

CLEAN TRUCK TECHNOLOGY COMPARATIVE REPORT 6 Incentives and Regulations

METRO GOODS MOVEMENT PLANNING



Metro

MAY 2022

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Nomenclature

AB	Assembly Bill
ACF	Advanced Clean Fleets
ACT	Advanced Clean Trucks
AQMD	Air Quality Management District
AQMP	Air Quality Management Plan
BEV	Battery-Electric Vehicle
CAA	Clean Air Act
CAIRP	California Registered International Registration Plan
CAP	Community Air Protection
CARB	California Air Resources Board
CERP	Community Emissions Reduction Plan
CRT	Charge Ready Transport
DPM	Diesel Particulate Matter
EMFAC	EMission FACtor
EnergIIZE	Energy Infrastructure Incentives for Zero-Emission
EPA	Environmental Protection Agency
ER	Emergency Room
FCEV	Fuel Cell Electric Vehicle
GHG	Greenhouse Gas
HD I&M	Heavy-Duty Inspection and Maintenance
HD Omnibus	Heavy-Duty Engine and Vehicle Omnibus Regulation
ISOR	Initial Statement of Reasons
IWG	Interagency Working Group
LCFS	Low Carbon Fuel Standard
MATES V	Multiple Air Toxics Exposure Study
NAAQS	National Air Ambient Air Quality Standards
NEVI	National Electric Vehicle Infrastructure
NOx	Nitrogen Oxides

NREL	National Renewable Energy Laboratory
NZE	Near-Zero Emission
PPB	Parts per Billion
PPM	Parts per Million
SB	Senate Bill
SCAB	South Coast Air Basin
SC-CO2	Social Cost of Carbon Dioxide
SIP	State Implementation Plan
SRIA	Standardized Regulatory Impact Assessment
SSP	Sustainability Strategic Plan
TTW	Tank to Wheel
VMT	Vehicle Miles Traveled
VOC	Volatile Organic Compounds
ZE	Zero-Emission
ZEV	Zero-Emission Vehicle

1 Background and Overview

The purpose of this report is to discuss the key role different incentives and regulations have played in the adoption of clean technologies. Different clean technology platforms, such as diesel with reduced emissions, low-NOx natural gas, and zero-emission (ZE) vehicles (ZEV), are core to realizing meaningful public health and emissions reductions benefits for California's disadvantaged communities. The policy landscape – grants, incentives, implementation plans, and regulations – has been instrumental in facilitating markets and private investments. This report will leverage the impact of incentive programs developed that resulted in achievements such as significant adoption of light-duty ZEVs. This work will also enumerate regulations, such as heavy-duty (HD) engine standards and zero emission truck regulations, that have contributed to reductions in emissions and accelerating clean technology penetration in the transportation sector.

This report opens with an incentive program overview, delineating the genesis and needs for monetary incentives and grants. Summaries of each identified grant and incentive program are prepared based on existing documentation developed by local and state agencies, such as California Air Resources Board (CARB), Ports of Los Angeles and Long Beach (POLA, POLB), South Coast Air Quality Management District (SCAQMD), Southern California Edison (SCE), and Los Angeles Department of Water and Power (LADWP). Here, the report will describe some of the key programs for vehicle replacement and clean technology adoption, and infrastructure. Upon the comprehensive overview on grants and incentives, the report documents to chronicle local, state, and federal government regulations, their requirements, and timelines for implementation. These regulations have been instrumental in establishing a linkage between clean technologies, infrastructure, and public health and emissions benefits. The regulations section of this report will present the prospective emissions benefits from reductions of Nitrogen Oxides (NOx), Diesel Particulate Matter (DPM), and greenhouse gases (GHG) for the South Coast Air Basin (SCAB) where available (potential statewide benefits are illustrated when SCAB level is not available). Also, if available, the potential public health benefits resulting from each regulation will be outlined and qualified. Another purpose of this discussion is to emphasize how each of the policies support the acceleration of clean technology adoption.

This report also centers attention towards local and state government air quality planning efforts via implementation plans. Although these implementation plans are not subordinate to laws the way regulations are, they are still valuable considerations in the overall policy landscape and in discussions of setting long-term emissions reductions targets. These plans offer supplementary evidence to the importance of the discussed regulations. This section will largely focus on the Draft 2022 State Strategy for the State Implementation Plan (SIP) and Draft 2022 South Coast Air Quality Management Plan (AQMP), as these planning efforts propose strategies that target Class 8 trucks and call for additional measures to accelerate ZEV penetration and further emissions reductions. This report closes the outlook on incentive programs, regulations, and planning efforts on their role in accelerated adoption of clean technologies in the transportation sector. In this effort to support continued discussion amongst Metro staff, policy makers, and other stakeholders, a referential summary has been produced by ICF and shown in Table 30. Having more informed audiences in this space may spur additional aid to more effectively achieve the clean technology portfolio and benefits explored in previous reports.

2 Incentive Programs

There are various incentive programs at the state and local level within Los Angeles (LA) County that support accelerated transition to clean trucks and zero emission infrastructure. These programs include CARB's Hybrid and Zero-Emission Truck and Bus Voucher Incentive Project (HVIP), Carl Moyer, Volkswagen Environmental Mitigation Program, Truck Loan Assistance program, CEC's Clean Transportation Program, as well as programs offered by local Investor-Owned Utilities such as SCE. In this section, we will provide a comprehensive review of the incentive programs available within LA county, describe their structure, and eligibility requirements. As part of this section, we will also highlight some of the gaps and barriers within the existing incentive portfolios that may impede the adoption of clean combustion and zero emission technologies.

2.1 Hybrid and Zero-Emission Truck and Bus Voucher Incentive Project (HVIP)

The California Hybrid and Zero-Emission Truck and Bus Voucher Incentive Project also known as HVIP, is one of CARB's key advanced technology heavy-duty incentive programs, providing funding since 2010 to support the long-term transition to ZEV. This is streamlined program that accelerates the early market adoption of ZE and other eligible trucks and buses, including plug-in hybrids; and vehicles using engines certified to the optional Low NOx standard of 0.01 g/bhp-hr¹. All fleets are eligible, whether they are public or private, large or small. HVIP is intended to address one of the biggest barriers to the purchase of medium- and heavy-duty zero emission trucks: the high incremental cost of these vehicles in the early market years when production volumes are still low. HVIP is one of the very few incentive programs that is exclusively designed to support market adoption of on-road heavy duty advanced technologies and does not provide funding for other mobile sources such as off-road equipment.

HVIP is a point-of-sale incentive program that provides a voucher for the vehicle incentive amount to a registered HVIP dealer² for eligible vehicles³. The dealer will then provide the discount to the purchaser at the time of sale, and the voucher is redeemable by the dealer at the time the vehicle or engine is delivered and/or when required voucher redemption paperwork is complete. An approved vehicle's voucher amount is determined by the vehicle's Base Incentive amount, as shown in Table 1, which is associated with the vehicle's weight class and then multiplied by the appropriate modifiers, as shown in Table 2. A plus-up modifier increases the voucher amount while a discount modifier decreases the voucher amount. There can be multiple modifiers, but the additions or subtractions do not compound. For example, a full-sized urban bus (Class 8, \$120,000), sold to a transit agency (15% x \$120,000), and domiciled in a DAC (10% x \$120,000) would receive the base voucher amount of \$120,000 plus the sum of its modifiers (\$18,000 + \$12,000), or \$150,000.

Table 1. ZEV Base Vehicle Incentive Amount⁴

Vehicle Weight Class	Base Vehicle Incentive
Class 2b	TBD
Class 3	\$45,000
Class 4-5	\$60,000
Class 6-7	\$85,000
Class 8	\$120,000

¹ In August 2020, CARB approved for adoption the Heavy-Duty Engine and Vehicle Omnibus Regulation and Associated Amendments, which creates a new optional standard of 0.01 g/bhp-hr NOx

