 2027 through 2030 MY heavy HDEs, the warranty period remains the same as in the original Omnibus and therefore, the proposed warranty amendment for this MY group is expected to provide same emissions benefits as the original Omnibus. For 2031 and subsequent MY heavy HDEs, the federal warranty period requirement

is slightly shorter than that in the original Omnibus, and therefore, the proposed warranty period amendments for this MY group of heavy HDEs may result in less emissions benefits. Overall, the impacts on the emissions due to aligning with the federal warranty periods for 2027 and subsequent MY HDEs are expected to be minimal compared to the overall emissions benefits projected from the original Omnibus regulation.

In addition to aligning with the length of the warranty periods, CARB staff is also proposing to harmonize the maintenance intervals for 2027 and subsequent MY HD CI and SI engines with the corresponding federal requirements.

Table III-14: Proposed Emissions Warranty Periods - 2027 and Subsequent MY MDEs and HDEs

Primary Intended Service Class	Units	Original Omnibus Warranty Period 2027-2030 MYs	Original Omnibus Warranty Period 2031 and Subsequent MYs	Proposed Warranty Period 2027 and Subsequent MYs
SI MDE	Mileage/ Years/ Hours	50,000/ 3 ---	50,000/ 3 ---	160,000/ 10/ 8,000
SI HDE	Mileage/ Years/ Hours	110,000/ 7/ 6,000	160,000/ 10/ 8,000	160,000/ 10/ 8,000
CI MDE	Mileage/ Years/ Hours	50,000/ 3 ---	50,000/ 3 ---	210,000/ 10/ 10,000
Light HDE	Mileage/ Years/ Hours	150,000/ 7/ 7,000	210,000/ 10/ 10,000	210,000/ 10/ 10,000
Medium HDE	Mileage/ Years/ Hours	220,000/ 7/ 11,000	280,000/ 10/ 14,000	280,000/ 10/ 14,000
Heavy HDE	Mileage/ Years/ Hours	450,000/ 7/ 22,000	600,000/ 10/ 30,000	450,000/ 10/ 22,000

5. Proposed Amendments to the Useful Life Periods

CARB staff is proposing to amend the criteria pollutant UL periods in title 13, CCR, section 2112 for 2027 and subsequent MY HDEs to align with the federal criteria pollutant UL periods for 2027 and subsequent MY HDEs. The proposed UL periods would ensure emissions are controlled in-use for a larger portion of the engine's operational life.

As shown in Table III-15, the UL periods for 2027 and subsequent MY CI and SI MDEs and 2027 through 2030 MY light and medium HDEs are longer than those in the original Omnibus. The longer UL periods would ensure that emissions from these groups of engines would be controlled in-use for longer periods than is required by the original Omnibus.

For 2027 and subsequent MY heavy HDEs, the proposed UL period is slightly shorter than the original Omnibus. However, manufacturers would also be required to demonstrate emission control durability during certification for a longer UL period of about 750,000 miles, which is about the same as in the original Omnibus regulation. The extended laboratory durability demonstration would ensure that in-use engines will meet the emission standards throughout the UL period. Overall, the proposed UL periods are not expected to impact any projected emissions benefits from the original Omnibus regulation.

Table III-15: Proposed Useful Life Periods for 2027 and Subsequent MY MDEs and HDEs for Criteria Pollutant Standards

Primary Intended Service Class	Units	Original Omnibus UL 2027-2030 MYs	Original Omnibus UL 2031 and Subsequent MYs	Proposed UL 2027 and Subsequent MYs
SI MDE	Mileage/ Years/ Hours	150,000/ 15/ ---	150,000/ 15/ ---	200,000/ 15/ 10,000
SI HDE	Mileage/ Years/ Hours	155,000/ 12/ ---	200,000/ 15/ ---	200,000/ 15/ 10,000
CI MDE	Mileage/ Years/ Hours	150,000/ 15/ ---	150,000/ 15/ ---	270,000/ 15/ 13,000
Light HDE	Mileage/ Years/ Hours	190,000/ 12/ ---	270,000/ 15 ---	270,000 15/ 13,000
Medium HDE	Mileage/ Years/ Hours	270,000/ 11 ---	350,000/ 12/ ---	350,000 12/ 17,000
Heavy HDE	Mileage/ Years/ Hours	600,000/ 11/ 30,000	800,000/ 12 40,000	650,000/ 11 32,000

6. Proposed Amendments to the Durability Demonstration Procedures

To demonstrate HD CI emissions durability, the original Omnibus regulation requires manufacturers to run the combined engine-aftertreatment system on an engine dynamometer over standardized cycles for the full UL. The regulation also provides manufacturers with the option to use accelerated aftertreatment aging on an engine dynamometer for a portion of the UL provided that the manufacturer periodically submits emissions data from in-use on-road HDDEs.

For 2027 and subsequent MY HDEs, U.S. EPA finalized two methods of demonstrating durability of the engines over the longer UL periods. The two methods are similar to existing methods in the Omnibus regulation except that the minimum required engine dynamometer

run hours for Omnibus is longer than that required by the federal program. Additionally, unlike Omnibus, the federal program allows accelerated bench aging and does not require manufacturers to submit in-use emissions data as a condition for using the accelerated aging process.

Thus, as agreed in the CTP, to streamline the certification process and reduce the burden on manufacturers, CARB staff is proposing to align with the U.S. EPA durability demonstration procedures for 2027 and subsequent MY HD CI and SI engines.

7. Proposed Amendments to the Averaging, Banking, and Trading (ABT) Program

With the introduction of the original Omnibus regulation, there was a need to establish a separate California-only ABT program (CA-ABT). There were two key drivers behind this requirement. First, the original Omnibus regulation included flexibility provisions to allow manufacturers of 2022 to 2026 MY zero-emission powertrain and vehicles to accumulate criteria pollutant NOx, PM, or HC credits in California. Such a mechanism does not exist in the corresponding federal program. Second, the numerical values of NOx and PM emission standards under the original Omnibus regulation are different than the corresponding federal emission standards for the 2024-2026 MY period. Based on these differences between the original Omnibus and the federal program, the CA-ABT program was established starting with the 2022 MY.

During the negotiations for the CTP agreement, engine manufacturers expressed a strong interest in merging the California and the federal NOx ABT programs for 2027 and subsequent MYs. The merging of these ABT programs would make the calculation and tracking of credits and deficits simpler for the HDE manufacturers.

Nationwide, some HDE manufacturers started producing and distributing engines that are cleaner than the current 0.20 g/hp·hr federal NOx emission standard since MY 2022. As a result, some HDE manufacturers have already accumulated NOx emissions credits in their federal ABT accounts. This trend will continue through the end of MY 2026. With excess NOx credits, HDE manufacturers will have the ability to certify 2027 and subsequent MY products at the NOx FEL caps (65 mg/hp·hr for 2027 through 2030 MYs and 50 mg/hp·hr for 2031 and subsequent MYs) instead of certifying HDEs at the 35 mg/hp·hr NOx emission standard. Using those federally accumulated NOx credits in California will therefore have an impact on NOx emissions benefits in California.

During the CTP negotiations, CARB staff expressed concerns and discussed the issue of excess federal NOx credits with the stakeholders. Given that the accumulated federal NOx credit balance at the end of the 2026 MY will be a function of future HDE sales, manufacturers could only provide projected values of their future federal NOx credit balance. Based on the information from manufacturers, CARB staff developed a worst-case scenario for analyzing the impacts of merging the federal and California NOx ABT programs (worst-case refers to a scenario where HDE manufacturers would generate the maximum amount of federal NOx credits at the end of the 2026 MY).

A summary of the worst-case scenario is provided in Table III-16 below. This table shows the fraction of various primary intended service classes of HDEs that could be certified at the maximum NOx FEL caps.

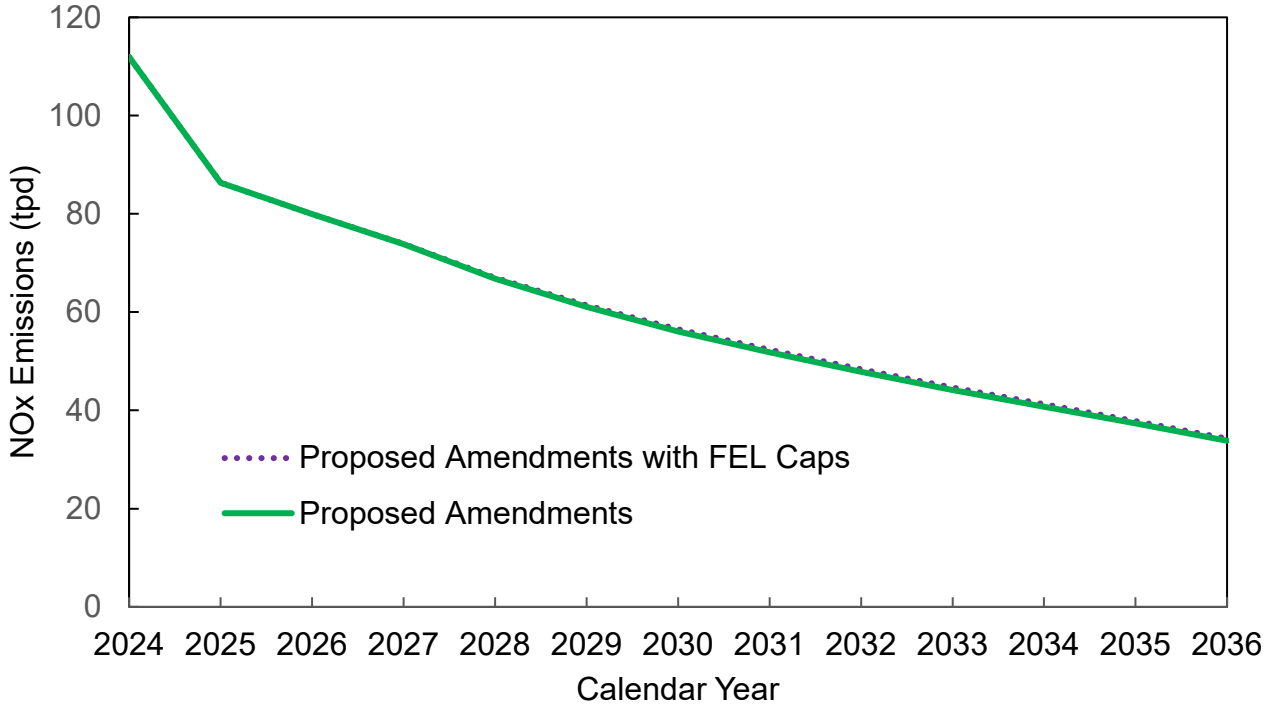
Table III-16: Projected Fraction of HDEs Certified at the NOx FEL Caps Due to Excess Federal NOx Credits at the End of the 2026 MY

Model Year	Primary Intended Service Class	Percentage of HDEs Certified at the Maximum NOx FEL Caps
2027-2030	Light HDE	0%
	Medium HDE	70%
	Heavy HDE	65%
2031	Light HDE	0%
	Medium HDE	70%
	Heavy HDE	65%
2032-2034	Light HDE	0%
	Medium HDE	64%
	Heavy HDE	32%

Based on the percentages in Table III-16, CARB staff performed an emissions inventory analysis using the Emission FACtors Inventory Model (EMFAC) 2021 model (CARB, 2025l) to evaluate the impacts of those excess federal NOx credits on the NOx emissions inventory in California. Figure III-1 shows the results of the analysis. As shown, the impacts of the NOx FEL caps on the inventory are relatively small (0.1 to 0.6 tons per day (tpd) between calendar years 2027 and 2036) and can therefore be neglected.

