Appendix D

Costs and Economic Impacts Assessment for the Proposed Amendments

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I. Overview

This appendix provides further details on the cost and economic impacts assessment for this rulemaking to largely align the On-Road Heavy-Duty Engine and Vehicle Omnibus (Omnibus) Regulation with the U.S. Environmental Protection Agency (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) *(U.S. EPA, 2023)* for 2027 and later model year (MY) heavy-duty (HD) and engine-certified medium-duty (MD) engines (hereinafter "Proposed Amendments").

In this rulemaking, California Air Resources Board (CARB) staff proposes to largely align with the federal certification emission standards, off-cycle standards, and test procedures for criteria pollutants for compression-ignition (CI) and spark-ignition (SI) MD engines (MDE) and HD engines (HDE). Additionally, CARB staff is proposing alignment with the federal durability demonstration provisions, Averaging, Banking, and Trading (ABT) program, useful life values and warranty periods, and the 2-bin moving average window (2B-MAW) methodology. In addition to the proposed alignment, CARB staff proposes to end the applicability of the transit agency exemption process beginning with the 2027 MY. CARB staff is also proposing modifications to the HD on-board diagnostic (OBD) Real Emissions Assessment Logging (REAL) parameters through substitution of the REAL not-to-exceed bin with the new 2B-MAW bins, and modifications to the emissions warranty information reporting (EWIR) in-use Corrective Action requirements. The cost and fiscal impacts associated with these Proposed Amendments are discussed in greater detail in this appendix.

On January 6, 2025, the U.S. EPA granted California's request for a Clean Air Act preemption waiver, authorizing the enforcement of the Omnibus regulations.[1] (U.S. EPA, 2025a) On June 12, 2025, President Trump signed a congressional resolution that purported to disapprove this waiver.[2] California and a coalition of states promptly filed suit to challenge this resolution and two others targeting other waivers granted to California.[3] That case remains pending. CARB is not enforcing the Omnibus regulation as a matter of law, including these proposed amendments, pending the outcome of that lawsuit and the grant of a waiver request, if required, by U.S. EPA. CARB is proposing the amendments to the Omnibus regulation as a protective measure in the event it succeeds in its challenge to the congressional resolution disapproving the regulation's waiver of federal preemption under the Clean Air Act. This analysis estimates the costs and economic impacts of the proposed amendments, if enforceable.

[1] 90 Fed. Reg. 643 (Jan. 6, 2025).
[2] H.J. Res. 89 (119th Congress).
[3] *State of California, et al., v. United States of America, et al.,* (ND Cal., case no. 3:25-cv-04966).

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II. Cost Impact

A. Cost Estimate

The Proposed Amendments would largely align CARB's Omnibus requirements for MDEs and HDEs with the EPA-NOx rule, as described in the Clean Truck Partnership (CTP) Agreement *(CARB, 2023)*. The Proposed Amendments would have cost impacts compared to the baseline Omnibus requirements. The cost impact of the Proposed Amendments is the difference between the cost of the Omnibus regulation as amended by the Proposed Amendments and the cost of the current Omnibus regulation (the baseline cost).

Staff analyzed seven major program areas for cost impacts caused by the alignment. These areas include:

1. Engine and Aftertreatment Technology
2. Engine durability testing and reporting requirements
3. Warranty requirements
4. EWIR and Corrective Action
5. In-use testing requirements
6. OBD requirements
7. ABT program
8. Transit agency impacts

The Proposed Amendments are expected to impact engine-certified MD and HD combustion engines sold in California. The projected sales of new engines in California are provided by CARB's on-road mobile source emissions inventory model, Emission FACtors (EMFAC) 2021 *(CARB, 2025a)*.[4] EMFAC incorporates the latest available information on vehicle emission-rates, population, and vehicle miles traveled at the time of rulemaking development. CARB staff adjusted EMFAC2021 outputs for recently adopted regulations, including the Clean Truck Check Program *(CARB, 2025b)*, State and local government fleet requirements within the Advanced Clean Fleets regulation *(CARB, 2025c)*, and the Advanced Clean Fleets requirement for 100% zero-emission HD sales starting in 2036 included in the CTP agreement. A summary of the projected engine sales is presented in Table 1.

Table 1. Projection of California New Combustion Engine Sales by Primary Intended Service Class

MY	CI MDE	Light HDE	Medium HDE	Heavy HDE	SI MDE	SI HDE
2027	161	5,129	5,251	8,618	10	1,639
2028	152	4,528	4,680	7,976	9	1,446
2029	143	3,867	4,071	7,361	9	1,127
2030	134	3,930	4,223	6,964	8	1,019
2031	123	3,375	3,776	6,573	7	909

[4] EMFAC2025 was not available yet when the analysis was conducted.

MY	CI MDE	Light HDE	Medium HDE	Heavy HDE	SI MDE	SI HDE
2032	114	3,011	3,481	6,614	7	799
2033	104	2,632	3,173	6,671	6	688
2034	94	2,207	2,804	6,701	6	575
2035	0	0	0	0	0	0
2036	0	0	0	0	0	0

1. Engine and Aftertreatment Technology

The Proposed Amendments would numerically change the emissions standards for MDEs and HDEs. The difference in the emissions standards does not impact the technology package required to meet emissions limits. The same technology identified in the Omnibus and the EPA-NOx rule would be needed to meet the oxides of nitrogen (NOx) standards of 20 and 35 milligrams per horsepower hour (mg/hp·hr), respectively. The technology package includes: an exhaust gas recirculation cooler bypass, selective catalytic reduction (SCR) system, diesel oxidation catalyst, diesel particulate filter, and additional sensors. No changes in engine production costs, compared to the baseline, were identified as necessary to meet the aligned emissions standards.

2. Durability

2.1 Laboratory Service Accumulation/Aging Amendments

The engine durability demonstration program is conducted by manufacturers certifying new engine families by aging an engine and aftertreatment system while periodically conducting emissions measurements. The costs for a durability program stem from three major sources: (1) fixed costs for programming, planning, installation, and reporting; (2) costs to age an engine a certain number of hours before emissions testing and (3) the cost of emissions testing. The Proposed Amendments would only impact the aging and number of emissions tests compared to the baseline durability requirements. The cost of two distinct durability programs in 2027 and 2031 were estimated for engine families expected to be certified for the 2027 to 2030 MYs and 2031 and subsequent MYs, respectively.

Based on the 2023 certification data, the expected number of durability families is expected to be three for light HDE, four for medium HDE, and six for heavy HDE applications, for durability programs expected in both 2027 and 2031.

For the 2027 and newer MY engines, the required number of hours for aging is expected to decrease compared to the baseline requirements. The cost for aging is expected to be $194.82[5] per hour. Table 2 summarizes the baseline, proposed, and change in hours for the 2027 durability program for each durability engine family (EF).

Table 2. Summary of Baseline and Proposed Durability Aging Requirements in 2027 for Each Durability EF

[5] Omnibus reported aging cost of $160/hour adjusted to 2023$, see *(CARB, 2020a)*.

Engine Application	Baseline (hours)	Proposed (hours)	Incremental Change (hours)*	Incremental Aging Cost**
Light HDE	3,135	1,745	-1,390	-$270,794
Medium HDE	4,395	2,155	-2,240	-$436,388
Heavy HDE	5,785	2,845	-2,940	-$572,759

*Negative values indicate a decrease in the number of hours required.
**Negative values indicate savings compared to the baseline.