² <https://californiahvip.org/dealerlist/>

³ <https://californiahvip.org/vehiclecatalog/>

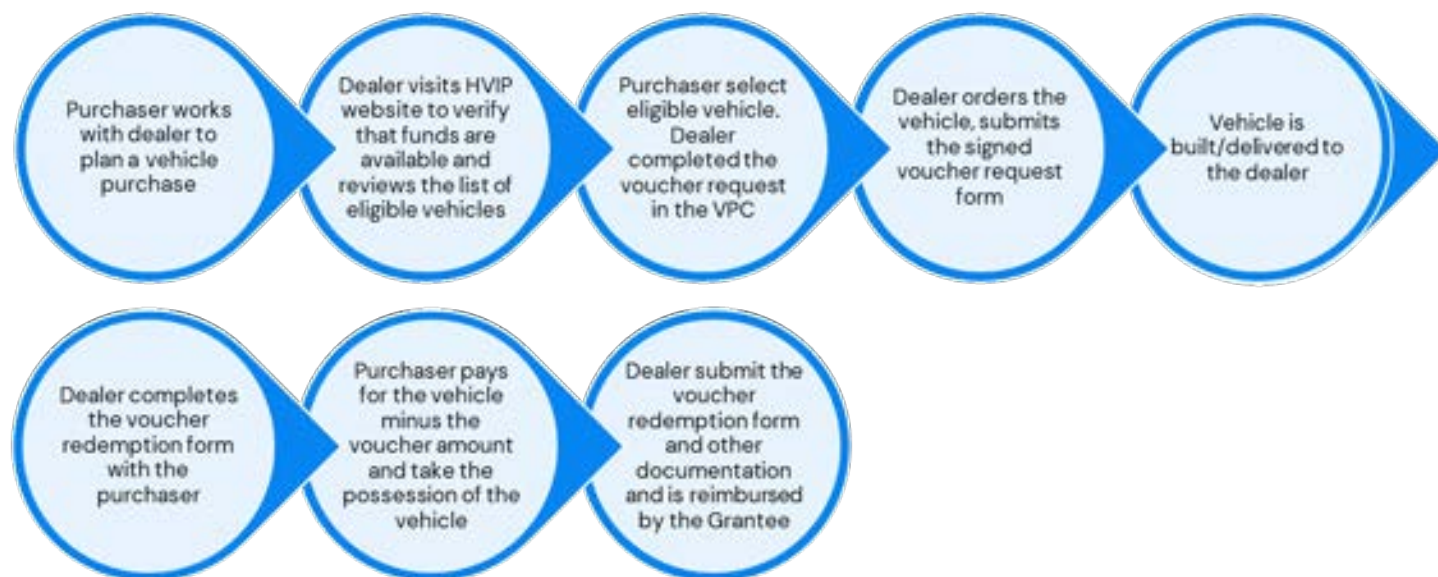
⁴ <https://californiahvip.org/wp-content/uploads/2021/04/HVIP-FY20-21-Implementation-Manual-FINAL-210429.pdf>

Table 2. ZEV Voucher Modifiers (plus-ups and discounts from base)

Modifier	Plus-up or Discount Rate
Disadvantaged Community	+10%
Class 8 Fuel Cell	+100%
Public Transit Agency	+15%
School Bus for Public School District	+65%
Plug-in Hybrid (> 35 mi All Electric Range)	-50%
In-Use Converted/Remanufactured	-50%

Error! Reference source not found. below provides a summary of purchase transactions involved with HVIP incentive program. As shown, HVIP provides the voucher to dealers and put the application burden on dealers as opposed to vehicle purchasers. This could be considered as one of the key elements for successful implementation of the HVIP program. However, HVIP also defines several responsibilities for the purchasers (e.g., purchaser must demonstrate access to necessary charging/fueling equipment at the domicile location located in California) which in some cases could make it difficult for the purchasers (especially owner-operators) to utilize incentive funds made available through HVIP. For more details on purchasers' responsibilities, see HVIP Implementation Manual⁵.

Figure 1. HVIP Truck or Bus Purchase Transaction



Since 2010, the HVIP program has issued more than 11,464 vouchers across all classes of medium and heavy duty vehicles, in the amount of \$844 million. Of these, almost 53% of the vouchers were used for purchasing battery electric vehicles (BEV), 22% has funded natural gas vehicles, and the rest were used to fund purchases of hybrid vehicles as well as electric Power Take-Offs (ePTOs). With respect to Class 8 trucks, HVIP has issued vouchers to almost 1,700 natural gas-powered trucks and 1,500 BEV trucks. Of these, 1,000 natural gas trucks and 638 BEV truck vouchers were issued for purchasers in LA County. However, only 37 of the vouchers for Class 8 BEVs in LA County were redeemed so far and the rest are still unredeemed⁶. While HVIP is a first-come first-served program, about 55% of all

⁵ <https://californiahvip.org/wp-content/uploads/2022/03/HVIP-FY21-22-Implementation-Manual-03.15.22.pdf>

⁶ Of the 1,500 vouchers for Class 8 BEV trucks issued at the statewide level, only 154 vouchers were redeemed so far.

vouchers have been requested in low-income and disadvantaged communities, helping to provide much needed diesel particulate matter reductions in communities facing disproportionate impacts of pollution.

It is noteworthy to mention that HVIP program is often being oversubscribed as California is experiencing record demand for advanced clean trucks and buses. For example, in 2019, the HVIP program with \$142 million of incentive vouchers, was oversubscribed a week after CARB adopted its annual funding plan for clean transportation investments. The oversubscription of the program has always been a key issue especially for smaller fleets that do not have the resources available to quickly apply for these grants through dealerships and use them to transition their trucks to zero emission technologies. In response to these limitations, in 2021, CARB proposed amendments to the HVIP program by introducing a fleet size limits. Beginning on January 1, 2023, private fleets with more than a total of 100 trucks and buses will no longer be eligible for HVIP incentives. This limit would be reduced to 50 trucks and buses beginning on January 1, 2024. Public agencies, including public transit and public school districts, public utilities, municipalities, and California Native American tribal governments would not be subject to any fleet size limits. Additionally, in their 2021-22 funding plan, CARB proposed to set aside \$25 million of pilot funding for incentives targeted at small trucking fleets and independent owner operators to implement new and innovative mechanisms including, but not limited to: flexible leases, peer to peer truck sharing, truck as a service, assistance with infrastructure, individual owner planning assistance, as well as other mechanisms. In addition to this, CARB also set aside \$75 million in its 2021-22 funding plan for ZE drayage trucks that will be limited to HVIP-eligible Class 8 trucks purchased by fleets and owner-operators that are currently operating in drayage service. In total, CARB's 2021-22 funding plan allocated \$569.5 million toward HVIP program. CARB is currently working on the 2022-23 funding plan.

Noteworthy to mention that, except for public transit buses, stacking HVIP with State-funded incentives is not allowed. However, local- and federal-funded incentives may be combined with HVIP vouchers, so long as each incentive program is not paying for the same incremental costs, or the total sum of incentives does not exceed the total cost of the vehicle.

2.2 Carl Moyer Program

The Carl Moyer Memorial Air Quality Standards Attainment Program (Carl Moyer Program) provides grant funding for cleaner-than-required engines, equipment, and other sources of air pollution. The Carl Moyer Program is implemented as a partnership between CARB and California's 35 local air districts. Unlike HVIP that provides incentive funding exclusively for medium and heavy duty vehicles, Carl Moyer provide incentive for replacement of both on-road as well as off-road diesel engines and equipment. Since 1998, the program has allocated approximately \$1 billion in grant funding to clean up older polluting engines throughout California. To date, one fifth of the Carl Moyer funding (~\$210 million) has been allocated to on-road projects which has resulted in replacement of 7,800 engines across CA. These engine replacements has resulted in emissions reductions of more than 25,000 tons of NOx+VOC, and 680 tons of PM. This program offers grant funding to eligible applicant such that the funds received are considered income to the recipient, making the recipient subject to higher income tax as a result (discussed further in the later section). Unlike HVIP that puts some restrictions on co-funding utilizing state funding sources, Senate Bill 513 (Beall, 2015) allows applicants to leverage other funding sources and combine them with Moyer funding. There is no limit on the number of co-funding sources to fund a project as long as total project costs are not exceeded and the applicant cost share requirement is met. An applicant that is not a public entity must provide at least 15 percent of a project's Moyer eligible cost from non-public sources. The applicant cost share cannot be covered through in-kind contributions. An air district may request a case-by-case determination from CARB

to waive all or part of an applicant's cost share. More details on co-funding opportunities allowed by Moyer can be found in section L of 2017 Carl Moyer Guideline⁷.

One of the key differences between HVIP and Carl Moyer is the scrappage requirement. Under Carl Moyer program, with the purchase of a new truck, the applicant shall scrap their existing truck. This is to ensure that the funding will achieve early or extra emission reductions beyond the natural turnover of vehicles. The Moyer program also only provides funding to replace vehicles of 6 years and older. For example, this year, the newest existing engine model year that is eligible to participate in the program would be 2016, and 2017 to 2022 model year vehicles would not be eligible to be scrapped, leaving them available for purchase by any consumer.