Finally, CARB staff was recently informed that, based on more recent estimates, some manufacturers may not have any excess federal NOx credits after the 2031 MY. Therefore, CARB staff anticipates that the above analysis will indeed be a worst-case scenario, and the actual impacts on the California NOx emissions inventory would be even smaller than what is reflected in Figure III-1.

Figure III-1. Projected NOx Emissions from MDEs and HDEs



B. Proposed Amendments to the On-Board Diagnostics Requirements

To align with the EPA-NOx rule, CARB staff is proposing the following amendments to the OBD regulations:

- Updates to the definitions of the FTP cycle and SET cycle;
- Modifications to the engine aging requirements for durability demonstration testing of MDEs and HDEs;
- Adoption of alternate, higher malfunction criteria, higher nonconformance criteria, and more relaxed test-out criteria for OBD monitors to account for the proposed lower FTP NMHC and CO standards for 2027 and subsequent MY MDEs and HDEs; and
- Adoption of new data stream parameters required to be made available on HDEs.

Additionally, to address manufacturers' implementation concerns and improve CARB staff's review of OBD applications, CARB staff is proposing the following amendments:

- Modifications to the NOx sensor monitor compliance criteria to address issues with the current criteria;
- Modifications to the in-use monitor performance denominator incrementing criteria for monitors that are part of a multiple NOx converting catalyst system to address issues of possible low in-use monitoring frequency;
- Modifications to the criteria to be exempt from monitoring the catalyzed PM filter NMHC conversion capability to address implementation issues;
- Modifications to the criteria to set the readiness status for a readiness group to "complete" to address monitors that do not run frequently in-use;

- Substitution of the not-to-exceed bin with the new 2B-MAW bins for NOx emissions tracking (i.e., the REAL requirements) in order to align with the binning method used for tailpipe IUC testing;
- Changes to manufacturer self-testing (MST) engine selection criteria and testing deadlines for HDEs to account for the updated full UL mileage requirements;
- Delay to the implementation date of the final in-use monitor performance ratio for the PM filter monitors on LD vehicles and engines, MDVs, and MDEs; and
- New required CARB templates for manufacturer submission of OBD information and test data to standardize data and information submitted by manufacturers and help CARB staff's review of the data and information.

Finally, CARB staff is also proposing several amendments to the OBD regulations to correct errors and to align with In-Use EWIR reporting requirements.

C. Proposed Amendments to the Emission Warranty Information Reporting Requirements and Corrective Action Procedures

The following sections describe the Proposed Amendments to various EWIR and corrective action-related sections of the CCR. The text identifies the affected CCR sections and then describes the Proposed Amendments.

1. Failure levels triggering recall and corrective action for 2027 and subsequent MYs

Title 13, CCR, section 2143 - Due to the proposed alignment with U.S. EPA, the proposed warranty period will increase from 7 years to 10 years starting with the 2027 MY, similar to the current 2032 MY, therefore, in the case of 2027 and subsequent MY California-certified HDEs and HDVs, vehicles or engines in an EF or test group shall be recalled or subject to other corrective action at the following failure levels: 4 percent (%) or 25 vehicles (whichever is greater) for the first five years of the warranty period, 5% or 35 vehicles (whichever is greater) for years 6 through 7 of the warranty period, and 7% or 50 vehicles (whichever is greater) for years 8 through 10 of the warranty period.

2. Allow manufacturers to collect new owner information using alternative methods for vehicles that are subject to corrective action

Title 13, CCR, sections 1971.5(e)(3)(C)(viii), 2118(f), 2127(d)(9), 2169.2(d)(10) - Manufacturers are required to provide a card with paid postage that vehicle owners can use to provide new owner contact info if the vehicle has been sold. CARB staff proposes to modify this requirement so that the new owner information can be provided electronically. It is expected that there is a greater likelihood of manufacturers receiving new owner information if it can be provided electronically through a QR code or website.

3. Change the proof of correction requirements for OTA recalls

Title 13, CCR, sections 1971.5(e)(5), 2117, 2129, 2169.4 - Manufacturers must provide POC certificates to vehicle owners once a recall has been performed. The certificate can be presented to the DMV to have a recall registration hold removed. Vehicles that are repaired during the first 6 months of the recall do not have registration holds placed on their vehicles

(CARB requires manufacturers to start submitting Vehicle Identification Numbers (VIN) of unrepaired vehicles after the first 6 months of recall), but current CARB regulations still require manufacturers to provide certificates to owners. This has become an issue with OTA recalls since manufacturers cannot provide a certificate when the vehicle owner does visit a dealership (they must be mailed, or an electronic copy must be provided pursuant to Manufacturers Advisory Correspondence 2023-03 Over-the-Air-Recall Requirements). Therefore, CARB proposes not to require manufacturers to provide the certificate to vehicle owners that receive the repair OTA during the first 6 months of recall. Since these VINs are not reported to the DMV for a registration hold, it should not matter if a vehicle owner does not receive a POC certificate.

Title 13, CCR. sections 1971.5(e)(3)(C)(ix), 2118, 2127(d), 2169.2(d) – To avoid confusion, manufacturers will also be required to notify the owner in the notification letter that they will not receive a POC certificate for an OTA recall if it was performed in the first 6 months.

4. CARB will no longer require recall repair labels for recalls that only involve software reflashes

Title 13, CCR, sections 2116, 2128, 2169.3 – Manufacturers will be exempt from the label requirement provided the following conditions are met:

(1) The recall involves only software or software calibration repairs or changes and does not involve hardware repairs or changes,
(2) The manufacturer keeps a record of the VINs of all vehicles that were inspected and/or repaired, and
(3) Upon request from the Executive Officer, the manufacturer provides information about running changes, field fixes, service campaigns, and recalls for any given VIN from all vehicles affected by the nonconformity.

If the conditions are met, CARB can ensure that vehicles that have had recalls that only involve software modification can be identified.

D. Other Modifications

In 2016, U.S. EPA adopted the second phase of the GHG emission standards for new MDEs, MDVs, HDEs, and HDVs (U.S. EPA, 2016a). The federal Phase 2 GHG standards established more stringent CO_2 emission standards than the federal Phase 1 GHG regulation for large pickups and vans, tractors, and vocational vehicles, including the engines used in these HDVs (U.S. EPA, 2011). The Phase 2 CO_2 emission standards become progressively more stringent for the 2021 through 2027 MYs.

In this rulemaking, CARB staff is not proposing any changes to the Phase 2 GHG emission standards. However, to facilitate and to make it easier for the reader to look up both the engine criteria pollutant and GHG emission standards in one location, the engine GHG emission standards for 2027 and subsequent MY HDEs have been moved from title 13, CCR, section 1956.8, to the new section in title 13, CCR, section 1956.8.2. CARB staff is also not proposing alignment with U.S. EPA's Phase 3 GHG standards in this rulemaking (U.S. EPA, 2024).

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

Government Code section 11346.2(b)(1) requires CARB to describe the specific purpose for each adoption and amendment. It also requires a description of the rationale for CARB's determination that each provision of the regulation is reasonably necessary to carry out the intent of CARB staff's proposal and to address the problems described in Chapter II of the ISOR. Accordingly, the following appendices summarize the new provisions and amendments and provide rationale for each proposal:

- Appendix C-A-1: Purpose and Rationale for Proposed Amendments to Title 13 Regulation Order;
- Appendix C-A-2: Purpose and Rationale for Proposed New Section to Title 13 Regulation Order;
- Appendix C-B-1: Purpose and Rationale for Proposed Amendments to the Heavy-Duty Diesel Engine Test Procedures;
- Appendix C-B-2: Purpose and Rationale for Proposed Amendments to the Heavy-Duty Otto-Cycle Engine Test Procedures; and
- Appendix C-B-3: Purpose and Rationale for Proposed New Heavy-Duty Engine Test Procedures.
- Appendix F: Supplement to Initial Statement of Reasons – Proposed Low Carbon Fuel Standard Amendments. (includes Purpose and Rationale for Proposed Amendments to the LCFS Regulation Order).
- Appendix G: Includes the Purpose and Rationale for the Emergency Vehicle Emissions Regulation

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

A. Emission Impacts

The Proposed Amendments aim to largely align the Omnibus regulation's requirements with the federal EPA-NOx rule, as agreed upon by CARB and the CTP signatories. These amendments are expected to result in a regulation that significantly decreases NOx from HD truck engines compared to today's emission levels, albeit slightly less than expected from the current Omnibus regulation. The Proposed Amendments are estimated to achieve approximately 2% less NOx emission benefits cumulatively over the analysis period from 2027 to 2036 than expected from the current Omnibus regulation. This rulemaking does not propose any changes to the PM or GHG emission standards for MDEs and HDEs. Therefore, no changes to PM or GHG emissions from MD and HD trucks are expected by the Proposed Amendments. A more detailed discussion about emission impacts and air quality is provided in Chapter VI.

B. Health Impacts

CARB staff analyzed the impacts to 12 health outcomes, most of which were added or updated through CARB's health analysis which includes cardiopulmonary mortality, acute myocardial

infarction, lung cancer incidence, asthma onset, asthma symptoms, hospitalizations for cardiovascular illness, hospitalizations for respiratory illness, hospitalizations for Alzheimer's disease, hospitalizations for Parkinson's disease, cardiovascular emergency department (ED) visits, respiratory ED visits, and work loss days (CARB, 2022c).

These health outcomes have been identified by U.S. EPA as having a causal or likely causal relationship with exposure to $PM_{2.5}$ based on a substantial body of scientific evidence (U.S. EPA, 2019; U.S. EPA, 2021). U.S. EPA has determined that both long-term and short-term exposure to $PM_{2.5}$ plays a causal role in premature mortality, meaning that a substantial body of scientific evidence shows a relationship between $PM_{2.5}$ exposure and increased risk of death. This relationship persists when other risk factors such as smoking rates, poverty, and other factors are taken into account. U.S. EPA has also determined a causal relationship between non-mortality cardiovascular effects (e.g., acute myocardial infarction) and short- and long-term exposure to $PM_{2.5}$, a likely causal relationship between non-mortality respiratory effects (including worsening asthma) and short- and long-term $PM_{2.5}$ exposure, and a likely causal relationship between non-mortality neurological effects and long-term $PM_{2.5}$ exposure.