The Proposed Amendments would also decrease the number of emissions tests required for each primary intended service class. The Proposed Amendments would decrease the number of emissions tests by two in a durability demonstration for both light HDE and medium HDE applications. The Proposed Amendments would decrease the number of emissions tests by four in a durability demonstration for heavy HDE applications. The cost per emissions test is estimated to be approximately $84,014[6]. Therefore, the Proposed Amendments would decrease the durability testing costs by $168,029 for each light HDE and medium HDE family and decrease the durability testing cost by $336,058 for each heavy HDE family.

The industry-wide incremental change in cost was estimated by multiplying the cost savings from the aging hours and emissions test requirements during the durability program for all the durability engine families. A summary of the number of durability engine families, cost savings from aging and emissions testing per EF, and industry-wide cost savings are provided in Table 3 for the 2027 durability program.

Table 3. Summary of Estimated Industry-wide Durability Costs in 2027

Engine Application	Number of Durability EFs	Aging (per EF)	Testing (per EF)	Industry-wide Cost
Light HDE	3	-$270,794	-$168,029	-$1,316,469
Medium HDE	4	-$436,388	-$168,029	-$2,417,667
Heavy HDE	6	-$572,759	-$336,058	-$5,452,900
Sum	13	-	-	-$9,187,000*

* The sum has been rounded to the nearest $100

For the 2031 proposed durability amendments, the required number of hours for aging is expected to decrease compared to the baseline requirements. The cost for aging is expected to be the same as the 2027 program at $194.82 per hour in 2023 dollars (2023$). Table 4 summarizes the baseline and proposed hours for the 2031 durability program for each durability EF.

Table 4. Summary of Baseline and Proposed Durability Aging Requirements in 2031 for Each Durability EF

[6] Omnibus reported emission testing cost of $69,000 adjusted to 2023$, see *(CARB, 2020a)*.

Engine Application	Baseline (hours)	Proposed (hours)	Incremental Change (hours)	Incremental Aging Cost
Light HDE	3,480	1,745	-1,735	-$338,006
Medium HDE	4,580	2,155	-2,425	-$472,429
Heavy HDE	6,245	2,845	-3,400	-$662,374

The Proposed Amendments would also decrease the number of emissions tests required for each primary intended service class by the same factors in the 2027 durability analysis.

The industry-wide incremental change in cost was estimated by multiplying the cost savings from the aging hours and emissions test requirements during the durability program for all the durability engine families. There are expected to be three, four, and six durability engine families for the light HDE, medium HDE, and heavy HDE categories, respectively. A summary of the number of durability engine families, cost savings from aging and emissions testing per EF, and industry-wide cost savings are provided in Table 5 for the 2031 durability program.

Table 5. Summary of Estimated Industry-wide Durability Costs in 2031

Engine Application	Number of Durability EFs*	Aging (per EF)	Testing (per EF)	Industry-wide Cost
Light HDE	3	-$338,006	-$168,029	-$1,518,104
Medium HDE	4	-$472,429	-$168,029	-$2,561,830
Heavy HDE	6	-$662,374	-$336,058	-$5,990,592
Sum	13	-	-	-$10,070,500*

* The sum has been rounded to the nearest $100

The engine manufacturers are expected to spread the negative incremental impact of the durability amendments amongst the sales volumes associated with each durability program. The total cost savings of $9,187,036 for the 2027 durability program is expected to be spread over a period of 4 years between 2027 and 2030, in the amount of $2,296,759 per year. Similarly, the total cost savings of $10,070,526 for the 2031 durability program is expected to be spread over a period of 4 years from 2031 to 2034, in the amount of $2,517,632 per year.

2.2 Durability In-Use Emissions/REAL Reporting

Under the current Omnibus regulation, manufacturers are required to collect REAL data from 50% of engines to support and validate their durability program. CARB plans to harmonize with the EPA-NOx rule, which does not require REAL data collection for durability demonstrations. As a result, manufacturers would no longer be required to collect and submit REAL data for durability purposes under the Proposed Amendments.

The Proposed Amendments are expected to reduce compliance costs for manufacturers, which in turn could lead to a reduction in pass-through costs to consumers. To assess the cost savings from removing the REAL data requirement, CARB staff analyzed the costs currently associated with REAL data collection, including telematics transfer, database licensing, data storage, and labor for setup and annual reporting.

Currently, the per-engine cost for telematics data transfer is estimated at $36.53[7]. Data storage costs, based on 5 megabytes ($5x10^{-3}$ gigabytes) of data per engine per year at a rate of $0.38 per gigabyte, are minimal. To support the REAL program under current Omnibus, three manufacturers would need to incur database licensing costs of approximately $121,758[8] and invest 1,000 hours of engineer labor (at $68.34/hour[9]) to set up the database and program. It is assumed that five of the eight manufacturers have already developed their REAL systems and

[7] $30 in 2018$, converted to 2023$, see *(CARB, 2020b)*.
[8] $100,000 in 2018$, converted to 2023$, see *(CARB, 2020b)*.
[9] The total benefits are estimated to be 1.429 times the salary. Median mechanical engineer salary reported to be $47.84 per hour in 2023 from U.S. Bureau of Labor Statistics, see *(U.S. Bureau of Labor Statistics, 2025)*.

will not incur these initial setup costs again. All eight manufacturers are also assumed to submit annual reports, requiring 100 hours of engineering time per year per manufacturer.

These costs, as summarized in Table 6, represent the burden that would be avoided under the Proposed Amendments for each calendar year (CY), since manufacturers would no longer be obligated to perform these data collection and reporting activities.

Table 6. Summary of Cost Impact from Removing Durability REAL Reporting

CY	Database Licensing	Labor for Setup and Reporting	Telematics Data Transfer	Data Storage	Total
2027	-$365,275	-$259,703	-$349,910	-$18	-$974,907
2028	$0	-$54,674	-$666,539	-$35	-$721,248
2029	$0	-$54,674	-$948,549	-$49	-$1,003,272
2030	$0	-$54,674	-$1,227,090	-$64	-$1,281,828
2031	$0	-$54,674	-$1,479,990	-$77	-$1,534,741
2032	$0	-$54,674	-$1,371,520	-$71	-$1,426,266
2033	$0	-$54,674	-$1,284,646	-$67	-$1,339,387
2034	$0	-$54,674	-$1,218,249	-$63	-$1,272,986
2035	$0	-$54,674	-$939,707	-$49	-$994,430
2036	$0	-$54,674	-$686,808	-$36	-$741,518
Sum*	-$365,300	-$751,800	-$10,173,000	-$500	-$11,290,600

* The sum has been rounded to the nearest $100

2.3 Durability Cost Summary

The cost reduction from the laboratory service accumulation/aging and the in-use NOx emissions data/REAL reporting due to the Proposed Amendments is summarized in Table 7.

Table 7. Summary of Durability Amendment Costs

CY	Laboratory Service Accumulation/Aging	REAL Reporting	Total
2027	-$2,296,759	-$974,907	-$3,271,666
2028	-$2,296,759	-$721,248	-$3,018,007
2029	-$2,296,759	-$1,003,272	-$3,300,031
2030	-$2,296,759	-$1,281,828	-$3,578,587
2031	-$2,517,632	-$1,534,741	-$4,052,372
2032	-$2,517,632	-$1,426,266	-$3,943,897
2033	-$2,517,632	-$1,339,387	-$3,857,018
2034	-$2,517,632	-$1,272,986	-$3,790,618
2035	$0	-$994,430	-$994,430
2036	$0	-$741,518	-$741,518
Sum*	-$19,257,600	-$11,290,600	-$30,548,100

* The sum has been rounded to the nearest $100

3. Warranty

The current Omnibus implements warranty requirements in two phases for HD engines. The first phase of warranty requirements applies to engine families from 2027 to 2030 MYs. The second phase of warranty requirements applies to engine families of 2031 and subsequent MYs. Staff's proposal is to align Omnibus warranty requirements with the EPA-NOx rule by incorporating the following changes: the Proposed Amendments would eliminate the two-phase warranty process, advance the second phase of the warranty mileage requirements to 2027 for Light HDEs, Medium HDEs, and SI HDEs, and retain the warranty mileage requirements for Heavy HDEs for 2031 and subsequent MYs the same as 2027 through 2030 MYs. In addition, the Proposed Amendments would increase the warranty mileage requirements for engines certified as CI MDE and SI MDE for 2027 and subsequent MYs. Tables 8 and 9 summarize the current warranty requirements and differences between the federal EPA-NOx rule warranty requirements and the current California Omnibus warranty requirements, which the Proposed Amendments aim to align.