Additionally, unlike the HVIP program that has specific incentive fund allocated for each category of trucks, Carl Moyer applies a cost-effectiveness limit to calculate the amount of funding that can be allocated to a certain project. Historically, the general cost-effectiveness limit was set at \$30,000 per weighted ton of emission reductions. For advanced technology projects that are ZE, or alternatively meet the cleanest certified optional standard (i.e., 0.02 g/bhp-hr) applicable by source category, air districts could apply a cost-effectiveness limit of up to \$100,000 per weighted ton. This higher cost-effectiveness limit would provide additional incentive to turn engines and fleets over to the cleanest certified technologies. In addition to cost effectiveness limits, there also exists funding caps for the purchase of optional Low NOx or zero emission vehicles. Before the 2021 amendments to the Moyer program, the funding cap for replacing Class 8 trucks to Low NOx engines meeting 0.02 g/bhp-hr was \$100,000 and for zero emissions vehicles was \$200,000. To calculate the amount funding available for a project, the Carl Moyer guideline uses three equations, and then pick the minimum funding value resulting from those three equations as the final funding value. Carl Moyer calculates funding value 1) based on the C/E limit, annual emission reduction, and Capital Recovery Factor (a factor that takes into account the project life – e.g., 7 years for on-road vehicles, and interest rates); 2) Potential grant amount based on maximum percentage of eligible cost (e.g., 80% for on-road heavy duty trucks), and 3) Potential grant amount at the funding cap.

Table 3 below provides an example of maximum grant available for a Class 8 drayage trucks under the Carl Moyer program⁸⁹.

Table 3. An example of a Class 8 drayage truck replacement using Carl Moyer Program

Existing Vehicle	Replacement Vehicles	Estimated Maximum Grant
- Vehicle Type: Drayage - Category: Replacement - Fuel Type: Diesel - GVWR: above 33,000 lbs. - Model Year: 2012 - Engine Standard: 0.2 g/bhp-hr - Fleet size: 1 – 10 - Annual Mileage: 60,000 miles - Percent Operation in CA: 100%	Vehicle Model Year: 2022 New or Used: New	If replaced with: 0.20g/bhp-hr: \$60,000 0.05g/bhp-hr: \$80,000 0.02g/bhp-hr: \$100,000 - Zero Emission: \$113,000

As conventional diesel trucks become cleaner over time due to stringent standards at both state and federal level, the emissions reductions resulting from replacing a conventional diesel with Low NOx or zero emission trucks becomes smaller which will subsequently result in lower available funding for Low

⁷ https://ww2.arb.ca.gov/sites/default/files/classic/msprog/moyer/guidelines/2017/2017_cmpgl.pdf#page=40

⁸ Based on CARB's On-Road Grant Calculator at: <https://ww2.arb.ca.gov/our-work/programs/carl-moyer-program/on-road-grant-calculator>

⁹ Examples of how grants are determined for heavy duty vehicle replacement projects is demonstrated at: <https://ww2.arb.ca.gov/sites/default/files/2022-02/Updated%20OnRoad%20Example%20Calculations%20022422.pdf>

NOx and zero emission trucks through Carl Moyer programs. As noted earlier, the Moyer program utilized a cost-effectiveness limit of \$100,000 per ton for advanced technologies when calculating the available grant for replacing a truck. Therefore, the lower the emissions benefits, the lower amount of funding available. In recent years, this effect has resulted in Moyer program to allocate less amount of funding to trucks as compared to other mobile sources (i.e., off-road equipment). In response to this issue, on November 19, 2021, CARB approved amendments to the Carl Moyer Program cost-effectiveness limits and funding caps for optional advanced technology and ZE replacement on-road projects. These new cost effectiveness limits are presented in

Table 4.

Table 4. Amended Cost Effectiveness Limits for Carl Moyer Program

Cost-Effectiveness (CE) Limit Types	Old CE Limits (\$/ton)	New CE Limits (\$/ton)
Base Limit	\$30,000	\$33,000
Optional Advanced Technology Limit	\$100,000	\$109,000
On-Road Optional Advanced Technology Limit – 0.02 g/bhp-hr or cleaner	\$100,000	\$200,000
On-Road Optional Zero-Emission Limit	\$100,000	\$500,000
School Bus (combustion)	\$276,230	\$300,000

Aside from the updates to cost effectiveness limits, CARB also approved increasing the maximum funding amounts to ensure that those incremental costs can be covered by the program. Changes include increasing the cap for:

- 0.02 g/bhp-hr HHD engines from \$100,000 to \$160,000
- HHD zero emission replacements from \$200,000 to \$410,000

Such amendments will ensure that the program will continue to focus on developing the most advanced ZE and low emission technologies. Despite these changes, access to Carl Moyer funding remains difficult due to the scrappage requirements. For California to claim emissions reductions from the Carl Moyer program as part of its State Implementation Plan (SIP), U.S. Environmental Protection Agency requires emission reductions be permanent, which requires scrapping a truck. While such requirements ensure that emission reductions resulting from the program are surplus, it impedes the use of funding to accelerate the adoption of advanced clean technologies.

One of the other potential barriers to successful implementation of the Carl Moyer program as well as other incentive programs that follow similar structure to Carl Moyer (as described later in the document) is the tax implication associated with grants received through these programs. Current federal and state laws do not specifically exclude Carl Moyer Program grants from gross income, and therefore, the grant received through these programs is subject to federal and state income tax. For example, for an owner-operator who receives \$100,000 grant to replace their old truck with a Low NOx natural gas truck, they have to pay a fraction of this grant as income tax which will increase their out of the pocket cost for purchasing a new truck.

In 2012, Senator Cannella introduced SB 358, which would have provided an income exclusion for air pollution reduction grants made by the State Air Resources Board. SB 358 failed to pass out of the Senate Governance and Finance Committee by the constitutional deadline. Later in 2018, Assembly members Salas and Burke introduced AB 2008 to exclude from gross income any income received from the Carl Moyer, but unfortunately this bill also did not pass. The proponents of this bill have argued that providing an income exclusion for amounts provided pursuant to the Carl Moyer Program would accelerate the replacement of higher polluting vehicles with advanced clean technologies whereas the opponents of the bill argued that the cost to the General Fund of the proposed income

exclusion would outweigh the benefit of reduced emissions. Such bill could also establish an exclusion for which federal law has no counterpart, thus increasing nonconformity (i.e., the bill will only exclude Carl Moyer grants from state income tax and not the federal income tax).

2.3 Carl Moyer Voucher Incentive Program (VIP)

The Carl Moyer Voucher Incentive Program (VIP) is part of the Carl Moyer Program and is a streamlined funding option directed exclusively to small fleets with 10 vehicles or less to purchase cleaner vehicle replacements. The existing vehicles that are planned to be replaced should have operated 75% of their time in California over the last two year and be in compliance with the California's Truck and Bus regulation. Applications are reviewed on a first-come, first-served basis, and applicants are notified within 15 business days upon receipt of their application. Historically, this program was designed to support transition of small fleets to 2010 diesel technology consistent with requirements from the Truck and Bus Rule. Following the updates to the Carl Moyer Program in 2021, CARB expanded the VIP to allow additional funding up to \$410,000 for replacement of old diesel class 8 trucks with zero emission technologies. Additionally, fleets that decide to transition to 0.02 g/bhp-hr natural gas engines (low NOx engines) can receive up to \$160,000 per class 8 truck. Similar to Carl Moyer program, zero emission projects in VIP are eligible for a cost-effectiveness limit of up to \$500,000 per weighted ton and projects meeting the 0.02 g/bhp-hr or cleaner are eligible for a cost-effectiveness limit of up to \$200,000 per weighted ton.

According to VIP guidelines¹⁰, an eligible fleet that has a 2007–2009 Class 8 diesel trucks with a minimum of 50,000 miles operation in California could get \$160,000 of funding toward new replacement with low NOx truck or \$410,000 toward replacement with a ZE truck. The funding matrix can be found in Appendix O of the VIP guidelines.

Similar to Carl Moyer program, the VIP also requires scrappage and the program is administered by Air Districts. In South Coast, the SCAQMD implement VIP through contractual agreements with Dealers and Dismantlers. The Dealers will apply to South Coast AQMD for the vouchers on behalf of the applicant. If approved, the voucher amount will be deducted from the total purchase price of the truck by the Dealer. Over the past 12 years, the VIP program administered by the South Coast AQMD has spent \$45.6 million and replaced approximately 1,300 trucks in South Coast region¹¹. More details about the VIP program, its application process, and eligibility criteria can be found at [SCAQMD 2022 VIP Brochure](#).

2.4 Community Air Protection (CAP) Incentives

Since 2017 the California Legislature has budgeted \$964 million to support Assembly Bill (AB) 617 (C. Garcia, Chapter 136, Statutes of 2017) with incentives to accelerate the adoption of advanced technologies in communities that are impacted by disproportionate levels of air pollution¹². So far, air districts have expended \$376 million in CAP incentives on projects. To ensure these funds will benefit the low income and disadvantaged communities, 70% of the funds must be invested in AB 617 communities and 80% should be in and benefiting disadvantaged or low-income communities¹³.