NOx includes nitrogen dioxide, a potent lung irritant, which can aggravate lung diseases such as asthma when inhaled (U.S. EPA, 2016b). However, the most serious quantifiable impacts of NOx emissions occur through the conversion of NOx to fine particles of ammonium nitrate aerosols through chemical processes in the atmosphere. $PM_{2.5}$ formed in this manner is termed secondary $PM_{2.5}$. Both directly emitted $PM_{2.5}$ and secondary $PM_{2.5}$ are associated with adverse health outcomes**.** As a result, reductions in $PM_{2.5}$ and NOx emissions are associated with reductions in these adverse health outcomes. In this analysis, CARB staff assessed the health impacts of exposure to secondary $PM_{2.5}$ formed by NOx emissions associated with the Proposed Amendments.

1. Incidence-Per-Ton Methodology

CARB uses the incidence-per-ton (IPT) methodology to quantify the health benefits of emissions reductions in cases where dispersion modeling results are not available. A description of this method is included on CARB's webpage (CARB, 2025m). CARB's IPT methodology is based on a methodology developed by U.S. EPA (Fann N et al., 2009; Fann N et al., 2012; Fann N et al., 2018).

Under the IPT methodology, it is assumed that changes in emissions are approximately proportional to changes in health outcomes. IPT factors are derived by calculating the number of health outcomes associated with exposure to $PM_{2.5}$ for a baseline scenario using measured ambient concentrations and dividing by the emissions of $PM_{2.5}$ or a precursor. The calculation is performed separately for each air basin using the following equation:

$$IPT = \frac{number\ of\ health\ outcomes\ in\ air\ basin}{annual\ emissions\ in\ air\ basin}$$

Multiplying the emissions changes from the Proposed Amendments in an air basin by the IPT factor then yields an estimate of the impact on health outcomes associated with the Proposed Amendments. For future years, the number of outcomes is adjusted to account for population growth. CARB's current IPT factors are based on a 2014-2016 baseline scenario, which

represents the most recent data available at the time the current IPT factors were computed. IPT factors are computed for the two types of $PM_{2.5}$: primary $PM_{2.5}$ and secondary $PM_{2.5}$ of ammonium nitrate aerosol formed from precursors.

2. Updated Information on Health Impact Analysis

CARB has initiated an expanded health analysis to include additional health endpoints in order to provide a more comprehensive analysis of the impacts of the agency's plans and regulations. A description of the updated health outcomes was provided in CARB's Updated Health Endpoints Bulletin, released in November 2022 (CARB, 2022c). This expansion was based on U.S. EPA's Technical Support Document for the Final Revised Cross-State Air Pollution Rule Update for the 2008 Ozone Season NAAQS and is associated with U.S. EPA's Environmental Benefit Mapping and Analysis Program – Community Edition (BenMAP-CE) version 1.5.8 (U.S. EPA, 2021).

To derive the IPT factors for each of the health endpoints, the number of health outcomes associated with exposure to $PM_{2.5}$ were calculated by inputting $PM_{2.5}$ concentrations from air monitoring data into U.S. EPA's BenMAP-CE version 1.5.8.4 (released April 16, 2021). The baseline incidence datasets embedded in the BenMAP-CE software were used; the incidence data for mortality, hospital admissions (including myocardial infarctions), and ED visits were at the county-level, while the incidence data for work loss days was provided at the national rate in the software (U.S. EPA, 2023b).

For most of the health endpoints, the U.S. EPA had identified one effect estimate derived from one study to be used in the respective health impact function. However, for myocardial infarction and respiratory ED visits, the U.S. EPA had identified multiple effect estimates; thus, U.S. EPA's health impact functions for these two endpoints were estimated using pooling methods. Pooling combines multiple risk estimates to determine a summary mean value estimate and associated confidence intervals (U.S. EPA, 2021). For the myocardial infarction endpoint, the results were pooled from four different epidemiological studies using the random or fixed effects pooling and sum dependent pooling methods, as specified in the configuration file that U.S. EPA uses for PM quantification. For respiratory ED visits, the results were pooled from analyses across four different locations in the U.S. done in one study; this pooling using the random or fixed effects method, also as specified in U.S. EPA's configuration file.

3. Adverse Health Impacts

CARB staff estimated the total number of statewide mortality and morbidity incidents associated with the implementation of the Proposed Amendments from 2027 to 2036, as shown in Table V-1. The Proposed Amendments are estimated to achieve slightly less benefits compared to the current Omnibus regulation, with approximately 5% or 30 fewer cardiopulmonary mortality incidents prevented over the analysis period. The Proposed Amendments are also estimated to lead to slightly less benefits in terms of respiratory diseases (one case or 1%), and cardiovascular diseases (six cases or 7%) over the analysis period. Overall, although the Proposed Amendments result in slightly less NOx emissions benefits and prevent slightly fewer prevented mortality and morbidity incidents than the current Omnibus regulation would achieve if fully implemented, the Omnibus regulation with the Proposed Amendments will still significantly reduce NOx emissions from HD truck engines in California compared to today's levels and hence have significant health benefits.

Table V-1: Impacts on Statewide Mortality and Morbidity Incidents from 2027 to 2036 under the Proposed Amendments

Health Endpoint	Number of Less Avoided Cases under the Proposed Amendments
Cardiopulmonary mortality[12]	30 (17 - 42)
Cardiovascular disease[12]	6 (4 - 7)
Cardiovascular ED visits	8 (-3 - 19)
Myocardial infarction	3 (1 - 9)
Respiratory disease[12]	1 (0 - 2)
Respiratory ED visits	18 (4 - 38)
Lung cancer incidence	2 (1 - 3)
Asthma onset	71 (68 - 73)
Asthma symptoms	6,105 (-2,987 – 14,770)
Work loss days	4,361 (3,680 – 5,015)
Alzheimer's disease	12 (10 - 14)
Parkinson's disease	2 (1 - 3)

Tables V-2 shows the impact on mortality and morbidity incidents associated with implementation of the Proposed Amendments from 2027 to 2036 by air basin, relative to the baseline.

[12] For comparison, the current Omnibus regulation was projected to avoid 577 cases of cardiopulmonary mortality, 86 cases of cardiovascular disease, and 103 cases of respiratory disease from 2027 to 2036 (CARB 2020b).

Table V-2: Impact on Mortality and Morbidity Incidents from 2027 to 2036 under the Proposed Amendments*

Air Basins**	Cardiopulmonary Mortality	Hospitalizations for Cardiovascular Disease	Cardiovascular ED Visits	Acute Myocardial Infarction	Hospitalizations for Respiratory Disease	Respiratory ED Visits
GBV	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)
LC	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)
LT	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)
MD	0 (0 - 1)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)
MC	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)
NCC	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)
NC	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)
NP	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)
SV	1 (1 - 2)	0 (0 - 0)	0 (0 - 1)	0 (0 - 0)	0 (0 - 0)	1 (0 - 1)
SS	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)
SD	1 (1 - 2)	0 (0 - 0)	0 (0 - 1)	0 (0 - 0)	0 (0 - 0)	1 (0 - 1)
SFB	2 (1 - 2)	0 (0 - 1)	0 (0 - 1)	0 (0 - 1)	0 (0 - 0)	1 (0 - 2)
SJV	7 (4 - 10)	1 (1 - 1)	2 (-1 - 4)	1 (0 - 2)	0 (0 - 0)	5 (1 - 10)
SCC	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)
SC	18 (10 - 25)	4 (3 - 5)	5 (-2 - 11)	2 (1 - 5)	1 (0 - 1)	10 (2 - 21)
Statewide	30 (17 - 42)	6 (4 - 7)	8 (-3 - 19)	3 (1 - 9)	1 (0 - 2)	18 (4 - 38)

* Numbers in parentheses throughout this table represent the 95% confidence interval.

**List of air basin names in full: Great Basin Valleys, Lake County, Lake Tahoe, Mojave Desert, Mountain Counties, North Central Coast, North Coast, Northeast Plateau, Sacramento Valley, Salton Sea, San Diego County, San Francisco Bay, San Joaquin Valley, South Central Coast, South Coast

Table V-2: Impact on Mortality and Morbidity Incidents from 2027 to 2036 under the Proposed Amendments (Continued)*

Air Basin**	Lung Cancer Incidence	Asthma Onset	Asthma Symptoms	Work Loss Days	Hospitalizations for Alzheimer's Disease	Hospitalizations for Parkinson's Disease
GBV	0 (0 - 0)	0 (0 - 0)	0 (0 - 1)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)
LC	0 (0 - 0)	0 (0 - 0)	1 (-1 - 3)	1 (1 - 1)	0 (0 - 0)	0 (0 - 0)
LT	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)
MD	0 (0 - 0)	1 (1 - 1)	70 (-34 - 169)	46 (38 - 52)	0 (0 - 0)	0 (0 - 0)
MC	0 (0 - 0)	0 (0 - 0)	18 (-9 - 43)	14 (12 - 17)	0 (0 - 0)	0 (0 - 0)
NCC	0 (0 - 0)	0 (0 - 0)	30 (-15 - 74)	19 (16 - 22)	0 (0 - 0)	0 (0 - 0)
NC	0 (0 - 0)	0 (0 - 0)	9 (-4 - 22)	6 (5 - 7)	0 (0 - 0)	0 (0 - 0)
NP	0 (0 - 0)	0 (0 - 0)	1 (0 - 1)	0 (0 - 1)	0 (0 - 0)	0 (0 - 0)
SV	0 (0 - 0)	3 (3 - 3)	253 (-123 - 613)	181 (152 - 208)	0 (0 - 0)	0 (0 - 0)
SS	0 (0 - 0)	1 (1 - 1)	60 (-29 - 145)	40 (34 - 46)	0 (0 - 0)	0 (0 - 0)
SD	0 (0 - 0)	3 (3 - 3)	262 (-128 - 636)	183 (154 - 210)	1 (1 - 1)	0 (0 - 0)
SFB	0 (0 - 0)	5 (4 - 5)	396 (-193 - 960)	301 (254 - 346)	1 (1 - 1)	0 (0 - 0)
SJV	0 (0 - 1)	18 (18 - 19)	1,630 (-798 – 3,937)	977 (825 – 1,123)	2 (2 - 3)	0 (0 - 0)
SCC	0 (0 - 0)	1 (1 - 1)	71 (-35 - 172)	48 (40 - 55)	0 (0 - 0)	0 (0 - 0)
SC	1 (0 - 2)	39 (37 - 40)	3,305 (-1,617 – 7,994)	2,544 (2,147 – 2,925)	8 (6 - 9)	1 (1 - 2)
Statewide	2 (1 - 3)	71 (68 - 73)	6,105 (-2,987 – 14,770)	4,361 (3,680 – 5,015)	12 (10 - 14)	2 (1 - 3)

* Numbers in parentheses throughout this table represent the 95% confidence interval.