Table 8. Summary of EPA-NOx Rule and Omnibus Warranty Requirements in Miles for 2027 to 2030 MY Engines

Engine Application	Federal EPA-NOx Rule	CA Omnibus	∆(Federal-CA)*
Heavy HDE	450,000	450,000	0
Medium HDE	280,000	220,000	60,000
Light HDE	210,000	150,000	60,000
CI MDE	210,000	50,000	160,000
SI HDE	160,000	110,000	50,000
SI MDE	160,000	50,000	110,000

*: ∆(Federal-CA) is the increase in warranty length due to the Proposed Amendments.

Table 9. Summary of EPA-NOx Rule and Omnibus Warranty Requirements in Miles for 2031 and Subsequent MY Engines

Engine Application	Federal EPA-NOx	CA Omnibus	∆ (Federal-CA)**
Heavy HDE	450,000	600,000	-150,000
Medium HDE	280,000	280,000	0
Light HDE	210,000	210,000	0
CI MDE	210,000	50,000	160,000
SI HDE	160,000	160,000	0
SI MDE	160,000	50,000	110,000

**: ∆(Federal-CA) is the increase in warranty length due to the Proposed Amendments.
(The negative value indicates a shorter warranty period under the Proposed Amendments.)

The estimated cost of warranty was estimated using currently known cost of repairs from the Step 1 warranty requirements as cited in the Omnibus rulemaking *(CARB, 2020a)* and is summarized in Table 10 and adjusted to 2023$.

Table 10. Summary of Average Repair Costs per Engine and Corresponding Warranty Period under the Step 1 Warranty Requirements

Engine Application	Avg. Repair Costs from EWIR	Indirect Emissions Parts	Total Avg. Repair Costs	Warranty Period (miles)
Heavy HDE	$2,922	$19	$2,942	350,000
Medium HDE	$3,372	$7	$3,379	150,000
Light HDE	$1,307	$28	$1,335	110,000
CI MDE	$793	$0	$793	50,000
SI HDE	$290	$0	$290	50,000
SI MDE	$0	$0	$78	50,000

The costs or savings for the alignment of warranty requirements are estimated by multiplying the incremental change in mileage of warranty requirements, as listed in Table 8 and Table 9, by an estimated cost per mile of warranty for each primary intended service class. The cost per mile for warranty was estimated for each of the primary intended service classes based on the average repair cost and warranty values in Table 10. Table 11 provides a summary of the warranty cost per mile and the estimated per engine incremental change in warranty cost by primary intended service class in 2027 and 2031.

Table 11. Summary of per Engine Costs due to Proposed Warranty Amendments

Engine Application	Warranty Cost per Mile	Δ (Federal-CA) in 2027-2030	Δ (Federal-CA) in 2031+
Heavy HDE	$0.0084	$0	-$1,261
Medium HDE	$0.0225	$1,352	$0
Light HDE	$0.0121	$728	$0
CI MDE	$0.0159	$2,536	$2,536
SI HDE	$0.0058	$290	$0
SI MDE	$0.0016	$171	$171

The statewide incremental change in cost due to the proposed warranty amendments was estimated by multiplying the per engine costs from Table 11 by the projected sales volumes in Table 1, as shown in Table 12 below.

Warranty is an element that directly impacts the vehicle purchasers. Fleets have been assumed to amortize warranty costs. The amortized warranty cost to fleets, assuming a 5% interest rate per year over a period of five years, is also presented in Table 12.

Table 12. Expected Statewide Incremental Cost due to Proposed Warranty Amendments

CY	CI MDE	Light HDE	Medium HDE	Heavy HDE	SI MDE	SI HDE	Total (Unamortized)	Total (Amortized)
2027	$409,357	$3,734,562	$7,096,964	$0	$1,676	$475,822	$11,718,381	$2,706,651
2028	$385,675	$3,296,847	$6,326,315	$0	$1,596	$419,872	$10,430,305	$5,115,788
2029	$361,635	$2,815,476	$5,502,501	$0	$1,468	$327,097	$9,008,177	$7,196,450
2030	$338,718	$2,861,869	$5,707,600	$0	$1,427	$295,701	$9,205,316	$9,322,646
2031	$312,784	$0	$0	-$8,287,324	$1,251	$263,980	-$7,709,310	$7,541,990
2032	$287,975	$0	$0	-$8,338,211	$1,172	$231,933	-$7,817,130	$3,029,779
2033	$262,823	$0	$0	-$8,410,341	$1,076	$199,578	-$7,946,865	-$1,214,884
2034	$237,612	$0	$0	-$8,447,887	$1,066	$166,930	-$8,042,279	-$5,153,110
2035	$0	$0	$0	$0	$0	$0	$0	-$7,279,306
2036	$0	$0	$0	$0	$0	$0	$0	-$5,498,649
Sum*	$2,596,600	$12,708,800	$24,633,400	-$33,483,800	$10,700	$2,380,900	$8,846,600	$15,767,400

* The sum has been rounded to the nearest $100.

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4. EWIR

4.1. Corrective Action

The current Omnibus regulation introduced EWIR and Corrective Action requirements in three phases that affect MYs 2024 to 2026, 2027 to 2030, and 2031 and subsequent MYs. As the proposed warranty and useful life (UL) periods will be aligned with the EPA-NOx rule's warranty and UL periods, the second and third phases will be combined into a single phase starting from the 2027 MY. Tables 13 and 14 summarize the additional EWIR Corrective Action's mileage coverage due to the alignment, which takes effect from the end of the warranty period to UL for MYs 2027 through 2030 and MYs 2031 and beyond.

Table 13. Proposed Additional EWIR Corrective Action's Coverage for MY 2027-2030 Engines (Unit: 1,000 Miles)

Engine Application	Federal Warranty	Federal UL	CA Warranty	CA UL	Federal ∆(UL-Warranty) [A]	CA ∆(UL-Warranty) [B]	∆ Covered Mileage* [A]-[B]
Heavy HDE	450	650	450	600	200	150	50
Medium HDE	280	350	220	270	70	50	20
Light HDE	210	270	150	190	60	40	20
CI MDE	210	270	50	150	60	100	-40
SI HDE	160	200	110	155	40	45	-5
SI MDE	160	200	50	150	40	100	-60

Table 14. Proposed Additional EWIR Corrective Action's Coverage for MY 2031+ Engines (Unit: 1,000 Miles)

Engine Application	Federal Warranty	Federal UL	CA Warranty	CA UL	Federal ∆(UL-Warranty) [A]	CA ∆(UL-Warranty) [B]	∆ Covered Mileage* [A]-[B]
Heavy HDE	450	650	600	800	200	200	0
Medium HDE	280	350	280	350	70	70	0
Light HDE	210	270	210	270	60	60	0
CI MDE	210	270	50	150	60	100	-40
SI HDE	160	200	160	200	40	40	0
SI MDE	160	200	50	150	40	100	-60

*: In Tables 13 and 14, ∆ Covered Mileage is the additional EWIR Corrective Action's mileage coverage under the Proposed Amendments. (The negative values indicate shorter EWIR Corrective Action mileage coverage under the Proposed Amendments.)