Following the legislative intent, 95% of these funds were allocated to the three air districts with the largest disadvantaged community populations (i.e., South Coast AQMD, San Joaquin Valley, and Bay Area AQMD), and CARB worked with the California Air Pollution Control Officer's Association (CAPCOA) to allocate the remaining 5%. As of November 2021, South Coast AQMD has expended almost \$140

¹⁰ <https://ww2.arb.ca.gov/sites/default/files/2022-02/2022vipguidelines.pdf>

¹¹ South Coast AQMD VIP Training Workshop – April 20, 2022

¹² <https://ww2.arb.ca.gov/sites/default/files/2022-06/CAP%20Status%20Board%20Memo%202022-05-19.pdf>

¹³ https://ww2.arb.ca.gov/sites/default/files/barcu/board/res/2018/res18-15.pdf?_ga=2.35248865.1515627721.1658866029-995985659.1628632978

million of CAP incentive funds allocated to the region which resulted in replacement of 648 engines. 648 engines¹⁴.

As part of this program, the Legislature directed that air districts to spend the fund following the Carl Moyer guidelines described earlier. This means that similar to Carl Moyer program, there is a scrappage requirement associated with CAP incentives. Also similar to Carl Moyer program, projects will be assessed based on their cost-effectiveness as well as the funding cap specified for each source categories except for zero emission on-road projects which CAP incentives does not identify any State funding caps.

2.5 Volkswagen Environmental Mitigation Trust for California

The Volkswagen (VW) Environmental Mitigation Trust (Trust) provides about \$423 million for California to mitigate the excess nitrogen oxide (NOX) emissions caused by VW's use of illegal emissions testing defeat devices in certain VW diesel vehicles. Of \$423 million, \$90 million (in multiple installments) is allocated to zero emission Class 8 freight and port drayage trucks and \$60 million (in two installments) is allocated to combustion freight and marine projects (e.g., Low NOx natural gas trucks). Funds in both of these categories are expended on a first-come/first-serve basis, and at least 50% of funds should go for projects that reduce emissions in disadvantaged or low-income communities. As of June 2021, of the \$423 million funding allocated to this program, almost \$115 million has been expended with \$29 million on zero emissions Class 8 trucks and \$15 million on combustion freight and marine projects¹⁵.

As part of this program, both public and private entities that own and operate eligible vehicles may apply. Similar to CAP and Moyer, the VW Trust fund requires scrappage of the existing vehicle and both the old and new vehicles should have at least 75% of their operation within the State. Also, it should be noted that the funding cannot be stacked with other state funding sources such as HVIP or Carl Moyer. However, similar to HVIP, transit agencies may stack Federal Transit Administration (FTA) funds with VW Mitigation Trust funds for purchasing zero-emission transit buses and supportive infrastructure. One caveat is that VW funds cannot be stacked with any other funding sources that takes credit for NOx emission reductions.

Table 5 below illustrates the eligibility criteria for VW Trust Fund. As shown, for non-government fleets, the program covers up to 75% of the cost of zero emissions trucks (with the maximum funding of \$200,000) and 25% (50% for drayage trucks) of Low NOx natural gas engines (with the maximum funding of \$85,000). For example, if a brand new Class 8 ZE truck, cost about \$350,000 before taxes, the amount of funding is calculated as the minimum of a) $75\% \times 350,000 = \$262,500$, and b) funding cap of \$200,000. In this case, the available funding will be \$200,000. In another case, for a non-drayage Low NOx CNG truck with a purchase price of \$200,000, the amount of funding is calculated as the minimum of a) $25\% \times \$200,000 = \$50,000$, and b) funding cap of \$85,000. In this case, the program can offer \$50,000 toward purchasing a Low NOx natural gas truck.

Table 5. Eligibility Criteria for VW Trust Fund Related to Class 8 Trucks

Baseline Equipment	Baseline Technology	Replacement Technology	Ownership Category	Maximum Incentive Percentage (of cost)	Maximum Incentive Cap (per equipment)
			Non-Government	75%	\$200,000

¹⁴ https://ww2.arb.ca.gov/sites/default/files/2022-06/CAP%20Status%20Board%20Memo%20Appendix%202022-05-19_1.pdf

¹⁵ <https://www.vwenvironmentalmitigationtrust.com/sites/default/files/2021-07/California-Semi-Annual%20Report%20to%20Trustee4.pdf>

Class 8 Freight Trucks (including drayage trucks, waste haulers, dump trucks, and concrete mixers)	Engine Model Years 1992 to 2012*	Zero-Emission Vehicle	Government	100%	\$85,000
	Engine Model Years 1992– 2012*	Low NOx (certified 0.02 g/bhp-hr)	Non-Government	25% (Non-Drayage)	
			Government	100%	

* Must comply with all applicable rules and regulations until time of scrapping/replacement

While the program allocated almost \$60 million to Combustion Freight and Marine Projects category, the first solicitation (\$30 million) was significantly undersubscribed and resulted in awards totaling only about \$4 million with approximately \$26 million to remain available. As a result, on June 4, 2021, the South Coast AQMD Governing Board approved changing the program so that the solicitation is available to eligible entities on a first-come, first-served basis rather than being competitive. South Coast AQMD also released its first solicitation for Zero-Emission Class 8 Freight and Port Drayage Trucks, for first come/first served funding in August 2020, and the funding was quickly oversubscribed.

While it is difficult to identify key barriers in spending the combustion funds (\$60 million), it is clear that a) there has been much higher interest in using the funds to transition to zero emission trucks, and b) the differences in the eligibility criteria and incentive funds available per vehicle between the ZE and Low NOx Natural Gas trucks has resulted in one program to be oversubscribed and another program to remain undersubscribed.

2.6 Truck Loan Assistance Program

The Truck Loan Assistance program administered by CARB provide financial assistance to truck owners affected by the Truck and Bus Regulation. The program offers financing opportunities to qualified small-business truckers who fall below conventional lending criteria and are unable to qualify for traditional financing for cleaner trucks. To meet the legislative intent of the loan program, the Truck Loan Assistance is open to qualified trucking fleets with 10 or fewer heavy-duty vehicles and the program requires that an eligible trucking company meet basic requirements by qualifying as a small business (fewer than 100 employees), generate less than \$10 million in annual revenue, and operate primarily in California. Loans from this program can be used to finance individual technologies, or a combination of technologies (diesel, Low NOx CNG, and zero emission), to help fleet owners comply with the Truck and Bus Regulation. To access these loans, truckers shall contact participating California Pollution Control Financing Authority's California Capital Access Program (CalCAP) lenders and complete a loan application. Loans provided through this program can be combined with other incentive programs.

According to CARB's draft 2022–23 Funding Plan¹⁶, as of May 13, 2022, about \$203 million in Truck Loan Assistance Program funding had been expended to provide about \$2.5 billion in financing to small-business truckers for the purchase of over 39,500 cleaner trucks, exhaust retrofits, and trailers. Since 2018, CARB has mailed out a total of 109,877 letters and 169,832 postcards to individuals identified as owning vehicles facing upcoming compliance deadlines. These outreach efforts frequently mention the Truck Loan Assistance Program as an option to help purchase compliant newer vehicles.

2.7 Zero-Emission Drayage Truck and Infrastructure Pilot Project

The Zero-Emission Drayage Truck and Infrastructure Pilot Project is a joint effort by California Energy Commission (CEC) and CARB to support large-scale deployments of on-road, ZE Class 8 drayage and regional haul trucks as well as the necessary ZE vehicle fueling infrastructure needed for service operation. The funding is provided by CEC's Clean Transportation Program funds and CARB's Fiscal

¹⁶ https://ww2.arb.ca.gov/sites/default/files/2022-07/fy2223_draft_funding_plan_accessible.pdf

Year 2019–2020 Funding Plan for Clean Transportation Incentives for Low Carbon Transportation Investments and the Air Quality Improvement Program. Many different freight facilities qualify for the project including warehouses, distribution centers, sea/rail ports, intermodal, border points of energy, and other freight facilities. To apply for these grants, technology manufacturers and end users must partner with eligible non-profit applicants (e.g., air districts, ports). Upon award there will be two separate grant agreements, one with CARB for the vehicles and one with CEC for zero emission infrastructure, workforce development, etc.

In terms of funding eligibility:

- Both battery electric and fuel cell on-road Class 8 trucks will be eligible
- The minimum range for each truck is 150 miles per refuel/recharge. Applicant must deploy all trucks by 2023.
- Funding per truck will be up to \$500,000; at a rate of \$1,600 funded per mile of range.
- Possible to use Carl Moyer Program to help with fund matching.

This solicitation is currently closed, and the notice of proposed award is now posted on CEC webpage. Table 6 below provides a list of first notice of proposed awards. As shown, both agencies expended a total of \$108 million (\$44 million from CEC and \$64 million from CARB), on a total of five projects.