**List of air basin names in full: Great Basin Valleys, Lake County, Lake Tahoe, Mojave Desert, Mountain Counties, North Central Coast, North Coast, Northeast Plateau, Sacramento Valley, Salton Sea, San Diego County, San Francisco Bay, San Joaquin Valley, South Central Coast, South Coast

4. Uncertainties Associated with the Mortality and Illness Analysis

Although the estimated health outcomes presented in this report are based on a well-established methodology, they are subject to uncertainty. Uncertainty is reflected in the 95% confidence intervals included with the central estimates in Tables V-1 and V-2. These confidence intervals take into account uncertainties in translating air quality changes into health outcomes.

Other sources of uncertainty include the following:

- The relationship between changes in pollutant concentrations and changes in pollutant or precursor emissions is assumed to be proportional, although this is an approximation.
- Future population estimates are subject to increasing uncertainty as they are projected further into the future.
- Baseline incidence rates can experience year-to-year variation.

C. Heath Impact Monetization

Health outcomes are monetized by multiplying each incident by a value per incident that is consistent with the IPT method described above, using the standard economic studies and data as provided in U.S. EPA's Environmental BenMAP-CE (U.S. EPA, 2023b). The value per incident is derived from BenMAP-CE using the results for the total status quo PM-related incidence for each health endpoint used to derive the IPT and dividing them by the total valuation (or cost) as estimated in BenMAP-CE using the standard studies and data as listed in Table V-3 to derive a dollar value for an incident. These value per incident estimates are derived for each of the three years considered in our air quality scenario (2014-2016); an average is taken across the three years to derive the final estimate (CARB, 2023e). The economic studies and data used are the same as those used in U.S. EPA's recent Revised Cross-State Air Pollution Rule Update (U.S. EPA, 2021). The dollar values per incident therefore are equivalent to those evaluated in that rule, only varying due to California-specific economic and demographic data.[13]

The value per incident for each endpoint derived by the methods described above are shown in Table V-3. The value for premature mortality is based on the value of statistical life (VSL) (U.S. EPA, 2000), a measure of willingness-to-pay (WTP) from economic theory, which when applied to mortality risk provides a dollar estimate of benefits for an avoided premature death. The VSL 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, such that one death would be avoided in the year across the population (CARB, 2023e). Specifically, the U.S. EPA central estimate of $7.4 million (2006$) is used for VSL (U.S. EPA, 2025b). The estimate of VSL is adjusted for per capita income growth using U.S. EPA's central income elasticity estimate of 0.40 and the income growth forecast included in BenMAP-CE. This income elasticity estimate for VSL follows from empirical research and indicates that for every 1%

[13] The California-specific data that cause variation from national estimates are the data on county-level median daily wages and the age distribution of the population residing in each air basin. Small variations may also arise due to BenMAP-CE's Monte Carlo simulation methods.

increase in per capita income, the VSL increases by 0.4%, consistent with health risk reduction being a normal good whose demand increases with income. Finally, the value for VSL is adjusted for California inflation to present the values in 2023 dollars.

Unlike mortality valuation, the cost for morbidity-related endpoints, such as hospitalizations and emergency room visits, as well as disease onset and occurrence, are based on the cost of illness (COI) methodology.[14] The COI methodology uses a combination of typical costs associated with hospitalization or disease occurrence to assign an economic value to such outcomes. The types of cost that are included across the different valuation studies applied here include hospital charges, post-hospitalization medical care, out-of-pocket expenses, lost earnings for both individuals and family members, and lost household production (e.g., valuation of time-losses from inability to maintain the household or provide childcare).

[14] The WTP method is also used for valuation of one morbidity-related health endpoint: asthma symptoms.

Table V-3: Valuation per Incident for Avoided Health Outcomes (2023$)

Endpoint	Value Per Incident (2023$)	Valuation Methodology	Notes
Premature Mortality	$14,030,101	WTP	Shown at 2023 income levels. The estimate will grow annually proportional to income growth using U.S. EPA's central estimate for income elasticity of 0.40, and income growth forecast from BenMAP-CE.
Hospitalizations and ED Visits			
Hospitalizations for Parkinson's Disease	$17,317	COI	Direct cost of hospitalization incident.
Hospitalizations for Respiratory Disease	$13,183	COI	Direct cost of hospitalization incident.
Hospitalizations for Alzheimer's Disease	$16,222	COI	Direct cost of hospitalization incident.
Hospitalizations for Cardiovascular Disease	$20,861	COI	Direct cost of hospitalization incident.
ED visits, All Cardiac Outcomes	$1,565	COI	Direct cost of ED visit.
ED Visits, Respiratory	$1,179	COI	Direct cost of ED visit.
Health Endpoint Onset/Occurrence			
Incidence, Asthma	$59,977	COI	Present value of lifetime healthcare cost and productivity losses using a 3% discount rate.
Asthma Symptoms, Albuterol Use	$283	WTP for symptoms + COI for Albuterol use	Willingness to pay plus cost of albuterol.
Incidence, Lung Cancer	$33,894	COI	Direct medical cost of lung cancer. Cost discounted to present value at 3%.
Acute Myocardial Infarction, Nonfatal	$105,257	COI	Present value of 3 years medical cost and earnings lost over a 5-year period. Using a 3% discount rate.

Table V-4 summarizes the impact on health outcome incidents and valuation between 2027 and 2036 for the Proposed Amendments.

Table V-4: Impact on Health Outcome Incidents and Valuation between 2027 and 2036 for the Proposed Amendments

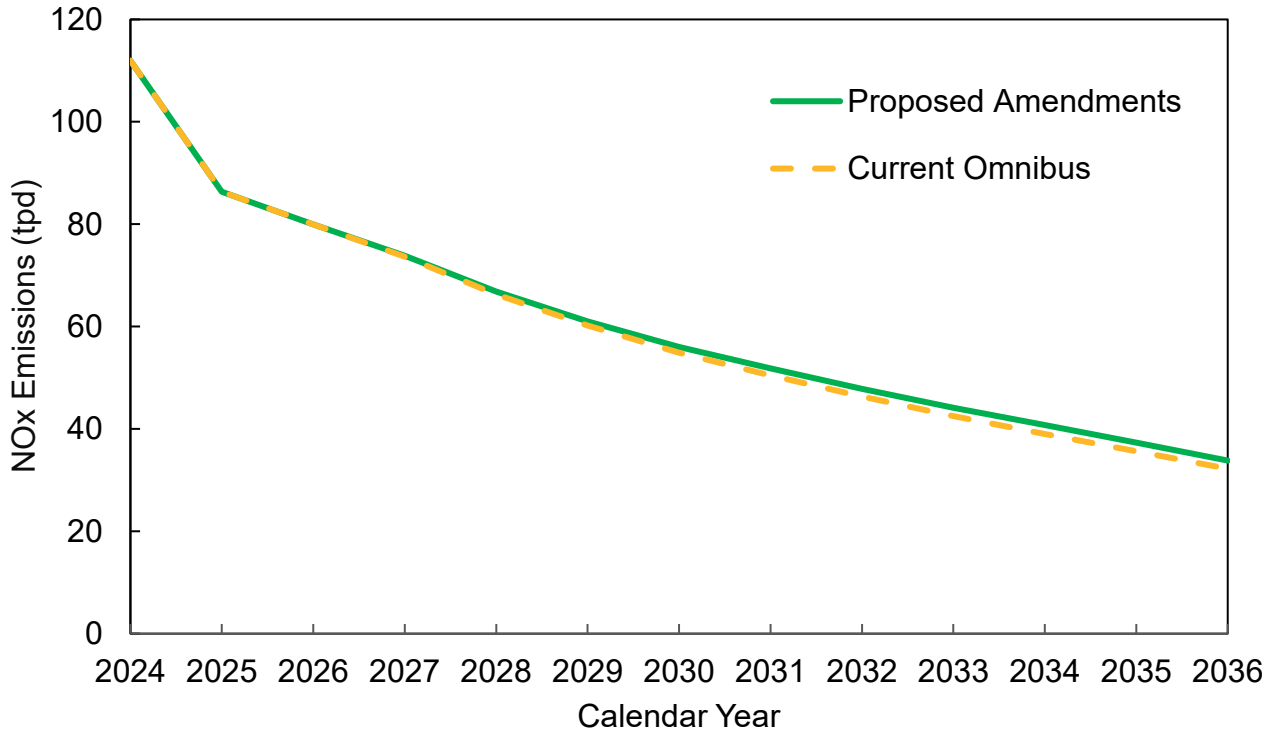
Year	Cardiopulmonary Mortality	Hospitalizations for Parkinson's Disease	Hospitalizations for Respiratory Disease	Hospitalizations for Alzheimer's Disease	Hospitalizations for Cardiovascular Disease	Cardiovascular ED Visits	Respiratory ED Visits	Asthma Onset	Asthma Symptoms	Lung Cancer Incidence	Acute Myocardial Infarction	Work Loss Days	Valuation (Million) (2023$)
2027	0	0	0	0	0	0	0	1	108	0	0	65	$6
2028	1	0	0	0	0	0	1	3	291	0	0	181	$18
2029	2	0	0	1	0	1	1	5	477	0	0	307	$30
2030	3	0	0	1	1	1	2	7	601	0	0	403	$40
2031	3	0	0	1	1	1	2	8	685	0	0	479	$48
2032	4	0	0	1	1	1	2	9	745	0	0	538	$55
2033	4	0	0	2	1	1	2	9	791	0	0	584	$60
2034	4	0	0	2	1	1	3	10	832	0	0	623	$65
2035	4	0	0	2	1	1	3	10	816	0	0	613	$64
2036	4	0	0	2	1	1	2	9	760	0	0	568	$60
Total	30	2	1	12	6	8	18	71	6,105	2	3	4,361	$447

VI. Air Quality

This chapter summarizes the potential air quality impacts in California resulting from the Proposed Amendments. Further details regarding the emission inventory development are provided in Appendix E.

The Proposed Amendments are designed to mostly harmonize the requirements of the Omnibus regulation with the federal EPA-NOx rule as agreed upon between CARB and the CTP signatories. The emissions trend of the Proposed Amendments is evaluated against current Omnibus regulation, which reflects implementation of all existing state and federal laws and regulations. The projected statewide NOx emissions from MDEs and HDEs in tpd are shown in Figure VI-1. This rulemaking does not propose any changes to the PM or GHG emission standards for MDEs and HDEs. Therefore, no changes to PM or GHG emissions from MD and HD trucks are expected from the Proposed Amendments.