The estimated total cost due to EWIR Corrective Action, which includes all respective costs of anticipated recalls, extended warranty, part storage, EWIR, field information reporting, and emissions information reporting, was discussed in the previous Omnibus rulemaking *(CARB, 2020b)* and is summarized in Table 15. These are normalized as cost per engine per 1,000 miles beyond the current warranty period to current UL. The EWIR Corrective Action costs for CI MDE engines are assumed to have the same per engine costs as the light HDE applications due to their similar engine size. Similarly, the SI MDE engines are assumed to have the same per engine costs as SI HDE due to their similar technology and architecture.

Table 15. Summary of per Engine per 1,000 Miles Cost due to EWIR Corrective Action Amendments (2023$)

CY	CI MDE	Light HDE	Medium HDE	Heavy HDE	SI MDE	SI HDE
2027-2030	$6.30	$6.30	$24.62	$9.18	$2.86	$2.86
2031-2036	$6.80	$6.80	$4.10	$1.56	$1.51	$1.51

Because the Proposed Amendments change the warranty and useful life provisions of the Omnibus regulation, they change the regulatory cost attributed to EWIR Corrective Action. The estimated statewide incremental cost due to EWIR Corrective Action amendments is listed in Table 16. These are estimated by multiplying the per engine per 1,000 miles cost in Table 15 by the total projected sales volumes in Table 1 and the additional mileage coverage shown in Table 13 and Table 14.

Similar to warranty, EWIR Corrective Action is another element that directly impacts vehicle procurement. It is assumed that fleets would amortize EWIR Corrective Action costs over time. The amortized EWIR Corrective Action costs to fleets were estimated by using a 5% interest rate per year over a period of five years. The results are shown in Table 16.

Table 16. Summary of Expected Statewide Incremental Cost due to EWIR Corrective Action Amendment

CY	CI MDE	Light HDE	Medium HDE	Heavy HDE	SI HDE	SI MDE	Total (Unamortized)	Total (Amortized)
2027	-$40,678	$646,385	$2,585,626	$3,954,887	-$1,679	-$23,464	$7,121,076	$1,644,789
2028	-$38,325	$570,625	$2,304,857	$3,660,417	-$1,599	-$20,705	$6,475,269	$3,140,413
2029	-$35,936	$487,308	$2,004,718	$3,377,994	-$1,471	-$16,130	$5,816,483	$4,483,874
2030	-$33,659	$495,338	$2,079,441	$3,196,105	-$1,430	-$14,582	$5,721,213	$5,805,330
2031	-$33,534	$0	$0	$0	-$661	$0	-$34,195	$5,797,432
2032	-$30,874	$0	$0	$0	-$620	$0	-$31,494	$4,145,369
2033	-$28,177	$0	$0	$0	-$569	$0	-$28,746	$2,643,105
2034	-$25,474	$0	$0	$0	-$564	$0	-$26,038	$1,293,630
2035	$0	$0	$0	$0	$0	$0	$0	-$27,826
2036	$0	$0	$0	$0	$0	$0	$0	-$19,928
Sum*	-$266,700	$2,199,700	$8,974,600	$14,189,400	-$8,600	-$74,900	$25,013,600	$28,906,200

* The sum has been rounded to the nearest $100

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4.2. Proposed Amendments to EWIR Reporting

New proposed EWIR amendments include elimination of the requirements for repair labels involving software-only-update recalls, postage paid returned post cards, and proof of correction (POC) involving over-the-air (OTA) recalls. The changes in requirements will apply to 2027 and later MY engines. To estimate the cost of these amendments, CARB staff contacted HD manufacturers for guidance on how they would currently account for these costs in a typical recall.

There were three manufacturers that returned the staff's survey with two manufacturers providing some estimated costs covered by the manufacturer and other costs absorbed by their dealership. The third manufacturer stated that they have not previously accounted for these costs individually, but rather absorbed them into the total recall cost. Based on the total number of MDEs and HDEs sold from 2022 through 2024 MYs and total number of MDEs and HDEs recalled for the corresponding MYs that only involved software updates, staff estimated that, on average, 43% of engines are subject to software-only-update recalls.

The cost savings of eliminating the post card requirement are estimated by multiplying the potential number of engines subjected to a recall by each MY's MDE and HDE sales volume and the post card requirement cost, which includes postage paid ($0.63) and the second notification mail-out handling cost ($2.68), accounting for an estimated 0.1% of post cards that would be returned. On the other hand, the cost savings for the repair label requirement are estimated by multiplying the average recall rate of 43% by each MY's MDE and HDE sales volume and a cost, on average, of $4.15/label and an estimate of 0.3 hours (at $33/hour) of labor to attach the repair label. Lastly, the cost savings of POC requirement elimination for OTA recalls are estimated by multiplying the average recall rate of 43% by each MY's MDE and HDE sales volume by a cost, on average, of $0.10/POC and 0.1 hours, on average, (at $33/hour) of labor to fill out the POC and an expected 80% completion rate of an OTA recalls in the first 6 months. The estimated statewide incremental costs due to EWIR reporting amendments are shown in Table 17.

Table 17. Summary of Statewide Costs due to EWIR Reporting Amendments

CY	Post Card	Repair Label	POC	Total
2027	-$69	-$125,325	-$24,223	-$149,616
2028	-$62	-$113,185	-$21,877	-$135,124
2029	-$55	-$99,839	-$19,297	-$119,191
2030	-$54	-$98,043	-$18,950	-$117,046
2031	-$49	-$88,922	-$17,187	-$106,158
2032	-$46	-$84,476	-$16,328	-$100,850
2033	-$44	-$79,947	-$15,452	-$95,443
2034	-$41	-$74,606	-$14,420	-$89,066
2035	$0	$0	$0	$0
2036	$0	$0	$0	$0
Sum*	-$400	-$764,300	-$147,700	-$912,500

* The sum has been rounded to the nearest $100

4.3. EWIR Cost Summary

In summary, the overall statewide costs due to all proposed EWIR amendments are presented in Table 18 below.

Table 18. Overall Statewide Costs due to All Proposed EWIR Amendments

CY	Corrective Action (Amortized)	Reporting	Total
2027	$1,644,789	-$149,616	$1,495,173
2028	$3,140,413	-$135,124	$3,005,289
2029	$4,483,874	-$119,191	$4,364,683
2030	$5,805,330	-$117,046	$5,688,284
2031	$5,797,432	-$106,158	$5,691,274
2032	$4,145,369	-$100,850	$4,044,519
2033	$2,643,105	-$95,443	$2,547,662
2034	$1,293,630	-$89,066	$1,204,563
2035	-$27,826	$0	-$27,826
2036	-$19,928	$0	-$19,928
Sum*	$28,906,200	-$912,500	$27,993,700

* The sum has been rounded to the nearest $100

5. In-use Testing

The current Omnibus regulation requires manufacturers to perform in-use testing on California-only certified engine families. This requires additional engineers to conduct in-use testing with portable emissions measurement systems. In addition to the baseline data collection, manufacturers are also required to collect additional OBD parameters. To meet these data collection requirements, manufacturers must initially purchase data tracking hardware to interface with the OBD system, employ an engineer to set up methods and protocols, and provide storage for the data. Additionally, HDE manufacturers must coordinate with CARB staff, process the data, and develop reports for CARB. The Proposed Amendments would align CARB's in-use testing program with the federal program, resulting in cost savings compared to the regulatory baseline estimated in the current Omnibus rulemaking.