Table 6. Zero-Emission Drayage Truck and Infrastructure Pilot Project. First Revised Notice of Proposed Awards dated August 13, 2021

Applicant	Type of ZE Fueling Technology	Project Title	Proposed CEC Award	Proposed CARB Funds to be Awarded
South Coast Air Quality Management District	Battery Electric	California Joint Electric Truck Scaling Initiative	\$10,964,955	\$16,019,316
Center for Transportation and the Environment	Hydrogen Fuel Cell	NorCAL Zero- Emission Regional and Drayage Operations with Fuel Cell Electric Trucks	\$9,898,218	\$11,979,914
San Joaquin Valley Air Pollution Control District	Battery Electric	South-Central Fresno Pepsi Delivery Truck Electrification	\$4,550,710	\$8,600,000
San Joaquin Valley Air Pollution Control District	Battery Electric	Grocery Operations for Carbon Emission Reductions	\$10,348,873	\$13,073,425
California Hispanic Chamber of Commerce Foundation	Battery Electric	GLI Electrification	\$8,555,037	\$14,199,977

2.8 CEC's Clean Transportation Program

The Clean Transportation Program is an incentive program administered by the CEC that invests up to \$100 million annually in a broad portfolio of transportation and fuel transportation projects throughout the state. According to CEC's *2022-23 Investment Plan Update for the Clean Transportation Program*¹⁷, as of December 2021, the CEC has invested more than \$1 billion in Clean Transportation Program funding. The projects funded through this program include:

- 15,213 chargers for plug-in electric vehicles, including 4,277 at multi- and single-family homes, 155 for fleets, and 419 at workplaces; 8,403 public and shared private Level 2 and Level 1 chargers; and 1,713 public direct-current (DC) fast-chargers and 246 Level 2 chargers along highway corridors and urban metropolitan areas.

¹⁷ <https://efiling.energy.ca.gov/GetDocument.aspx?tn=242563>

- Invested more than \$115 million on 79 projects for deployment of Medium- and Heavy-Duty ZEV Infrastructure
- 80 publicly available hydrogen-fueling stations and approved funding for an additional 74 stations based on deployment progress, funding availability, and Clean Transportation Program Investment Plan funding allocations. Of these stations, 13 will accommodate medium- and heavy-duty vehicles as well as passenger vehicles
- 55 regional readiness planning grants, regional readiness implementation grants, and medium- and heavy-duty ZEV blueprint grants for communities and fleets that are ramping up for the adoption of ZEV technologies.
- The nation's first commercial vehicle fleet incentive project titled "EnerGIIZE" to accelerate the deployment of electric and hydrogen infrastructure needed to fuel ZE trucks, buses, and equipment.
- Workforce training for more than 20,000 trainees and 277 businesses, helping prepare workers for the clean transportation economy and the opportunity to earn sustainable wages and expand employment opportunities.

A complete list of projects funded through the Clean Transportation Program is provided in

Table 7.

Table 7. Clean Transportation Program Investments as of December 2021 (Source: CEC's 2022-23 Investment Plan Update for the Clean Transportation Program)

Funded Activity	Awards to Date (in Millions)	# of Projects or Units
Alternative Fuel Production		
Biomethane Production	\$73.86	29 Projects
Gasoline Substitutes Production	\$26.94	14 Projects
Diesel Substitutes Production	\$66.99	26 Projects
Renewable Hydrogen Production	\$16.93	5 Projects
Alternative Fuel Infrastructure		
Electric Vehicle Charging Infrastructure	\$254.51	15,154 chargers
Hydrogen Fueling Infrastructure (Including Operations and Maintenance)	\$166.82	80 Public Fueling Stations
Medium- and Heavy-Duty ZEV Infrastructure	\$115.27	79 Projects
E85 Fueling Infrastructure	\$3.61	21 Fueling Stations
Upstream Biodiesel Infrastructure	\$6.98	7 Infrastructure Sites
Natural Gas Fueling Infrastructure	\$24.11	70 Fueling Stations
Alternative Fuel and Advanced Technology Vehicles		
NG and Propane Vehicle Deployment, Hybrid and ZEV Deployment (Including CVRP, HVIP, and Low-Income Mobility Incentives), and Advanced Technology Freight and Fleet Vehicles	\$250.40	14,516+ NG, Propane, Hybrid and ZEVs and 54 Demonstrations
Related Needs and Opportunities		
Manufacturing	\$55.32	27 Manufacturing Projects
Workforce Training and Development	\$34.33	20,000 Trainees
Fuel Standards and Equipment Certification	\$3.90	1 Project
Sustainability Studies	\$2.04	2 Projects
Regional Alternative Fuel Readiness	\$24.15	55 Regional Plans
Centers for Alternative Fuels	\$5.41	5 Centers

Technical Assistance and Program Evaluation	\$17.52	n/a
Total	\$1.149 Billion	-

Grants awarded through CEC's Clean Transportation Program are mainly using three different type of funding mechanisms:

- **Competitive Solicitation for Grants** which represents the most common funding mechanism for the Clean Transportation Program to date. The competitive scoring through this program allows increased scrutiny on key issues for each project type. However, it also requires significant time and attention to review each application and oversee each subsequent funding agreement. Therefore, dispensing funding through this mechanism is often slow and requires a lot of resources.
- **Block Grants** which is mainly used to distribute Clean Transportation Program funding through third-party implementers (e.g., Center for Transportation and the Environment) and allows the CEC to select another organization to administer Clean Transportation Program funding while following set procedures for project and applicant eligibility.
- **First-Come, First-Served** which is mainly used for vehicle and infrastructure incentives. Once eligibility requirements are established, the funding is administered relatively quickly and can provide greater market certainty for a project type.

As part of the draft funding allocations for FY 2022–23, CEC has allocated more than \$160 million to support medium- and heavy-duty ZEV infrastructure to address the need for rapid transition to ZE technologies across the state. Of these, \$30 million will be allocated to medium- and heavy-duty ZE vehicles and infrastructure (Level 2 and DCFC), \$85 million is earmarked for drayage, \$30 million for transit, and \$15 million for school buses. Also in FY 2021–22, CEC allocated \$390 million for medium and heavy-duty vehicles, of which \$105 million is earmarked for drayage and infrastructure pilot, \$28.5 million for transit, and \$19 million for school bus. Fundings from FY2021–22 are currently being disbursed to different projects.

The Clean Transportation Program also allows co-funding using non-CEC incentive programs, and applicants can bring their match funds from any other state, federal, utility programs that are not tied to CEC programs.

Energy Infrastructure Incentives for Zero-Emission Commercial Vehicles¹⁸ (EnergiIZE Commercial Vehicles)

To facilitate distribution of the Clean Transportation Program funds allocated to medium and heavy-duty vehicles, in March 2022 the CEC and CALSTART launched the \$50 million EnergiIZE Commercial Vehicles block grant which will provide exclusive zero emission infrastructure funding to support the transition of medium- and heavy-duty vehicles to ZE battery electric and hydrogen fuel cell vehicles. In December 2021, CEC increased the project cap to \$276 million which will be disbursed via CALSTART¹⁹. Participation in the EnergiIZE incentive project requires that the applicant or the funding recipient belong to one of the following categories: a) a business, organization, or individual responsible for the operation of a MD/HD ZEV (vehicle class 2b and above) in the state of California, or b) a business, organization, or individual responsible for the engineering, construction, procurement, and completion of a ZE infrastructure site in the state of California which shall service MD/HD ZEVs Class 2b or above.

EnergiIZE also establishes four “Funding Lanes” each with differing qualifications and incentive structures. These funding lanes include:

¹⁸ <https://www.energiize.org/about>

¹⁹ <https://efiling.energy.ca.gov/GetDocument.aspx?tn=240980&DocumentContentId=74829>

- **EV Fast-Track:** Targeting zero emissions medium and heavy-duty fleets registered in California or have been purchased, funded or otherwise incentivized through state/federal projects.
- **EV Jump Start:** Targeting small businesses²⁰, certified Minority Business Enterprise, Woman-Owned Small Business, Veteran-Owned Small Business, or LGBT-owned small business. This funding lane is also available for transit agencies, school districts, or commercial fleet whose infrastructure will be located in a designated disadvantaged community. Additionally, the funding is available to California Federally Recognized Tribes and California Tribal Organizations, or commercial fleets that is a 501(c)(3) non-profit organization.
- **Public Charging Station:** Available to public charging station developers, who can show documentation providing adequate utilization and throughput for the proposed public charging stations. The funding shall be used to install DC fast chargers at capacities of 150 kW or higher (level 2 chargers are not eligible).
- **Hydrogen Fueling:** Available for medium and heavy-duty hydrogen fueling infrastructure projects only.

Table 8 describes the incentive structure for EnergIIZE across all four funding lanes including eligible costs, project caps, and type of application.