Figure VI-1. Projected Statewide NOx Emissions from MDEs and HDEs



As shown in Figure VI-1, both the current Omnibus regulation and the Proposed Amendments are projected to significantly reduce NOx emissions from now through 2036. However, some requirements in the Proposed Amendments are slightly less stringent than the current Omnibus regulation, therefore, a small decrease in projected emission benefits from the Proposed Amendments is expected when compared to the current Omnibus regulation. Table VI-1 summarizes the differences in NOx emissions between the Proposed Amendments and the current Omnibus regulation in the San Joaquin Valley air basin, the South Coast air basin,

and statewide. As shown in the table, the maximum loss of benefits in statewide NOx emissions is 1.75 tpd, in calendar year 2034.

Table VI-1: Projected Difference in NOx Emissions: Proposed Amendments vs. Current Omnibus (tpd)

Calendar Year	Statewide	San Joaquin Valley	South Coast Air Basin
2027	0.18	0.04	0.05
2028	0.51	0.12	0.15
2029	0.86	0.20	0.25
2030	1.13	0.27	0.32
2031	1.34	0.32	0.38
2032	1.51	0.37	0.42
2033	1.63	0.40	0.46
2034	1.75	0.43	0.49
2035	1.72	0.43	0.48
2036	1.60	0.40	0.44

VII. Environmental Analysis

A. Introduction

As previously stated, while CARB is proposing the Omnibus amendments, LCFS amendments, and the proposal to make permanent CARB's Emergency Vehicle Emissions Regulations together as one rulemaking for administrative efficiency, the Omnibus amendments, LCFS amendments, and the proposal to make permanent CARB's Emergency Vehicle Emissions regulations are three separate regulatory items and projects which will result in three separate approval actions. Therefore, the Omnibus amendments, LCFS amendments, and the proposal to make permanent CARB's Emergency Vehicle Emissions Regulations are three separate projects under the California Environmental Quality Act (CEQA). As such, CARB appropriately analyzed the Omnibus amendments, LCFS amendments, and the proposal to make permanent CARB's Emergency Vehicle Emissions Regulations as separate projects under CEQA. The CEQA determinations made for Proposed Omnibus Amendments are summarized below.

This chapter provides the basis for CARB's determination that the Proposed Amendments are exempt from CEQA requirements. 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 (Title 14, CCR, section 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 (Title 17, CCR, sections 60000-60007).

B. Analysis

1. Common-Sense Exemption—General Rule

CARB has determined that the Proposed Amendments are exempt from CEQA under the “general rule” or “common sense” exemption (Title 14, CCR, section 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 detail in Chapter III, a primary goal of the Proposed Amendments is to largely align with the EPA-NOx rule for 2027 and subsequent MY HDEs. The Proposed Amendments align the California and federal standards, without creating new compliance responses from complying entities, and are not expected to cause a significant effect on the environment. While the numerical value of the emission standards, UL, and emissions warranty periods would change, CARB staff does not anticipate any changes to the architecture of future engine and aftertreatment system designs relative to the current Omnibus regulation. In terms of in-use emissions testing, the 2B-MAW methodology only impacts the processing of the in-use emissions data, and no changes to the physical testing process or testing facilities is anticipated. As a result, CARB staff does not anticipate that the Proposed Amendments would cause any new significant environmental effects or alter the types of compliance response of the regulated entities that would result in any changes that significantly affect the physical environment. Overall, although the Proposed Amendments result in slightly less NOx emissions benefits than the current Omnibus regulation would achieve if fully implemented, the Omnibus regulation with the Proposed Amendments will still significantly reduce NOx emissions from HD truck engines in California compared to today’s levels, and will help ensure that emissions reductions already achieved are preserved into the future.

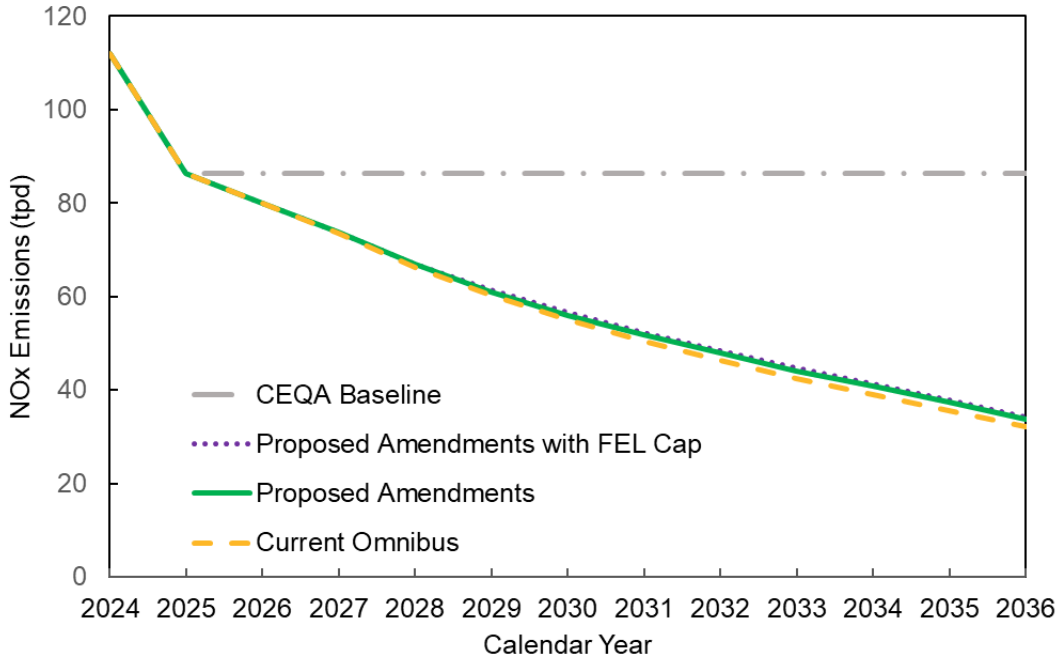
The Proposed Amendments to merge the California-ABT program with the federal-ABT program and allow credits accrued under the federal-ABT program (from 2022-2026 MYs) to be available for certifying 50-state engine families in California for 2027 and subsequent MYs would not lead to any significant emissions impacts, as shown in Figure VII-1 (see the line marked “Proposed Amendments with FEL Caps”). As discussed in Chapter III, based on feedback from some manufacturers, CARB staff evaluated the worst-case scenario where approximately 65% to 75% of the 2027 through 2034 MY HDEs would be certified to the maximum FEL caps (65 mg/hp·hr for 2027 to 2030 MYs; 50 mg/hp·hr for 2031 and subsequent MYs) and the remaining 30% to 35% of HDEs would be certified to the applicable standard of 35 mg/hp·hr. As shown in Figure VII-I, the emissions impact between the FEL caps and the scenario where 100% of the HDE families are certified at the standard is negligible.

The Proposed Amendments to the emissions warranty and UL period would extend the warranty period requirements and UL period to align with those in the EPA-NOx rule, resulting in the same or greater emission benefits as the current Omnibus without requiring any

additional construction, modification, or production of materials. The Proposed Amendments to the OBD regulation and EWIR requirements are intended to streamline the implementation and review process related to testing and recall procedures. The Proposed Amendments would align the durability demonstration procedures to match the U.S. EPA finalized methods for 2027 and subsequent MY HD CI and SI engines, which is a procedural modification to program administration and does not change how entities will comply.

Finally, the exhaust emission standards under the EPA-NOx rule consist of the same HDE regulatory elements as the current Omnibus regulation. The overall stringency of the exhaust emission standards under the EPA-NOx rule is comparable to that of the current Omnibus regulation with the exception that the NOx exhaust emission standards are slightly less stringent than the Omnibus NOx standard. The Proposed Amendments would align the Omnibus regulation stringency with that of the EPA-NOx rule, and as a result, the Proposed Amendments are projected to result in slightly less future NOx emissions benefits of about 0.20 to 1.8 tpd between 2027 through 2036 compared to the projected reductions under the current Omnibus regulation. However, as shown in Figure VII-1, the Omnibus regulation with the Proposed Amendments is projected to significantly reduce NOx emissions in California from now through 2036, and the Proposed Amendments are projected to result in significant NOx emissions benefits compared to the CEQA baseline.[15]

Figure VII-1. Projected NOx Emissions from MDEs and HDEs in California



[15] The CEQA baseline is the actual environmental conditions existing at the time environmental analysis for the Proposed Amendments commenced (i.e., 2025 existing conditions).

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. As mentioned above, the Omnibus regulation implements two critical measures for reducing NOx emissions in the 2016 State SIP Strategy: "the Low NOx standard" and parts of the "Lower In-Use Emissions Performance Level." The Omnibus regulation is projected to contribute significant NOx emissions reductions towards achieving commitments in the 2016 State SIP Strategy. The Proposed Amendments modify the elements in the current Omnibus regulation that were developed to implement the two measures in the 2016 State SIP Strategy, but, as shown in Figure VII-I, the Proposed Amendments are projected to provide similar NOx emissions reductions and maintain those benefits as the current Omnibus regulation. Therefore, it can be concluded that the Proposed Amendments are also consistent with the 2016 State SIP Strategy.

The 2022 State Strategy for the State Implementation Plan (2022 State SIP Strategy) (CARB, 2022d) and the 2020 Mobile Source Strategy (2020 MSS) (CARB, 2021a) were built upon the measures and commitments already made in the 2016 State SIP Strategy. Emissions reductions projected in the 2022 State SIP Strategy and the 2020 MSS are above and beyond those committed in the 2016 State SIP Strategy. The Proposed Amendments do not have any impacts on GHG emissions or the other criteria pollutant emissions reductions incorporated into the 2022 State SIP Strategy, 2020 MSS, and 2022 Scoping Plan Update (CARB, 2022e). The on-road HD measures included in these plans mainly involve measures that accelerate the transition to zero-emission vehicle technology. That is, there are no measures in these plans that require additional new HD combustion engine technologies beyond those currently projected to be used to enable the requirements in the Proposed Amendments. Thus, it can be concluded that the Proposed Amendments are also consistent with California's 2022 State SIP Strategy, the 2020 MSS, and the 2022 Climate Change Scoping Plan Update. 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 (Title 14, CCR, section 15300.2); therefore, this activity is exempt from CEQA.

2. Class 7 and 8 Categorical Exemptions—Actions by Regulatory Agencies for Natural Resources and Environmental Protection

The Proposed Amendments are also categorically exempt from CEQA pursuant to Classes 7 and 8 of the CEQA Guidelines.[16] These exemptions encompass actions by regulatory agencies, duly authorized by state law, to ensure the maintenance, restoration, enhancement, or protection of natural resources and the environment, provided such actions are conducted through a regulatory process fortified with robust environmental safeguards. The Proposed Amendments unequivocally satisfy these criteria, as substantiated by the administrative record.