The Proposed Amendments would reduce the amount of time for an engineer to conduct in-use testing. CARB staff estimates that in-use testing would require two engineers working 12 hours each to handle preparation, testing, data collection, and processing. This translates into approximately $1,640 for a single test.

Testing an EF requires at least five engine tests. In some cases, manufacturers may be required to test additional engines, up to ten engines, depending on the initial results. Such occurrences are expected to be rare, with a weighted frequency of 9:1 between five-engine test orders and ten-engine test orders. The weighted cost for an EF in-use test order is estimated to be $9,021. CARB may request in-use test orders for 25% of a manufacturer's qualifying EFs, defined as those with annual sales volumes exceeding 1,500 units.

The Proposed Amendments would also reduce the cost associated with purchasing hardware and setting up OBD data collection procedures, storage, and reporting. The cost for the required HEM data logger is estimated to be $3,055[10]. An engineer would need approximately 40 hours per manufacturer to set up data collection and protocols. Industry-wide, the hardware and initial setup costs are projected to total $46,309 in 2027.

Manufacturers are expected to reduce labor costs associated with ongoing activities that will be aligned with the federal requirements. HDE manufacturers will save an estimated 80 hours of engineer labor per year for each EF, with 40 hours each for annual coordination with CARB and handling of OBD data. Total labor costs for coordination and data handling are calculated by multiplying the labor cost associated with each EF by the number of EFs subject to in-use testing requests. A summary of these ongoing in-use labor costs is outlined in Table 19.

Table 19. Summary of Cost Impacts for In-Use Testing Program Harmonization

CY	Testing	Initial Costs	Coordination & Data Handling	Total
2027	-$28,806	-$46,309	-$17,458	-$92,573
2028	-$26,066	$0	-$15,798	-$41,864
2029	-$23,216	$0	-$14,070	-$37,286
2030	-$22,931	$0	-$13,897	-$36,828
2031	-$20,820	$0	-$12,618	-$33,438
2032	-$19,876	$0	-$12,046	-$31,923
2033	-$18,914	$0	-$11,463	-$30,377
2034	-$17,750	$0	-$10,758	-$28,508
2035	$0	$0	$0	$0
2036	$0	$0	$0	$0
Sum*	-$178,400	-$46,300	-$108,100	-$332,800

* The sum has been rounded to the nearest $100

6. OBD 2B-MAW Transition

The Proposed Amendments include various updates to the existing OBD requirements. These updates include provisions to ensure the integrity of the OBD II and HD OBD systems, clarify existing requirements, and address manufacturers' implementation concerns. In order to determine the cost of the proposal, staff assessed the cost impact of each proposed revision. The majority of the proposed revisions are not expected to impact costs because the changes involve updating and clarifying existing requirements, providing compliance flexibility, or only involve minor software changes. The main proposed change expected to increase costs is the addition of the 2B-MAW bins to the NOx emissions tracking requirements for HD diesel engine (HD OBD reg) and MD diesel engines certified to applicable engine emissions standards (OBD II reg). Therefore, the costs from the HD OBD and OBD II amendments will be discussed mainly focusing on the proposed 2B-MAW addition.

[10] $2,509 (2018$) adjusted to 2023$, see *(CARB, 2020b)*.

The proposed 2B-MAW amendments to the HD OBD and OBD II regulation impact 2031 and subsequent MY HD diesel engines and MD diesel engines certified to applicable engine emissions standards. The proposed 2B-MAW proposal is needed to make the NOx emissions tracking requirements consistent with the 2B-MAW in-use compliance testing requirements that apply to new diesel engines. The proposed new “Bin A” and “Bin B” would store data following the same 300-second moving window methodology used for 2B-MAW in-use compliance testing. One difference, however, is that any window of data with less than 300 seconds of valid data at the end of a driving cycle would be discarded instead of carried over into the next driving cycle. This simplification relative to the official 2B-MAW methodology reduces the memory requirements for the engine control module.

The cost analysis for the addition of 2B-MAW applies to the HD and MD diesel engines in the HD OBD and OBD II regulations. Since the manufacturers who make MD engines also make HD engines, staff expect the same 2B-MAW algorithm will be applied to all their engine products. Therefore, staff has grouped the costs for the MD and HD diesel engines in this analysis.

The methodology used to determine costs of these OBD proposals is similar to that used in previous cost analysis of the OBD II and HD OBD programs *(CARB, 2018)*. Staff utilized new vehicle/engine certification data for MYs 2022 to 2024 *(CARB, 2025d)*, to model the HD and MD diesel engine manufacturer industry as consisting of 7 “average” sized manufacturers and 1 “large” manufacturer that each produce 3 distinct engine families and 10 distinct engine families, respectively. Therefore, separate cost analyses were conducted for the “average” and “large” manufacturers.

Next, in order to determine the OBD costs of the regulatory proposals, staff broke down the costs into five main categories and determined where costs or savings would be incurred. These cost categories are hardware costs, algorithm development costs, calibration and validation costs, testing costs (durability demonstration engine (DDE) testing and post-certification verification testing), and reporting costs. Hardware costs result from the addition of hardware (e.g., sensors and extra memory on the engine’s on-board computers) for monitoring purposes to comply with the proposed changes. Algorithm development costs include the engineering and other labor costs needed to develop the required OBD system algorithms to comply with the proposal. To adjust the base algorithm to work on every EF, each algorithm will need to be individually calibrated and then validated, resulting in calibration and validation costs. The testing costs mainly include hardware costs, equipment rental costs, and labor costs to conduct the DDE tests and post-certification verification tests. Lastly, reporting costs primarily consist of labor costs to prepare the OBD application and report test results. After examining each cost category, staff proposes that the costs of 2B-MAW addition would consist of potential hardware costs, algorithm development costs, and calibration and validation costs, which are discussed in detail below.

For the addition of 2B-MAW bins in non-volatile random-access memory (NV-RAM), CARB staff believes that manufacturers could add the two new bins without increasing NV-RAM size by replacing the original Not-To-Exceed bin that will not be required after MY 2031. Additionally, the 300 second data buffer used to support the new bins will be stored in the random-access memory (RAM) which is even more plentiful on current engines than NV-RAM

and therefore should be adequate to meet the proposed changes. As such, CARB staff estimates the engine's on-board computers could handle the proposed 2B-MAW changes without requiring increased computer memory.

Algorithm development costs were determined based on staff's engineering judgement and previous experience with NOx emissions tracking. CARB staff expects that most of the details of the 2B-MAW implementation will be developed by the Society of Automotive Engineers International committees, so the development workload for manufacturers will be reduced. CARB staff also assumes that a manufacturer would develop a single base algorithm that can be applied across all different EFs within the manufacturer's product lineup. Additionally, minor modifications to the base algorithm may be needed to accommodate each EF. Since software development costs primarily consist of labor costs, labor rates of $150,000 per year were assumed for software developers. CARB staff estimates the associated labor costs related to algorithm development are $26,775 for the 7"average" sized manufactures and $4,350 for the one "large" manufacturer. Similarly, calibration and validation costs also primarily consist of labor costs. With a labor cost of $150,000 per year, calibration and validation costs are estimated to be $19,950 for the 7 "average" sized manufactures and $8,100 for the 1 "large" manufacturer. In addition, CARB staff assumes the base algorithm development will only be necessary for the first year, while minor algorithm modifications and calibration and validation would be applied for subsequent years.

From the above estimates, the total 2B-MAW-related costs for engine manufacturers are summarized in Table 20. The per engine costs are derived by dividing the total 2B-MAW costs by the projected annual California sales volume for HDEs and MDEs (as listed in Table 1). As shown in Table 20, the incremental cost per engine is $4.27 for the first applicable MY and then decreases to between $2.30 and $2.57 for the following MYs.