Table 8. EnergIIZE incentive structure across the four funding lanes²¹

	EV Fast-Track	EV Jump Start	Public Charging Station	Hydrogen Fueling
Type of Application	First Come, First Served	Competitive	Competitive	Competitive
Maximum Incentive Offering	50% of Hardware and Software Costs Incurred	75% of Hardware, Software, and Soft Costs	50% of Hardware and Software Costs Incurred	50% of Hardware and Software Costs Incurred
Eligible for Milestone Payments	Yes	Yes	Yes	Yes
Maximum Project Cap	\$500,000	\$750,000	\$500,000	\$2,000,000

Of the four programs offered under the EnergIIZE, EV Fast Track and Hydrogen funding lanes were launched earlier this year, and both were heavily oversubscribed. EV Jump Start and EV Public Charging Station funding lanes will open before the end of 2022, with the first opening on September 1. The four-lane funding structure designed for the programs allows equitable disbursement of the infrastructure fund and ensures that the program address the diverse array of potential applicants with varying needs. While there are some commercial fleets with vehicle deliveries fast approaching, there are other fleets that are just starting their planning for ZEV infrastructure deployment. The first come first served approach for EV Fast-Track funding lane, allows quick and efficient disbursement of funding who are in immediate need of it, whereas the competitive solicitations used for other categories allows CEC to put higher level of scrutiny and ensure the highest return on investment. The CEC, CALSTART, and CARB will also be coordinating this year to develop EnergIIZE funding lanes specific to the earmarked drayage, transit, and school bus funding.

²⁰ As recognized by the California State Legislative Code, Section 14837(d)

²¹ <https://efiling.energy.ca.gov/GetDocument.aspx?tn=240980&DocumentContentId=74829>

2.9 Southern California Edison Commercial EV Programs

Aside from the incentive programs offered at the state level including those administered by South Coast AQMD, there are also several programs offered by the Southern California Edison (SCE) that support fleets operating in the South Coast region within SCE's service territory to transition to zero emission vehicles. It should be noted that SCE programs are only available to SCE customers.

Transportation Electrification Advisory Services – Grant Assistance Program²²

Transportation Electrification Advisory Services provides fleets with education, awareness, and support through several services, including custom EV Readiness Studies, grant writing assistance, events, and webinars. One of these programs is the *Grant Assistance Program*²³ offered by SCE to help qualified medium- and heavy-duty fleets apply for state and local grants that reduce the cost of purchasing EVs. Currently the program offers the following services:

- **Grant Writing Assistance:** This assistance is provided to small fleets (20 vehicles or fewer) and mid-sized fleets (21-50 vehicles) that need hands-on support identifying and submitting a funding application. This service will provide small and mid-sized fleet with an opportunity to confirm funding source, review eligibility requirements, timeline, and contractual obligations; draft grant outline and budget templates; run through application checklist (identification of all required information and documentation); and finalize grant applications ready for submission
- **Grant Package Review Assistance:** For fleets of any size that need support ensuring their completed funding application is ready to submit. This service, which is available to fleets of any sizes, help the applicants to review their grant application materials and provide them with feedback on the gaps and issues with their application.

Charge Ready Transport Program²⁴

SCE's Charge Ready Transport (CRT) Program offers low-to no-cost electrical system upgrades to support the installation of EV charging equipment for fleets of medium and heavy-duty vehicles. When a customer is approved to participate in the program, SCE will design, construct, and install the necessary infrastructure on both the utility-side and customer-side of the electric meter. This includes electrical design, construction work, and new or upgraded transformers, electrical panels, conduit and trenching. Although through CRT program, SCE will perform infrastructure work on the utility side and customer side of the meter, the customers are still responsible for the purchase and installation of their selected charging equipment. For customers to be eligible for CRT program, they need to have the equipment on order, and have to make a 10 year commitment to own/operate the infrastructure. This requirement could be problematic for fleets who do not have long-term lease.

As part of this program, SCE will perform on-site visits to evaluate site's electrical infrastructure needs and develop utility-side and customer-side of the meter cost estimates. SCE will also design, secure permit, and install the necessary infrastructure. SCE will also install a separate meter dedicated to the EV charging infrastructure and waive customer demand charges through 2024 with their commercial EV rates.

In addition to receiving the necessary infrastructure to support EV charging equipment, this Program provides two additional rebate options: the Charging Equipment Rebate and the Make-Ready Rebate. The Charging Equipment Rebate is offered to eligible participants in order to offset a portion of the costs associated with the purchase of EV charging equipment approved by SCE. The second rebate

²² https://www.sce.com/evbusiness/sites/default/files/evcharging/TEAs-Grant%20Assistance-Fact%20Sheet_2022-ADA.pdf

²³ To request grant assistance, fleets can visit: <https://cloud.sce.com/teas-grant-form>

²⁴ <https://image.email.sce.com/lib/fe9612727166057577/m/3/7019e577-72c2-40d2-b89a-4b7ca782ced8.pdf>

option, which is referred to as the Make-Ready Rebate is available to any Participant who chooses to design, procure, and install the customer side of the meter infrastructure work (also referred to as “customer side make-ready”). CRT has an approved budget of \$342.6M and a goal to enroll and support Of the 139 active applications, utility construction was complete for 27 sites, with 24 of them being activated²⁵. It is worth noting that SCE is transitioning the CRT program to its second phase (still under development).

2.10 LADWP Commercial EV Charging Station Rebate Program

LADWP is also offering its non-residential customers rebates for installation of EV charging infrastructure. This program which is called Commercial Electric Vehicle (EV) Charging Station Rebate Program, incentivizes the installation of EV charging station equipment, including:

- Level 2 charging stations to charge light-duty EVs
- Direct current fast chargers (DCFCs) to charge light-duty EVs
- Alternating current (AC) or direct current (DC) charging stations to charge medium- and heavy-duty (MDHD) EVs

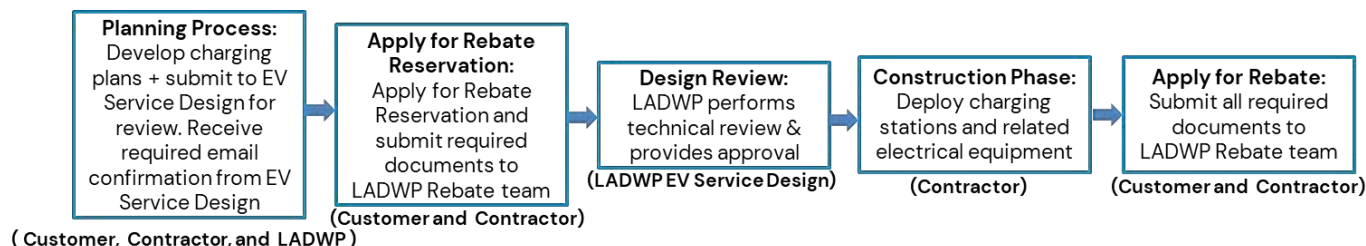
The program is open to all LADWP commercial customers operating a site (premises) with an active LADWP electric meter on a non-residential rate schedule. LADWP customers who receives these rebates, must agree to keep charging stations in service for a minimum of five years. For medium and heavy-duty vehicles, the program currently pays up to \$125,000 per charging station with a maximum of \$500,000 per site. Table 9 below provides details on the maximum rebate amount for AC and DC charging stations. For projects to be eligible for rebates, the station power should be 6.2 kW or more for AC charging stations and 24 kW or more for DC charging stations. Additionally, the station shall be used to charge on-road medium and heavy-duty plug-in EVs, including battery EVs and plug-in hybrid EVs. Qualifying vehicles are limited to transit buses, shuttle buses, commercial buses, school buses, and trucks (Class 3 to Class 8). Customers must acquire at least one new qualifying medium or heavy-duty EV for each charging station rebate. The vehicle must be eligible for financial incentives (e.g., rebate or grant) by a government agency of the state of California. As part of Cycle 2 of the program offered in Q2 2022, LADWP allocated a total of \$18 million in rebates, of which \$2 million is earmarked for medium and heavy duty vehicles. Figure 2 below provides an overview of the process that customers should take to apply for these rebates. More information is available at [Commercial EV Charging Station Rebate Program Guide](#)

Table 9. LADWP Commercial EV Charging Station Rebate Program for Medium and Heavy Duty Vehicles

Charging Stations for Medium-and Heavy- Duty EVs	Output (kW)	Max Rebate Amount per Charging Station	Max Amount per Site
AC-1	6.2 to 49	\$10,000	\$500,000
AC-2	50 to 99	\$20,000	
AC-3	100 and above	\$30,000	
DC-1	24 to 49	\$35,000	
DC-2	50 to 99	\$60,000	
DC-3	100 to 149	\$100,000	
DC-4	150 and above	\$125,000	