The Proposed Amendments would not result in any significant adverse impacts on the physical environment and rather ensure air quality is maintained and protected consistent with federal standards. As discussed above, the primary goal of the Proposed Amendments is to align with

[16] Cal. Code Regs. (CCR), tit. 14, §§ 15307, 15308.

the EPA-NOx rule for 2027 and subsequent MY HDEs. The Proposed Amendments align the California and federal contractual standards, without creating new compliance responses from complying entities, and are not expected to cause a significant effect on the environment. While the numerical value of the emission standards, UL, and emissions warranty periods would change, CARB staff does not anticipate any changes to the architecture of future engine and aftertreatment system designs relative to the current Omnibus regulation. In terms of in-use emissions testing, the 2B-MAW methodology only impacts the processing of the in-use emissions data, and no changes to the physical testing process or testing facilities are anticipated. As a result, CARB staff does not anticipate that the Proposed Amendments would cause any new significant environmental effects or alter the types of compliance response of the regulated entities that would result in any changes that significantly affect the physical environment. Overall, the Omnibus regulation with the Proposed Amendments will still significantly reduce NOx emissions from HD truck engines in California compared to today's levels, resulting in maintenance, restoration, and protection of natural resources and the environment, specifically air quality.

Under CEQA, certain classes of projects are exempt from environmental review unless an exception applies.[17] A categorical exemption may not be used where there is a reasonable possibility that the activity will result in a significant effect due to unusual circumstances, contribute to a cumulatively significant impact, affect or damage scenic resources along a scenic highway, be located on a hazardous waste site, or cause substantial adverse changes to historical resources. CARB has considered the applicability of these exceptions to the categorical exemptions and finds that substantial evidence in the record supports a determination that none of the exceptions apply to the Proposed Amendments.

Substantial evidence in the ISOR supports CARB's determination that no exceptions apply under Public Resources Code section 21084 or CCR, title 14, section 15300.2. There is no evidence of "unusual circumstances" under section 15300.2(c), as the Proposed Amendments involve no direct environmental impacts.[18] Likewise, because the Proposed Amendments involve no direct impacts, there are no cumulatively significant impacts, damage to scenic highways, locations at hazardous waste sites, or any chances to historical resources. Accordingly, there is substantial evidence for CARB to declare the Proposed Amendments exempt pursuant to Class 7 and Class 8 exemptions, based on the administrative record in general and the ISOR in particular.

3. Determination

For the foregoing reasons, there is substantial evidence in the record to support a finding by CARB, as the lead agency under CEQA, that the Proposed Amendments are exempt from CEQA. The Proposed Amendments are exempt under two categorical exemptions identified in the CEQA Guidelines section 15307 (Class 7 – Protection of Natural Resources) and section

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[17] Pub. Res. Code, § 21084; Cal. Code Regs., tit. 14, § 15300.2..

[18] *Save Our Carmel River v. Monterey Peninsula Water Management Dist.* (2006) 141 Cal.App.4th 677, 695-696 [no unusual circumstances for speculative indirect impacts]; *Save the Plastic Bag Coalition v. County of Marin* (2013) 218 Cal.App.4th 209, 224-225 [no impacts from potential paper bag increase].

15308 (Class 8 – Environmental Protection), as well as the common-sense exemption under section 15061, subdivision (b)(3).

The administrative record generally reflects that the proposal complies with each exemption independently and separately, and the ISOR provides a sufficient basis for CEQA compliance. Based on CARB's review, it can be seen with certainty that there is no possibility that the Proposed Amendments would result in a significant adverse impact on the environment. Further, the Proposed Amendments are designed to protect the environment, and CARB found no substantial evidence indicating the Proposed Amendments could adversely affect air quality or any other environmental resource area, or that any of the exceptions to the Class 7 and Class 8 exemptions apply.[19]. Therefore, the Proposed Amendments are exempt from CEQA.

VIII. Environmental Justice

State law defines EJ 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 (Gov. Code, § 65040.12, subd. (e)(1)). EJ 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 in 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 (Gov. 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 EJ 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. EJ is one of CARB's core values and fundamental to achieving its mission.

Implementation of CARB and U.S. EPA regulations in the past decades has led to a significant reduction in criteria pollutant emissions from HDVs. Despite this progress, some areas in California still suffer from poor air quality related to unhealthy ozone and PM levels. HDVs are significant contributors to California's air quality problems. As described earlier in Chapter I, HDVs emit significant quantities of NOx and PM emissions, which result in the formation of ambient ozone and $PM_{2.5}$ in the atmosphere. HDVs are the predominant means for distribution of goods and services in California, and the population of these vehicles is projected to continue to increase over time. It is therefore essential to address this sector's excess NOx and PM emissions.

[19] Cal. Code Regs., tit. 14, § 15300.2

As described in Chapter II, the Proposed Amendments would largely align the Omnibus requirements with the final federal EPA-NOx rule adopted by U.S. EPA in January 2023. As described in Chapter I, under the CTP signed in July of 2023, CARB agreed to propose amendments to the Omnibus regulation, and—concurrently—EMA, its member companies, and the Ford Motor Company, agreed to comply with the requirements of the Omnibus regulation and the ACT regulation in California regardless of the outcome of any future lawsuits against these two regulations.

Overall, although the Proposed Amendments result in slightly less NOx emissions benefits than the current Omnibus regulation would achieve if fully implemented, the Omnibus regulation with the Proposed Amendments will still significantly reduce NOx emissions from HD truck engines in California compared to today's levels.

The benefits of the Omnibus regulation with the Proposed Amendments are derived from the various elements of the program. For example, longer UL and warranty periods would help ensure HDV emission control systems are more durable, which means that the exhaust emission standards will be met over a larger portion of the operational life of the HDV. Lower emitting HDVs would help protect all Californians, and the general population would face lower risks of premature death and other serious health effects. This will benefit all Californians, including those living in EJ communities, which tend to be located near areas frequented by HDVs.

The Omnibus regulation with the Proposed Amendments contains provisions specifically intended to benefit disadvantaged communities. Under these provisions, manufacturers selling legacy engines who cannot offset such excess emissions via credits must fund projects in disadvantaged communities to offset the excess emissions.

As part of the Proposed Amendments, CARB staff proposes to end the applicability of the transit agency exemption process beginning with the 2027 MY. This proposal would encourage transit agencies to purchase cleaner buses which operate around more densely populated areas, including EJ communities that are already affected by the cumulative impact of air pollution from multiple mobile, commercial, industrial, area-wide, and other sources.

The Proposed Amendments are expected to result in slightly higher NOx emissions from HD trucks compared to the benefits expected from the original Omnibus regulation (see Chapter VI). PM emission standards remain the same and therefore the Proposed Amendments are not expected to result in any changes to the PM emissions inventory. The Proposed Amendments enable CARB to comply with the terms of the CTP, which is intended to secure important emission benefits.

Overall, the adoption of the Proposed Amendments is expected to benefit residents of such communities, affirming the Board's commitment to the fair treatment of all people throughout California.

IX. Economic Impacts Assessment

This chapter summarizes CARB staff's estimated cost and benefit impacts of the Proposed Amendments. For more details regarding the economic impact assessment methodology and results, refer to Appendix D.

Similar to the emissions impact analysis in Chapter V, the economic impacts of the Proposed Amendments are evaluated against the current Omnibus for the analysis period from 2027 through 2036. The total statewide economic impact is estimated to be a cost of $39.4 million from 2027 through 2032, followed by a saving of $24.9 million from 2033 through 2036, resulting in a net cost of $14.5 million over the full analysis period.

A. The creation or elimination of jobs within the State of California.

The main intent of the Proposed Amendments is to largely align with the EPA-NOx rule. Since the affected HDE manufacturers are located outside of California, the Proposed Amendments are not expected to directly impact the creation or elimination of jobs within the state. In addition, the Proposed Amendments are not expected to impact job creation or elimination for California fleets, since the average incremental cost of $100 per vehicle is negligible, as discussed in greater detail in Appendix D.

B. The creation of new businesses or the elimination of existing businesses within the State of California.

The main intent of the Proposed Amendments is to largely align with the EPA-NOx rule. Since the affected HDE manufacturers are located outside of California, the Proposed Amendments are not expected to directly impact the creation of new businesses or the elimination of existing businesses within the state. In addition, the Proposed Amendments are not expected to impact the creation of new businesses or elimination of existing businesses for California fleets, since the average incremental cost of $100 per vehicle is negligible, as discussed in greater detail in Appendix D.

C. The expansion of businesses currently doing business within the State of California.

The main intent of the Proposed Amendments is to largely align with the EPA-NOx rule. Since the affected HDE manufacturers are located outside of California, the Proposed Amendments are not expected to impact the expansion of businesses currently doing business within the state. In addition, the Proposed Amendments are not expected to impact the expansion of businesses for California fleets, since the average incremental cost of $100 per vehicle is negligible, as discussed in greater detail in Appendix D.

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

The Proposed Amendments are not expected to impact or cause any adverse economic impact directly affecting businesses or the ability to compete. Since the Proposed Amendments would largely align with the federal emission standards and requirements, in-state and out-of-state engines would have to meet the same requirements. The Proposed Amendments would make California fleets equally competitive with out-of-state fleets because both would purchase products that would be certified for all 50 states.

E. The benefits of the regulation to the health and welfare of California residents, worker safety, and the state's environment

As discussed in Chapter V, the Proposed Amendments are expected to result in slightly less NOx emission benefits from 2027 through 2036 within the state compared to the benefits originally projected from the current Omnibus regulation. It is important to note, however, that the Proposed Amendments enable CARB to comply with the terms of the CTP, which is intended to secure important emission benefits.

X. 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 Proposed Amendments. 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.

A. Alternatives Considered

1. Alternative 1: No Action (Business as Usual)

CARB staff considered Alternative 1, i.e., not making any changes to the current Omnibus regulation, and analyzed potential costs, savings, and emission impacts. Under Alternative 1, the requirements for HDEs in California must meet the requirements of the current Omnibus Rulemaking. The new engines from out-of-state operating in California are expected to comply with federal regulations starting in the 2027 MY. 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 adhere to one of the key terms of CTP agreement, i.e. to amend the Omnibus regulation and propose to largely align with the EPA-NOx rule beginning in the 2027 MY. In addition, Alternative 1 would result in separate certification requirements for federal and California engines. For these reasons, Alternative 1 was rejected.