Table 20. Summary of 2B-MAW Addition Costs by MY

MY	Hardware	Algorithm Development (Main + Minor)	Calibration & Validation	Total	Cost per Engine
2027	$0	$0	$0	$0	$0
2028	$0	$0	$0	$0	$0
2029	$0	$0	$0	$0	$0
2030	$0	$0	$0	$0	$0
2031	$0	$31,125	$28,050	$59,175	$4.27
2032	$0	$2,325	$28,050	$30,375	$2.30
2033	$0	$2,325	$28,050	$30,375	$2.41
2034	$0	$2,325	$28,050	$30,375	$2.57
2035	$0	$0	$0	$0	$0
2036	$0	$0	$0	$0	$0
Sum*	$0	$38,100	$112,200	$150,300	-

* The sum has been rounded to the nearest $100

7. ABT Program

The Proposed Amendments intend to harmonize federal and California ABT requirements. The California specific ABT program adopted for the Omnibus rulemaking would no longer be needed as credits could be tracked nationally. This would provide savings for the industry. It is estimated that each manufacturer would require 20 hours ($68.34 per hour) for an engineer to track California specific ABT credits. There are a total of 31 manufacturers involved in the ABT program. Ending the California specific ABT program would provide industry-wide savings of $42,373 annually.

8. Transit Agency Exemption

The Proposed Amendments would end the applicability of the Omnibus transit agency exemption at the end of the 2026 MY. For 2027 and 2028 MYs, diesel-fueled buses purchased by transit agencies would be required to have engines meeting the harmonized emissions standards. This would require manufacturers to certify new EFs in California. The base certification costs in 2027 are estimated to be $131,243 per EF, and the carryover certification costs in 2028 are estimated to be $34,134 per EF. There are currently two HD diesel-fueled engine families used by transit agencies. Therefore, the total certification costs are estimated to be $232,486 in 2027 and $68,268 in 2028. Starting in 2029, the Innovative Clean Transit regulation will require all new bus purchases by California transit fleets to be zero-emission.

New engine purchases by transit agencies are estimated by using EMFAC's Urban Bus category *(CARB, 2025a)*. A summary of the new sales projections for transit buses is presented in Table 21.

Table 21. New Transit Bus Sales Projections by Primary Intended Service Class

CY	Medium HDE	Heavy HDE
2027	8	73
2028	9	38

The estimated incremental technology costs and operating costs for a transit vehicle to meet the 2027 MY emissions standards were derived from the EPA-NOx rule estimates *(U.S. EPA, 2022)* and converted to 2023$, as shown in Table 22 below. The technology cost reflects the direct plus indirect cost per vehicle in the specific MY, where direct costs refer to estimated direct manufacturing costs and indirect costs refer to estimated costs such as research and development, warranty, and administrative costs incurred by manufacturers in achieving compliance. The increase in operating costs is associated with the increased diesel exhaust fluid consumption in diesel-fueled engines meeting the 2027 emissions standards.

Table 22. Incremental Costs in Technology and Operating Costs for a Transit Vehicle

Cost Item	Medium HDE	Heavy HDE
Technology	$6,569	$10,111
Operating	$2,032	$2,032
Total	$8,601	$12,143

Statewide incremental costs related to the Proposed Amendments to the transit agency exemption are calculated by multiplying the technology and operating costs from Table 22 with the new transit bus sales from Table 21, and then adding the certification costs for each MY, as detailed in Table 23 below.

Table 23. Statewide Costs Related to the Proposed Amendments to Transit Agency Exemption

CY	Technology & Operating Costs	Certification Costs	Total
2027	$952,057	$262,486	$1,214,544
2028	$535,404	$68,268	$603,672
Sum*	$1,487,500	$330,800	$1,818,200

* The sum has been rounded to the nearest $100

B. Statewide Costs due to the Proposed Amendments

In summary, the Proposed Amendments are expected to impact the purchase price of HD vehicles purchased by fleets. Table 24 summarizes the expected statewide cost impact as a result of the Proposed Amendments.

Table 24. Summary of Statewide Cost Impacts due to the Proposed Amendments

CY	Durability	Warranty	EWIR	In-Use Testing	OBD	ABT	Transit	Statewide Impact
2027	-$3,271,666	$2,706,651	$1,495,173	-$92,573	$0	-$42,373	$1,214,544	$2,009,756
2028	-$3,018,007	$5,115,788	$3,005,289	-$41,864	$0	-$42,373	$603,672	$5,622,507
2029	-$3,300,031	$7,196,450	$4,364,683	-$37,286	$0	-$42,373	$0	$8,181,443
2030	-$3,578,587	$9,322,646	$5,688,284	-$36,828	$0	-$42,373	$0	$11,353,143
2031	-$4,052,372	$7,541,990	$5,691,274	-$33,438	$59,175	-$42,373	$0	$9,164,256
2032	-$3,943,897	$3,029,779	$4,044,519	-$31,923	$30,375	-$42,373	$0	$3,086,481
2033	-$3,857,018	-$1,214,884	$2,547,662	-$30,377	$30,375	-$42,373	$0	-$2,566,615
2034	-$3,790,618	-$5,153,110	$1,204,563	-$28,508	$30,375	-$42,373	$0	-$7,779,669
2035	-$994,430	-$7,279,306	-$27,826	$0	$0	$0	$0	-$8,301,562
2036	-$741,518	-$5,498,649	-$19,928	$0	$0	$0	$0	-$6,260,095
Sum*	-$30,548,100	$15,767,400	$27,993,700	-$332,800	$150,300	-$339,000	$1,818,200	$14,509,600

* The sum has been rounded to the nearest $100

C. Costs to Businesses due to the Proposed Amendments

1. Businesses Impacted

MD and HD engine/vehicle manufacturers would be the regulated entities under the Proposed Amendments. Since these manufacturers are located outside of California, CARB staff assumes the direct cost impact on these manufacturers would be passed onto California fleets that purchase California-certified vehicles. CARB staff estimates the number of impacted California fleets using the combined database from the Department of Motor Vehicles registration data, Dun & Bradstreet database *(Dun & Bradstreet, 2020)*, and CARB's latest (2023) Fleet Database *(CARB, 2025e)*, which suggest about 150,759 MD and HD fleets (GVWR>10,000 pounds, engine-certified vehicles only, including owner operators) are registered in California. CARB staff estimated the number of impacted engine/vehicle manufacturers using CARB's certification data, which suggests about 31 MD and HD engine/vehicle manufacturers certify their new engines and vehicles with CARB. Therefore, the Proposed Amendments would directly impact a total of approximately 150,790 businesses.

The impacted businesses were evaluated under a few different systems, including the North American Industrial Classification System (NAICS) and its assigned industry codes. The Proposed Amendments would directly impact MD and HD Truck Transportation (NAICS 484) and engine/vehicle manufacturers (NAICS 3363 and 3361, respectively). These NAICS codes include MD and HD fleets in California that purchase California-certified vehicles, as CARB staff assumes MDE and HDE engine/vehicle manufacturers would immediately pass on the increased upfront cost due to the Proposed Amendments to the vehicle/engine buyers and end users.

In addition, the Proposed Amendments would cause vehicle owners to be more likely to maintain and repair their vehicles during the longer warranty periods that are part of the Proposed Amendments. Hence, secondary industries such as HD repair shops, dealerships (NAICS 4411), and independent repair facilities (NAICS 8111), would also be impacted due to warranty-related repairs under the Proposed Amendments.