²⁵ <https://www.cpuc.ca.gov/-/media/cpuc-website/divisions/energy-division/documents/sb-350-te/sb-350-standard-review-programs-annual-transportation-electrification-evaluation-2021.pdf>

Figure 2. Overview of Rebate Reservation Process (Source: LADWP Charge Up LA! presentation slides²⁶)



2.11 Low Carbon Fuel Standard (LCFS)

While the California Low Carbon Fuel Standard (LCFS) is a regulatory program to reduce the carbon intensity of transportation fuels used in California, the program offers incentives toward deployment and operation of non-residential EV charging and hydrogen fueling stations. This is mainly because EV chargers deliver a low-carbon fuel to transportation vehicles and therefore, owners of Level 2 and DC fast chargers are eligible to apply for the generation of LCFS credits based on the amount of fuel (electricity) dispensed. Additionally, LCFS provides credit options for deployment of DC fast chargers as well as H2 fueling station based on their capacity (called capacity credit). The number of credits that a fleet generates is based on the amount of electricity used to charge and the carbon intensity of that electricity. Fleets that strategically use renewable electricity for charging, or purchase renewable energy certificates (RECs), can further increase their LCFS revenue streams. With renewable electricity, the LCFS credits could increase by 20% as illustrated in Figure 3. It is noteworthy to mention that owners of public charging infrastructure can also generate and sell credits, including incremental credits, for EV charging. Specific to public ZEV infrastructure, these sites are not only eligible for regular LCFS credits (i.e., credits earned through dispensing of fuel), but the eligible hydrogen station, or DC fast charger sites can generate infrastructure credits based on the capacity of the station or charger minus the quantity of dispensed fuel. Such credit will incentivize initial build-out of ZEV refueling infrastructure by providing credits when fuel demand is low in early years. As more ZEVs use the station and the station utilization increases, the site will generate more LCFS fuel credits and fewer infrastructure credits. Currently stations intended for light duty vehicles (<1,200 kg/day for hydrogen stations and <350 kW per charger for charging stations) are eligible for the capacity credits. Although the program does not preclude a heavy-duty vehicle from utilizing the sites, the regulation limits the design of sites for light duty use (based on the capacity constraints provided earlier). This is certainly one of the limitations of the LCFS program in promoting adoption of public charging and fueling infrastructure for medium and heavy-duty vehicles. More details on ZEV infrastructure capacity credits are provided at: [LCFS ZEV Infrastructure Crediting](#). In its July 7, 2022 workshop²⁷, CARB staff included a discussion on the opportunity for extending these capacity credits to medium and heavy duty vehicle stations as part of the next amendments to the LCFS program.

Credits earned through the LCFS program may be sold by a registered broker, and the value of the credits are generally required to be reinvested in electric vehicle infrastructure or services. This could include services such as EV purchases and maintenance, charging infrastructure purchases and maintenance, electricity costs, and administrative fees. The value of the LCFS credits for any one EV charging site is influenced by many factors including but not limited to: the number of EV chargers in

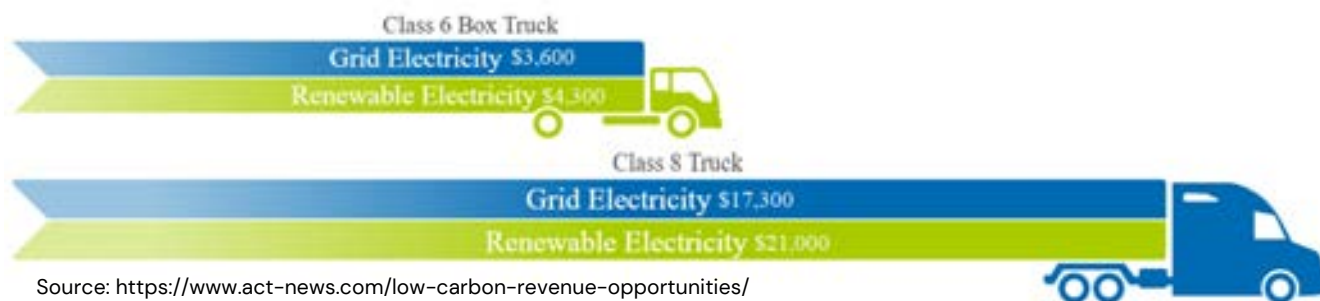
²⁶

https://www.ladwp.com/cs/idcplg?ldcService=GET_FILE&dDocName=OPLADWPCCB777888&RevisionSelectionMethod=LatestReleased

²⁷ https://ww2.arb.ca.gov/sites/default/files/2022-07/LCFSWorkshop_Presentation.pdf

operation, the type of EV chargers installed, the amount of fuel dispensed, and the value of the credit when sold, etc.

Figure 3. An example of annual revenues generated using LCFS



Source: <https://www.act-news.com/low-carbon-revenue-opportunities/>
Assuming an average credit price of \$100/credit

2.12 National Electric Vehicle Infrastructure Formula (NEVI) Grant

On November 15, 2021, President Biden signed the Infrastructure Investment and Jobs Act/Bipartisan Infrastructure Law (IIJA/BIL), which allocated \$7.5 Billion for the nationwide deployment of EV charging stations of which \$5 billion is allocated to National Electric Vehicle Infrastructure (NEVI) Formula Program and \$2.5B available for Competitive grant program to support communities and corridors. California's share of NEVI funding is estimated to include \$384 million over the five-year period. The IIJA designates state Departments of Transportation to serve as the lead agency and requires close collaboration with state-level energy departments. The California Department of Transportation (Caltrans) and CEC are leading NEVI development in California.

The NEVI guidelines require development of the State Electric Vehicle Infrastructure Deployment Plan. This Plan is due to the Joint Office of Energy and Transportation by August 1, 2022. Initially, NEVI funds can only be used on designated Alternative Fuel Corridors. After the corridors are built out, NEVI funding can be used on any public road or at a publicly accessible site that is open to the general public. NEVI requires that new DCFC stations be spaced no more than 50 miles apart within 1 mile of the freeway or highway corridor. The minimum technical requirements are for 4 x 150 kW connectors with a minimum station power capacity of 600 kW.

On June 14, 2022, CEC and Caltrans released draft California's Deployment Plan for the National Electric Vehicle Infrastructure Program²⁸ as required by NEVI. According to the plan, the initial deployment will focus on investments in light-duty vehicle charging infrastructure and will consider projects that can also accommodate medium- and heavy-duty charging infrastructure. Following the release of the plan, several Class 8 zero emission vehicle manufacturers as well as a coalition consisted of Port of Long Beach, Port of Los Angeles, Harbor Trucking Association, California Trucking Association, Pacific Merchant Shipping Association, Earthjustice, and Los Angeles Cleantech Incubator have commented on the program indicating the lack of focus on medium and heavy-duty vehicle charging. For example, the Volvo group indicated that *"the plan assumes that other state programs are sufficient for funding the infrastructure needed to support the anticipated MHD ZEV deployments. Additionally, California's NEVI deployment plan may be used as a model by other states, and it creates a perception that only light-duty ZEV charging infrastructure should be prioritized"*. Navistar, another major manufacturer of zero emission Class 8 trucks also commented that *"While the NEVI Formula Program guidance is primarily focused on passenger vehicles, it also allows states to consider future EV needs including the needs of medium and heavy-duty vehicle use. We encourage the state to use this opportunity to build out commercial vehicle charging network concurrently with passenger vehicles as higher capacity commercial vehicle charging would also charge passenger vehicles. The state should also*

²⁸ <https://efiling.energy.ca.gov/GetDocument.aspx?tn=243505>

use this opportunity to commit to definitive near-term actions to commit NEVI funds for commercial vehicle charging. Charging technologies for passenger and commercial vehicles are similar, however, there are many nuances and details that differ. Because of these differences, a charging network throughout a corridor built for passenger vehicles cannot simply be upfitted or scaled to accommodate commercial vehicles without thoughtful planning for a number of reasons (e.g., site power requirements, charging requirements, and physical constraints)." The Coalition also commented that *"the [California] NEVI Formula Program should set aside at least 50% of the funding available to California to support infrastructure for Class 8, battery-electric trucks, with an emphasis on drayage trucks serving the nation's busiest seaports throughout all program implementation years."*

The plan as well as the comments from major manufacturers, ports, trucking associations, and environmental justice advocates indicate that at least in the near-term, the focus of the plan will be on light duty ZEVs, whereas the agencies may shift the focus to medium and heavy-duty vehicle charging in long term. Therefore, at this point, we do not anticipate NEVI funds to play a critical role in development of charging infrastructure for Class 8 trucks.