2. Alternative 2: Maintain the 2024 Omnibus Requirements

CARB staff considered a less strict alternative, Alternative 2. The current Omnibus regulation has emission standards of 0.050 g/hp·hr NOx starting in 2024, stricter emission standards starting in 2027, and then longer useful lives starting in 2031. Alternative 2 would maintain the 2024 Omnibus requirements indefinitely, including for 2027 and later MYs.

Emissions Impact

Alternative 2 is less strict than the Proposed Amendments and would allow manufacturers to continue producing engines that comply with the 2024 Omnibus requirements for 2027 and subsequent MYs. The 2024 NOx emission standards for MDEs and HDEs would remain at 0.050 g/hp·hr. Thus, Omnibus 2027 and 2031+ requirements would be removed from the

regulation. Alternative 2 is expected to have NOx emissions impacts due to the difference in standards for 2027 and subsequent MY engines. The new engines that would be manufactured would result in increased NOx emissions compared to the baseline scenario. Table X-1 summarizes the projected increase in NOx emissions. PM emission standards remain the same and therefore the Proposed Amendments are not expected to result in any changes to the PM emissions inventory.

Table X-1: Projected Increase in NOx Emissions for Alternative 2 Compared to Current Omnibus Regulation (tpd)

CY	Statewide	San Joaquin Valley	South Coast Air Basin
2027	0.22	0.05	0.06
2028	0.72	0.17	0.21
2029	1.26	0.30	0.36
2030	1.71	0.41	0.49
2031	2.09	0.51	0.59
2032	2.43	0.59	0.68
2033	2.70	0.67	0.76
2034	2.94	0.73	0.82
2035	2.97	0.74	0.83
2036	2.78	0.70	0.77

Economic Impact

The total cost impact of Alternative 2 is approximately $729 million in savings during the analysis period, 2027 through 2036. Overall, because Alternative 2 has the least stringent requirements, it would have greater savings than Alternative 1 and the Proposed Amendments. For more details regarding the economic impact assessment for Alternative 2, refer to Appendix D.

Reason for Rejection

Alternative 2 would achieve up to 74% less reductions of NOx emissions than the proposed harmonization with EPA-NOx rule. In addition, similar to Alternative 1, Alternative 2 would not adhere to one of the key terms of the CTP agreement, i.e., to amend the Omnibus regulation and propose to largely align with EPA-NOx rule beginning in the 2027 MY. CARB staff is cognizant of the potential advantages of nationally harmonized standards, including encouraging manufacturers to design and produce a single set of 50-state engines that would reduce the testing burden and costs. For these reasons, Alternative 2 is rejected.

B. Small Business Alternative

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

C. Performance Standards in Place of Prescriptive Standards

Government Code sections 11346.2(b)(4)(A) and 11346.2(b)(1) contain requirements for proposed regulations that would mandate the use of specific technologies or equipment. However, because the Proposed Amendments are performance based and do not mandate

the use of specific technologies or equipment, these Government Code requirements are not applicable. In fact, manufacturers may choose different technology pathways to comply with the federal HDE emission standards beginning in the 2027 MY. The adoption of these Proposed Amendments would help the engine manufacturers in certifying a single 50-state engine platform for 2027 and subsequent MYs.

D. Health and Safety Code section 57005 Major Regulation Alternatives

The Proposed Amendments 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.

XI. 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. CARB staff is proposing to largely harmonize with EPA-NOx rule for new 2027 and subsequent MY HDEs to enable the regulated industry to design and produce a single product line of MDEs and HDEs that can be certified to both U.S. EPA and CARB emission standards and sold in all 50 states.

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 establish emission standards and other emission-related requirements for new motor vehicles and new motor vehicle engines is as described in Chapter II. 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.

HDVs are significant contributors to the state's NOx emissions inventory, and thus reducing emissions from this category of vehicles is critical in meeting the NAAQS for ozone and $PM_{2.5}$. Because of California's urgent need to reduce air pollution and meet the federal air quality standards, CARB staff initiated work on developing regulations to reduce emissions from HDVs with the launch of a research program in October 2013, which aims to demonstrate the feasibility of reducing NOx emission standards by 90% or more (CARB, 2020a).

In September 2021, CARB adopted the HD Omnibus regulation which is applicable to new 2024 and later MY HDEs. The Omnibus regulation introduced new exhaust emission standards and test procedures that are more stringent than the corresponding federal requirements (CARB, 2021b). As a result, beginning with MY 2024, manufacturers have been certifying and producing two different sets of engine families: one set of HD Omnibus compliant engine families for sale in California and states that have adopted the Omnibus regulation, and a separate set of engine families that meet the federal requirements for sale in the remaining states.

On January 24, 2023, U.S. EPA adopted the EPA-NOx rule that established criteria pollutant emission standards and test procedures for MY 2027 and subsequent HDEs that are comparable in stringency to the 2027 MY HD Omnibus requirements (U.S. EPA, 2023a). Via the Proposed Amendments, CARB staff is proposing to largely align with the 2027 MY federal requirements. Harmonization with the 2027 MY federal requirements would enable the regulated industry to design and produce a single product line of engines and vehicles that can be certified to both U.S. EPA and CARB emission standards and sold in all 50 states.

Although CARB staff is proposing to largely align the Omnibus regulation with the 2027 MY federal requirements, the CTP agreement specifies several areas where CARB's requirements will differ from the EPA-NOx rule. These include:

- **Interim Compliance Allowance.** The Proposed Amendments would provide NOx compliance allowance of 15 mg/hp·hr for in-use testing applicable to only MYs 2027 through 2034 medium HDEs and heavy HDEs. By contrast, the federal interim compliance allowance of 15 mg/hp·hr is permanent and is applicable to all 2027 and subsequent MY medium HDEs and heavy HDEs.
- **Temperature Adjustment.** The Proposed Amendments include ambient temperature adjustments to the in-use off-cycle standards that are different from the corresponding federal provisions. For California, the proposed ambient temperature adjustment would apply for Bins 1 and 2 for temperatures below 20 degrees Celsius (ºC) for MYs 2027 to 2030 and for temperatures below 5 °C for MYs 2031 and subsequent HDEs. By comparison, the ambient temperature adjustment in the federal regulations apply for Bins 1 and 2 for ambient temperatures below 25 °C for all 2027 and subsequent MY HDEs.

CARB staff expect that even with the limited differences mentioned above, manufacturers would still be able to design and produce a single product line of engines and vehicles that can be certified to both U.S. EPA and CARB emission standards and sold in all 50 states.

XII. 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 the Board's long-standing practice, CARB staff held a public workshop and had other meetings with interested parties during the development of the Proposed Amendments. Most of the proposed elements in this rulemaking are a result of the CTP agreement signed between CARB and EMA and its members and Ford Motor Company. In addition, the informal pre-rulemaking discussions provided CARB staff with useful information that was considered during development of the Proposed Amendments now being proposed for formal public comment.

CARB staff held a public workshop on March 20, 2024, regarding the Proposed Amendments. CARB staff notified stakeholders regarding the workshop via email distribution of a public notice one month prior to the occurrence. The notice was posted to the program's website and distributed through several public list-serves. Meeting materials, including presentation slides, were posted and available to the public. In the virtual public workshop (CARB, 2024), CARB staff discussed the Proposed Amendments to the Omnibus regulation and solicited feedback

from stakeholders about the proposed changes. Attendees included engine and vehicle manufacturers, trade associations, non-governmental organizations, and members of the general public.

In addition, CARB staff held multiple virtual meetings with engine manufacturers individually and as a group. CARB staff also met with the EMA and other interested stakeholders.

XIII. Documents Relied Upon

1. (CARB, 2017) *Revised Proposed 2016 State Strategy for the State Implementation Plan*, California Air Resources Board, March 7, 2017.
2. (CARB, 2018) *HD Warranty 2018*, California Air Resources Board, Hearing Date(s): June 28, 2018.
3. (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, Scheduled For Consideration: August 27, 2020.
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*, California Air Resources Board, Agenda Item No.: 20-8-2, Public Hearing Date: August 27, 2020.
5. (CARB, 2020c) *Appendix I Current and Advanced Emission Control Strategies and Key Findings of CARB/SwRI Demonstration Work* of the Staff Report for the Omnibus Regulation, California Air Resources Board, Date of Hearing: August 27, 2020.
6. (CARB, 2021a) *2020 Mobile Source Strategy*, California Air Resources Board, October 28, 2021.
7. (CARB, 2021b) *Executive Order R-21-007 Relating to Heavy-Duty Engine and Vehicle Omnibus Regulation and Associated Amendments*, California Air Resources Board, September 9, 2021.
8. (CARB, 2022a) *Request for Waiver and Authorization Action Pursuant to Clean Air Act Sections 209(b) and 209(e) for California's "Omnibus" Low NOx Regulation*, California Air Resources Board, January 31, 2022.
9. (CARB, 2022b) *Comments of the California Air Resources Board in Response to the U.S. Environmental Protection Agency's Request for Comments on Control of Air Pollution from New Motor Vehicles: Heavy-Duty Engine and Vehicle Standards*, California Air Resources Board, May 13, 2022.
10. (CARB, 2022c) *California Air Resources Board Updated Health Endpoints Bulletin*, California Air Resources Board, November 2022.
11. (CARB, 2022d) *2022 State Strategy for the State Implementation Plan*, California Air Resources Board, Adopted September 22, 2022.
12. (CARB, 2022e) *2022 Scoping Plan for Achieving Carbon Neutrality*, California Air Resources Board, December 2022.
13. (CARB, 2023a) *Clean Truck Partnership Agreement*, California Air Resources Board, July 5, 2023.
14. (CARB, 2023b) Staff Report: Initial Statement of Reasons, *Public Hearing to Consider the Proposed Amendments to the Heavy-Duty Engine and Vehicle Omnibus Regulation*, California Air Resources Board, Date of Release: August 1, 2023.