For the impacted California fleets, there are about 120,567 small fleets[11], which is about 80% of the total impacted fleets in California. These small business fleets own about 25% of the total MD and HD vehicles in California. For the impacted engine/vehicle manufacturers, there are about 10 small businesses[12], which is about 32% of the total impacted manufacturers. In

[11] For the purposes of this analysis, CARB staff assumed fleets that own three or fewer vehicles to be small businesses.

[12] Small business size criteria set by the Small Business Administration (SBA). SBA defines a small business by the maximum number of employees for transportation equipment manufacturing sector, for example, this is currently 1,050 for gasoline engine manufacturing (NAICS code 336310) and 1,500 for other engine manufacturing (NAICS code 333618) *(SBA, 2025)*.

total, therefore, there would be about 120,577 small businesses impacted, which is about 80% of the total impacted businesses.

2. Costs to Businesses

The Proposed Amendments regulate the engine manufacturers, which are exclusively located outside of California. Costs are expected to be passed onto businesses and fleets purchasing and operating HDEs. Except for the transit bus engines, which are assumed to be all purchased by local government agencies, the fraction of new non-transit engine sales is estimated to be 10.7% and 3.3% for local government and state government fleets, respectively. The percentage of new non-transit engine sales for businesses is estimated to be approximately 86% of total new non-transit engine sales, thus 86% of the total costs for non-transit engines presented in Table 24 will have an impact on businesses, with an estimated cost of $32.3 million between 2027 and 2032, as shown in Table 25 below.

Table 24 shows the total costs to businesses and local and state governments due to the Proposed Amendments. Table 25 shows the costs to businesses only due to the Proposed Amendments. The costs in Table 25 are lower than in Table 24 because Table 25 does not include costs to local and state governments.

The estimated cost of the Proposed Amendments to California businesses is less than $10 million in any year from 2027 to 2036, with the highest annual cost being $9.8 million in 2030, as illustrated in Table 25. Therefore, the Proposed Amendments are not a major regulation.

Table 25. Summary of Cost to Businesses due to the Proposed Amendments

CY	Durability	Warranty	EWIR	In-Use Testing	OBD	ABT	Total Cost to Businesses
2027	-$2,813,633	$2,327,719	$1,285,849	-$79,613	$0	-$36,440	$683,882
2028	-$2,595,486	$4,399,578	$2,584,549	-$36,003	$0	-$36,440	$4,316,198
2029	-$2,838,027	$6,188,947	$3,753,627	-$32,066	$0	-$36,440	$7,036,041
2030	-$3,077,585	$8,017,476	$4,891,924	-$31,672	$0	-$36,440	$9,763,703
2031	-$3,485,040	$6,486,111	$4,894,496	-$28,756	$50,891	-$36,440	$7,881,260
2032	-$3,391,752	$2,605,610	$3,478,286	-$27,453	$26,123	-$36,440	$2,654,373
2033	-$3,317,036	-$1,044,800	$2,190,990	-$26,125	$26,123	-$36,440	-$2,207,289
2034	-$3,259,931	-$4,431,674	$1,035,925	-$24,517	$26,123	-$36,440	-$6,690,515
2035	-$855,210	-$6,260,203	-$23,931	$0	$0	$0	-$7,139,344
2036	-$637,705	-$4,728,838	-$17,138	$0	$0	$0	-$5,383,682
Sum*	-$26,271,400	$13,559,900	$24,074,600	-$286,200	$129,300	-$291,500	$10,914,600

* The sum has been rounded to the nearest $100

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2.1. Costs to Typical Small Business

Small businesses impacted by the Proposed Amendments are defined as small fleets that own three or fewer vehicles with HDEs. The percentage of new engines purchased by small businesses is estimated to be approximately 25% of total new engine sales.

Given that HD vehicles have 10+ years of UL and small businesses may have limited budgets, it is reasonable to assume that a small business is unlikely to replace or purchase an entire fleet of its vehicles at once. Therefore, a single engine/vehicle purchase is modeled for small businesses. An overall average per engine cost due to the Proposed Amendments is estimated at $100, by dividing the net impact of the regulation by the number of total engine sales. The costs by primary intended service class are also calculated, ranging from a saving of $347 to a cost of $2,265 per engine, as shown in Table 26 below. The Proposed Amendments are not expected to impose any ongoing costs.

Table 26. Small Business Cost Example for Purchasing Single Engine

Engine Class	CI MDE	Light HDE	Medium HDE	Heavy HDE	SI MDE	SI HDE	Average
Cost	$2,265	$509	$1,057	-$347	$22	$269	$100

2.2. Costs to Typical Business

Typical fleets may purchase more engines per year than small fleets. To provide an example, staff analyzed a fleet that might purchase 20 engines in a single year. A typical fleet is estimated to incur an incremental cost of $2,000 on average to purchase 20 engines. The costs by primary intended service class are also calculated, ranging from a savings of $6,938 to a cost of $45,295 for purchasing 20 engines, as shown in Table 27 below. Staff does not expect any change in ongoing costs as a result of the Proposed Amendments.

Table 27. Typical Business Cost Example for Purchasing 20 Engines

Engine Class	CI MDE	Light HDE	Medium HDE	Heavy HDE	SI MDE	SI HDE	Average
Cost	$45,295	$10,173	$21,141	-$6,938	$434	$5,374	$2,000

D. Costs to Individuals due to the Proposed Amendments

The Proposed Amendments directly regulate the engine manufacturers. The manufacturers are expected to pass on any savings or costs to the fleet owners purchasing new vehicles. HD and MD vehicles are assumed to be purchased for business purposes and not for personal use, thus no costs are estimated to be passed onto individuals.

III. Fiscal Impact

A. Fiscal Impact on Local Government

The Proposed Amendments are expected to have a fiscal impact on local governments. Fiscal impacts are expected to stem from local government fleet purchases and tax revenue from statewide sales. Local government fleet purchases are estimated to be 100% of transit vehicle sales and approximately 10.7% of statewide non-transit vehicle sales. As a result, local governments are expected to bear 100% of the transit vehicle cost and 10.7% of statewide non-transit vehicle costs. Local governments are estimated to receive 4.8% in tax revenue from statewide vehicle sales to businesses. A summary of the annual expected fiscal impacts on local governments is presented in Table 28.

Table 28. Summary of Fiscal Impact on Local Governments

CY	Cost to Local Government Fleets[A]	Local Tax Revenue[B]	Net Impact[C]
2027	$1,299,632	$33,237	$1,266,395
2028	$1,140,687	$209,767	$930,920
2029	$875,414	$341,952	$533,463
2030	$1,214,786	$474,516	$740,270
2031	$980,575	$383,029	$597,546
2032	$330,253	$129,003	$201,251
2033	-$274,628	-$107,274	-$167,354
2034	-$832,425	-$325,159	-$507,266
2035	-$888,267	-$346,972	-$541,295
2036	-$669,830	-$261,647	-$408,183
Total[D]	$3,176,200	$530,500	$2,645,700

[A]: Negative values represent savings to fleets.
[B]: Negative values for tax revenue indicate a decrease in projected tax revenue.
[C]: Net fiscal impact is calculated as the cost to government fleets subtracted by the local tax revenue. Negative values for net impact represent savings (reduced cost) to local government.
[D]: The total has been rounded to the nearest $100.

As shown in Table 28, the Proposed Amendments are estimated to result in $5.84 million in costs to local government fleets from 2027 to 2032, and $2.67 million in savings to local government fleets from 2033 to 2036. The Proposed Amendments are estimated to result in $1.57 million of additional local tax revenue from 2027 to 2032, and $1.04 million in decreased local tax revenue from 2033 to 2036. Between 2027 and 2036, the overall net fiscal impact from the Proposed Amendments on local governments is a cost of about $2.65 million.