15. (CARB, 2023c) Final Statement of Reasons for Rulemaking: *Public Hearing to Consider the Proposed Amendments to the Heavy-Duty Engine and Vehicle Omnibus Regulation*, California Air Resources Board, Agenda Item No.: EO-23-1-1, Public Hearing Date: October 20, 2023.
16. (CARB, 2023d) *Delegation of Authority to the Executive Officer to Consider Proposed Amendments to Mobile Source Regulations Resolution 23-15*, California Air Resources Board, Agenda Item No.: 23-3-3, March 23, 2023.
17. (CARB, 2023e) Valuation Estimates Spreadsheet, California Air Resources Board, 2023.
18. (CARB, 2024) *Public Workshop Heavy-Duty Engine and Vehicle Omnibus Regulation Amendments*, California Air Resources Board, March 20, 2024.
19. (CARB, 2025a) *Advanced Clean Trucks*, California Air Resources Board, (Accessed June 2, 2025).
20. (CARB, 2025b) *CEPAM2019v1.04 - Standard Emission Tool*, California Air Resources Board, (Accessed June 19, 2025).
21. (CARB, 2025c) *Current California GHG Emission Inventory Data,* California Air Resources Board, (Accessed June 2, 2025).
22. (CARB, 2025d) *New Vehicle and Engine Certification: Executive Orders for Compression-Ignition and Heavy-Duty Engines and Vehicles: A-006-2411-1*; *A-021-0778-1*; *A-021-0779-1*; *A-021-0790*; *A-344-0169-1*; *A-384-0233-1*; *A-400-0038*, California Air Resources Board, (Accessed June 20, 2025).
23. (CARB, 2025e) *New Vehicle and Engine Certification: Executive Orders for Compression-Ignition and Heavy-Duty Engines and Vehicles: A-006-2458*; *A-006-2459*; *A-006-2460*; *A-021-0800*; *A-021-0801*; *A-021-0802*; *A-021-0805*; *A-021-0806*; *A-021-0807*; *A-344-0179*; *A-384-0236*, California Air Resources Board, (Accessed June 20, 2025).
24. (CARB, 2025f) *Paccar Inc. Executive Order: A-384-0236*, California Air Resources Board, (Accessed May 13, 2025).
25. (CARB, 2025g) *Volvo Group Trucks Technology, Powertrain Engineering, A Division Of Mack Trucks, Inc. (Volvo) Executive Order: A-242-0250*, California Air Resources Board, (Accessed May 13, 2025).
26. (CARB, 2025h) *Cummins Inc.: Executive Orders: A-021-0806, A-021-0807*, California Air Resources Board, (Accessed May 13, 2025).
27. (CARB, 2025i) *Roush Industries, Inc. Executive Order: A-344-0169-1*, California Air Resources Board, (Accessed April 30, 2025).
28. (CARB, 2025j) *Roush Industries, Inc. Executive Order: A-344-0179*, California Air Resources Board, (Accessed April 30, 2025).
29. (CARB, 2025k) *On-Road Heavy-Duty and Off-Road Compression Ignition Certification Programs: Infrequent Regeneration Adjustment Factor (IRAF)*, California Air Resources Board, (Accessed June 2, 2025).
30. (CARB, 2025l) *EMFAC 2021*, California Air Resources Board, (Accessed June 17, 2025).
31. (CARB, 2025m) *CARB's Methodology for Estimating the Health Effects of Air Pollution*, California Air Resources Board, (Accessed June 4, 2025).
32. (Cummins, 2023) *Submission to Docket ID No. EPA-HQ-OAR-2022-0332*, Matthew W. Spears, Cummins Inc., March 1, 2023.

33. (Cummins, 2025) *An aftertreatment system that meets the future EPA regulations*, Cummins Inc., April 16, 2025.
34. (EMA, 2022a) *Oral Testimony of the Truck and Engine Manufacturers Association*, Jed Mandel, Truck and Engine Manufacturers Association, Public Hearing Date: June 29, 2022.
35. (EMA, 2022b) *Comments of the Truck and Engine Manufacturers Association*, Timothy A. French, Truck and Engine Manufacturers Association, August 1, 2022.
36. (EMA, 2023) *Submission to Docket ID No. EPA-HQ-OAR-2022-0332,* Timothy A. French, Truck and Engine Manufacturers Association, March 6, 2023.
37. (Fann N et al., 2009) *The influence of location, source, and emission type in estimates of the human health benefits of reducing a ton of air pollution*, Neal Fann, Charles M. Fulcher, and Bryan J. Hubbell, Air Qual Atmos Health, 2:169-176, June 9, 2009.
38. (Fann N et al., 2012) *Characterizing the $PM_{2.5}$-related health benefits of emission reductions for 17 industrial, area and mobile emission sectors across the U.S.*, Neal Fann, Kirk R. Baker, and Charles M. Fulcher, Environment International, Volume 49, Pages 141-51, September 28, 2012.
39. (Fann N et al., 2018) *Assessing Human Health $PM_{2.5}$ and Ozone Impacts from U.S. Oil and Natural Gas Sector Emissions in 2025*, Neal Fann, Kirk R. Baker, Elizabeth A. W. Chan, Alison Eyth, Alexander Macpherson, Elizabeth Miller, and Jennifer Snyder, Environmental & Science Technology, Volume 52/Issue 15: 8095−8103, July 13, 2018.
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XIV. Appendices

Appendix A-1: Proposed Amendments to Omnibus Title 13 Regulation Order

Appendix A-1-1: Proposed Amendments to Omnibus Title 13 Regulation Order (Accessible Format)

Appendix A-2: Proposed New Section to Omnibus Title 13 Regulation Order

Appendix A-2-1: Proposed New Section to Omnibus Title 13 Regulation Order (Accessible Format)

Appendix A-3: Proposed Amendments to Title 13 Sections for the Emergency Vehicle Emissions Regulation

Appendix A-3-1: Proposed Amendments to Title 13 Sections for the Emergency Vehicle Emissions Regulation (Accessible Format)

Appendices A-4-1 and A-4-2: Proposed Adoption of Title 13 Sections for the Emergency Vehicle Emissions Regulation

Appendix A-4-1-1 and A-4-2-1: Proposed Adoption of Title 13 Sections for the Emergency Vehicle Emissions Regulation (Accessible Format)

Appendix A-5: Proposed Amendments to Title 17 Sections for the Emergency Vehicle Emissions Regulation

Appendix A-5-1: Proposed Amendments to Title 17 Sections for the Emergency Vehicle Emissions Regulation (Accessible Format)

Appendix A-6: Proposed Adoption of Title 17 Sections for the Emergency Vehicle Emissions Regulation

Appendix A-6-1: Proposed Adoption of Title 17 Sections for the Emergency Vehicle Emissions Regulation (Accessible Format)

Appendix A-7: Proposed LCFS Amendments to Title 17 Regulation Order

Appendix A-7-1: Proposed LCFS Amendments to Title 17 Regulation Order (Accessible Format)

Appendix B-1: Proposed Amendments to California Exhaust Emission Standards and Test Procedures for 2004 Through 2026 Model Heavy-Duty Diesel Engines and Vehicles

Appendix B-1-1: Proposed Amendments to California Exhaust Emission Standards and Test Procedures for 2004 Through 2026 Model Heavy-Duty Diesel Engines and Vehicles (Accessible Format)

Appendix B-2: Proposed Amendments to California Exhaust Emission Standards and Test Procedures for 2004 Through 2026 Model Heavy-Duty Otto-Cycle Engines and Vehicles

Appendix B-2-1: Proposed Amendments to California Exhaust Emission Standards and Test Procedures for 2004 Through 2026 Model Heavy-Duty Otto-Cycle Engines and Vehicles (Accessible Format)

Appendix B-3: Proposed New California Exhaust Emission Standards and Test Procedures for 2027 and Subsequent Model Heavy-Duty Engines, Vehicles and Hybrid Powertrains

Appendix B-3-1: Proposed New California Exhaust Emission Standards and Test Procedures for 2027 and Subsequent Model Heavy-Duty Engines, Vehicles and Hybrid Powertrains (Accessible Format)

Appendix B-4: Proposed Amendments to California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Diesel Engines and Vehicles, amended October 21, 2014

Appendix B-4-1: Proposed Amendments to California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Diesel Engines and Vehicles, October 21, 2014 (Accessible Format)

Appendix B-5: Proposed Amendments to California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Otto-Cycle Engines and Vehicles, amended October 21, 2014

Appendix B-5-1: Proposed Amendments to California Exhaust Emission Standards and Test Procedures for 2004 and Subsequent Model Heavy-Duty Otto-Cycle Engines and Vehicles, October 21, 2014 (Accessible Format)

Appendix B-6: California Evaporative Emission Standards and Test Procedures for 2001 and Subsequent Model Motor Vehicles, amended December 6, 2012

Appendix B-7: California Test Procedures for Evaluating Substitute Fuels and New Clean Fuels in 2015 and Subsequent Years, adopted March 22, 2012

Appendix B-8: California 2015 and Subsequent Model Criteria Pollutant Exhaust Emission Standards and Test Procedures and 2017 and Subsequent Model Greenhouse Gas Exhaust Emission Standards and Test Procedures for Passenger Cars, Light-Duty Trucks, and Medium-Duty Vehicles, amended December 6, 2012

Appendix B-9: California Exhaust Emission Standards and Test Procedures for 2018 and Subsequent Model Zero-Emission Vehicles and Hybrid Electric Vehicles, in the Passenger Car, Light-Duty Truck and Medium-Duty Vehicle Classes, amended September 3, 2015

Appendix B-10: California Refueling Emission Standards and Test Procedures for 2001 and Subsequent Model Motor Vehicles, amended March 22, 2012

Appendix B-11: California Non-Methane Organic Gas Test Procedures for 2017 and Subsequent Model Year Vehicles, adopted September 2, 2015

Appendix B-12: California Greenhouse Gas Exhaust Emission Standards and Test Procedures for 2014 and Subsequent Model Heavy-Duty Vehicles, adopted October 21, 2014

Appendix B-13: California Interim Certification Procedures For 2004 and Subsequent Model Hybrid-Electric and Other Hybrid Vehicles in the Urban Bus and Heavy-Duty Vehicle Classes, amended October 21, 2014

Appendix B-14: California Non-Methane Organic Gas Test Procedures for 1993 Through 2016 Model Year Vehicles, amended September 2, 2015

Appendix C-A-1: Purpose and Rationale for Proposed Amendments to Title 13 Regulation Order for Omnibus

Appendix C-A-2: Purpose and Rationale for Proposed New Section to Title 13 Regulation Order for Omnibus

Appendix C-B-1: Purpose and Rationale for Proposed Amendments to the Heavy-Duty Diesel Engine Test Procedures: California Exhaust Emission Standards and Test Procedures for 2004 Through 2026 Model Heavy-Duty Diesel Engines and Vehicles

Appendix C-B-2: Purpose and Rationale for Proposed Amendments to the Heavy-Duty Otto-Cycle Engine Test Procedures: California Exhaust Emission Standards and Test Procedures for 2004 Through 2026 Model Heavy-Duty Otto-Cycle Engines and Vehicles

Appendix C-B-3: Purpose and Rationale for Proposed New Heavy-Duty Engine Test Procedures: California Exhaust Emission Standards and Test Procedures for 2027 and Subsequent Model Heavy-Duty Engines, Vehicles and Hybrid Powertrains

Appendix D: Costs and Economic Impacts Assessment

Appendix E: Emissions Inventory Methods and Results

Appendix F: Supplement to Initial Statement of Reasons – Proposed Low Carbon Fuel Standard Amendments (includes Purpose and Rationale for Proposed Amendments to the Low Carbon Fuel Standard Regulation)

Appendix G: Supplement to Initial Statement of Reasons – Proposed Emergency Vehicle Emissions Regulations