Costs to local government are not reimbursable pursuant to Section 6 of Article XIII B of the California Constitution and Part 7 (commencing with Section 17500) of Division 4 of the Government Code. These costs are not reimbursable because this action neither compels local agencies to provide new governmental functions (i.e., it does not require such agencies to provide additional services to the public), nor imposes requirements that apply only on local agencies or school districts *(Supreme Court of California, 1987)*. Instead, this regulatory action

establishes requirements that impacts all individuals and entities that own or operate impacted vehicles. This action also does not compel local agencies to increase the actual level or quality of services that they already provide the public *(Supreme Court of California, 2004)*. For the foregoing reasons, any costs incurred by local agencies to comply with this regulatory action are not reimbursable *(Supreme Court of California, 1987)*.

B. Fiscal Impact on State Government

The Proposed Amendments are expected to have a fiscal impact on state governments. Fiscal impacts are expected to stem from state government fleet purchases and tax revenue from statewide sales. State government fleet purchases are estimated to be approximately 3.3% of statewide non-transit vehicle sales; therefore, state governments are expected to bear 3.3% of statewide estimated non-transit vehicle costs. State governments are estimated to receive 3.9% in tax revenue from statewide vehicle sales to businesses. A summary of the annual expected fiscal impacts on state governments is presented in Table 29.

Table 29. Summary of Fiscal Impact on State Governments

CY	Cost to State Government Fleets[A]	State Tax Revenue[B]	Net Impact[C]
2027	$26,242	$26,945	-$703
2028	$165,622	$170,058	-$4,437
2029	$269,988	$277,220	-$7,232
2030	$374,654	$384,690	-$10,036
2031	$302,420	$310,522	-$8,101
2032	$101,854	$104,582	-$2,728
2033	-$84,698	-$86,967	$2,269
2034	-$256,729	-$263,606	$6,877
2035	-$273,952	-$281,290	$7,339
2036	-$206,583	-$212,117	$5,534
Total[D]	$418,800	$430,000	-$11,200

[A]: Negative values represent savings to fleets.
[B]: Negative values for tax revenue indicate a decrease in projected tax revenue.
[C]: Net fiscal impact is calculated as the cost to government fleets subtracted by the state tax revenue. Negative values for net impact represent savings (reduced cost) to state government.
[D]: The total has been rounded to the nearest $100.

As shown in Table 29, the Proposed Amendments are estimated to result in $1.24 million in costs to state government fleets from 2027 to 2032, and $0.82 million in savings to state government fleets from 2033 to 2036. The Proposed Amendments are estimated to result in $1.27 million of additional state tax revenue from 2027 to 2032, and $0.84 million in decreased state tax revenue from 2033 to 2036. Between 2027 and 2036, the overall net fiscal impact from the Proposed Amendments on state government is a saving of about $11,000.

IV. Alternatives to the Regulation

A. Alternative 1: No Action

Staff considered a business-as-usual scenario. Under Alternative 1, HD engines sold in California must meet the requirements of the existing Omnibus regulation. Staff estimated that there would be no costs or savings under Alternative 1.

B. Alternative 2: Maintain the 2024 Omnibus Requirements

Staff considered a less stringent alternative, Alternative 2. The current Omnibus regulation has emissions standards of 0.050 g/hp·hr NOx starting in 2024, stricter emissions standards starting in 2027, and then longer useful lives starting in 2031. Alternative 2 would maintain the 2024 MY Omnibus requirements for 2027 and later MYs. Alternative 2 would be expected to reduce the costs for durability demonstration as well as warranty requirements. Under this alternative, California would maintain its in-use requirements, ABT requirements, OBD requirements, and transit agency exemption; therefore, there are no cost changes from these elements.

Because Alternative 2 is less stringent than the current Omnibus regulation, it would lead to savings of $729 million from 2027 to 2036, as shown in Table 30, and would lead to greater increased NOx emissions compared to the baseline, as summarized in Section X of the Staff Report: Initial Statement of Reasons for the Proposed Amendments.

Table 30. Statewide Cost Impact from Alternative 2

CY	Technology	Durability	Warranty	EWIR	Total
2027	-$70,031,124	-$1,039,952	-$4,292,383	-$1,917,772	-$77,281,231
2028	-$63,467,623	-$1,039,952	-$8,169,622	-$3,665,401	-$76,342,598
2029	-$56,672,888	-$1,039,952	-$11,605,558	-$5,240,916	-$74,559,315
2030	-$55,881,276	-$1,039,952	-$15,018,261	-$6,779,543	-$78,719,031
2031	-$65,199,796	-$1,260,825	-$21,842,588	-$7,482,578	-$95,785,787
2032	-$62,584,378	-$1,260,825	-$24,076,807	-$6,231,952	-$94,153,962
2033	-$59,929,973	-$1,260,825	-$26,422,908	-$5,108,678	-$92,722,385
2034	-$56,661,692	-$1,260,825	-$28,839,408	-$4,107,265	-$90,869,190
2035	$0	$0	-$25,426,706	-$2,568,639	-$27,995,345
2036	$0	$0	-$18,602,378	-$1,865,604	-$20,467,982
Total*	-$490,428,700	-$9,203,100	-$184,296,600	-$44,968,300	-$728,896,800

* The total has been rounded to the nearest $100

V. References

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2. (CARB, 2020a) *Proposed Heavy-Duty Engine and Vehicle Omnibus Regulation and Associated Amendments - Standardized Regulatory Impact Assessment (SRIA)*, California Air Resources Board, Date of Hearing: August 27, 2020.
3. (CARB, 2020b) 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, 2023) *Clean Truck Partnership Agreement*, California Air Resources Board, July 5, 2023.
5. (CARB, 2025a) *EMFAC2021*, California Air Resources Board, (Accessed June 17, 2025).
6. (CARB, 2025b) *Clean Truck Check (HD I/M)*, California Air Resources Board, (Accessed June 17, 2025).
7. (CARB, 2025c) *Advanced Clean Fleets*, California Air Resources Board, (Accessed June 17, 2025).
8. (CARB, 2025d) *New Vehicle and Engine Certification: Executive Orders for Compression-Ignition and Heavy-Duty Engines and Vehicles*, California Air Resources Board, (Accessed June 17, 2025).
9. (CARB, 2025e) *Fleet Database*, California Air Resources Board, (Accessed June 17, 2025).
10. (Dun & Bradstreet, 2020), Dun & Bradstreet® Database, acquired from internal communication with CARB's Mobile Source Control Division, 2020.
11. (SBA, 2025) *What size standards has SBA identified by North American Industry Classification System codes?* SBA, 13 CFR 121.201, (Accessed June 16, 2025).
12. (Supreme Court of California, 1987), County of Los Angeles v. State of California, 43 Cal 3d 46 (1987), Supreme Court of California, 1987.
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14. (U.S. Bureau of Labor Statistics, 2025) *Occupational Employment and Wages, May 2023 – 17-2141 Mechanical Engineers*, U.S. Bureau of Labor Statistics, (Accessed June 11, 2025).
15. (U.S. EPA, 2022) *Control of Air Pollution from New Motor Vehicles: Heavy-Duty Engine and Vehicle Standards - Regulatory Impact Analysis*, U.S. Environmental Protection Agency, EPA-420-R-22-035, December 2022.
16. (U.S. EPA, 2023) Final Rule: *Control of Air Pollution from New Motor Vehicles: Heavy-Duty Engine and Vehicle Standards*, Federal Register Vol. 88, No. 15, January 24, 2023.