2.13 Summary of Incentive Programs

As described in this section, there are quite a number of incentive programs in the state that provide funding toward purchase of clean and zero emission trucks as well as replacement of legacy diesel fleets. Additionally, with the increased interest in zero emission vehicles and policies enacted by local and state agencies to accelerate adoption of these vehicles, there is an immediate need to deploy charging and fueling infrastructure that can support the upcoming wave of zero emission medium and heavy-duty vehicles. Therefore, aside from the incentive programs that help with the purchase of clean and zero emission vehicles, this report also provided a summary of incentive and assistance programs related to charging and hydrogen fueling infrastructure. Table 10 provides a summary overview of all of these programs including their eligibility and some of their key requirements as it related to Class 8 trucks.

Aside from each incentive program providing funding to facilitate the transition to clean truck technologies, to the extent possible, fleets may want to stack up and combine multiple funding sources to reduce the cost of transition. Examples include using one grant to fund vehicles and another to fund charging infrastructure, using a state grant to meet the match requirements of a federal grant, or stacking non-utility funding with participation in a utility program. It should be noted that despite the incentive programs having their own unique eligibility criteria, these programs often provide stacking opportunities. For example, with respect to HVIP program, local- and federal-funded incentives may be combined with HVIP vouchers, so long as each incentive program is not paying for the same incremental costs, or the total sum of incentives does not exceed the total cost of the vehicle. Local incentives that may be combined with HVIP include programs administered by local air districts or local municipalities that are locally funded. Federal incentive programs may be combined with HVIP vouchers, including funding provided by the Federal Transit Administration (FTA), the Department of Energy (DOE), and other federal agencies. Except for public transit buses, stacking HVIP with State-funded incentives is not allowed. Similar to HVIP, the VW mitigation trust fund cannot be stacked with any of the state level fundings, however, it could be combined with either local or federal grants as well as utility programs. To further clarify this, Table 11 shows the stacking opportunities across various funding sources described in this report. Each cell in the table shows whether the two funding programs (the one representing the row and the one representing the column) can be stacked or not. In cases, where one funding program only pays for infrastructure and the other program only pays for vehicles, we marked those as "No Overlap".

Table 10. Summary of Incentive Programs for Class 8 Trucks

Program	Incentive Structure	Eligibility	Funding Amount for Class 8 trucks
HVIP	Point-of-sale	Zero Emission or 0.01 g/bhp-hr engines	\$120,000 (Base)
Carl Moyer	Cost-effectiveness limit	Clean combustion and Zero emissions Requires scrappage	Up to \$160,000 for 0.02 engines Up to \$410,000 for ZE trucks
Carl Moyer VIP	First come first served	Fleets of 10 or fewer vehicles that have been operating at least 75% (mileage-based) in California during the previous 24 months	Up to \$160,000 for 0.02 engines Up to \$410,000 for ZE trucks
CAP	Same as Moyer with no state caps for zero emission trucks	Follows Moyer guideline	Up to \$160,000 for 0.02 engines Determine based on C/E for ZE trucks
VW Mitigation Trust	First come first served	Class 8 Freight Trucks (including drayage trucks, waste haulers, dump trucks, and concrete mixers) – Public and private	Up to \$85,000 for 0.02 engines Up to \$200,000 for zero emission trucks
Truck Loan Assistance	Financing Assistance	Trucking fleets with 10 or fewer heavy-duty vehicles that are also designated as small business	Varies
ZE Drayage Truck & Infrastructure	Competitive solicitation	freight facilities qualify for the project including warehouses, distribution centers, sea/rail ports, intermodal, border points of energy, and other freight facilities	Funded both vehicles as well as charging infrastructure. A minimum of 50% of match funding is required (i.e., only pays up to 50% of the project cost). Maximum of \$500,000 per truck.
Clean Transportation Program	Competitive solicitation Block Grants First come first served	Public and private fleets of medium and heavy-duty vehicles as well as public charging and hydrogen fueling station developers	Between 50 – 75 percent of the project cost
LADWP Commercial EV Charging Station Rebate Program	Rebates for charging station installation	LADWP commercial customers operating a site (premises) with an active LADWP electric meter on a non-residential rate schedule	Up to \$125,000 per charger with a maximum of \$500,000 per site.
Socal Edison Grant Assistance	Grant Assistance	Small and mid-size fleets (<50 vehicles)	Provide grant assistance to small and mid-size fleets
Socal Edison Charge Ready Transport	Make-Ready Rebates	Fleets of medium and heavy-duty vehicles who owns and planned to own at least two zero emission vehicles SCE customer	Provide low-to no-cost electrical system upgrades. Rebates will be the minimum of (a) 80 percent of the Participant's actual installation cost or (b) 80 percent of the average utility direct cost for installing the customer side make-ready infrastructure for the relevant sector.
LCFS	Credit based program	Non-residential EV charging and H2 fueling stations	Number of credits earned x Credit price

Table 11. Stacking Opportunities Across Various Funding Sources

Program	HVIP	Carl Moyer	Moyer VIP	CAP	VW	Truck Loan	ZE Drayage & Infra	CEC CTP	LADWP	SCE CRT	LCFS
HVIP	N/A	No	No	No	No	No	No	No	No Overlap	No Overlap	No Overlap
Carl Moyer	No	N/A	No	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes
Moyer VIP	No	No	N/A	Yes	No	Yes	Yes	No Overlap	No Overlap	No Overlap	No Overlap
CAP	No	No	Yes	N/A	No	Yes	Yes	Yes	Yes	Yes	Yes
VW	No	No	No	No	N/A	No	No	No Overlap	No Overlap	No Overlap	Yes
Truck Loan	Maybe?	Yes	Yes	Yes	No	N/A	Yes	No Overlap	No Overlap	No Overlap	No Overlap
ZE Drayage & Infra	No	Yes	Yes	Yes	No	Yes	N/A	N/A	Yes	Yes	Yes
CEC CTP	No Overlap	Yes	No Overlap	Yes	No	No Overlap	No	N/A	Yes	Yes	Yes
LADWP	No Overlap	Yes	No Overlap	Yes	No	No Overlap	Yes	Yes	N/A	N/A	Yes
SCR CRT	No Overlap	Yes	No Overlap	Yes	No	No Overlap	Yes	Yes	N/A	N/A	Yes
LCFS	No Overlap	No Overlap	No Overlap	No Overlap	No	No Overlap	Yes	Yes	Yes	Yes	N/A

3 Regulations

California has several effective and proposed regulations that set clean truck requirements across the manufacturing and transportation sectors. These regulations come from state and federal offices, such as CARB, San Pedro Bay Ports, South Coast AQMD, and EPA. The regulations that have already been signed into law include the Advanced Clean Trucks, Heavy-Duty Omnibus and Heavy-Duty Inspection and Maintenance. Proposed regulations discussed in this report include the Advanced Clean Fleets, EPA Clean Truck Plan, South Coast AQMD Warehouse Actions and Investments to Reduce Emissions Program, and San Pedro Bay Ports Clean Truck Fund Rate. This section intends to highlight the motivation behind these regulations, as well as the prospective air quality and public health impacts posed by each regulation when information is available.

3.1 Advanced Clean Trucks

The Advanced Clean Trucks (ACT) regulation is a manufacturers ZEV sales requirement and a one-time reporting requirement for large entities and fleets. The goal of this proposed regulation is to achieve NOx and GHG emission reductions through adoption of advanced clean technology, and to increase the penetration of the first wave of ZE heavy-duty technology into applications that are well suited to its use. The first primary element of the ACT regulation requires manufacturers to report the number of ZE trucks and buses produced and deliver for sale in alignment with a sales percentage schedule. This ZEV sales requirement applies to vehicles with a GVWR greater than 8,500 lbs. (Classes 2b through 8) and manufacturers with greater than 500 annual California sales²⁹. Table 12 shows the proposed ZEV sales percentage schedule where ZEV sales requirements increase annually until 2030.

Table 12. ZEV Sales Percentage Schedule

Model Year	Class 2b-3 Group*	Class 4-8 Group**	Class 7-8 Tractor Group
2024	5%	9%	5%
2025	7%	11%	7%
2026	10%	13%	10%
2027	15%	20%	15%
2028	20%	30%	20%
2029	25%	40%	25%
2030	30%	50%	30%
...	...	...	...
2035 and beyond	55%	75%	40%

*Excludes pickups until 2027 model year

**Excludes Class 7-8 Tractors, includes Yard Tractors

The second primary element of the ACT regulation requires large entities reporting to aid future regulations seeking to increase the use of ZEVs. As part of this regulation, large entities are required to report information about different types of facilities they operate in California, contracting practices, and vehicle usage information for those who own trucks. Additionally, any regulated entities that own vehicles would be required to report vehicle usage information per facility, grouped by vehicle body type. The information collected are used to determine future strategies (e.g., Advanced Clean Fleet regulating) that would maximize the purchase of ZE vehicles in California.

²⁹ Manufacturers with less than 500 annual California sales are exempt, but may opt-in to earn credits for selling ZEVs.

Emissions Reductions

Reductions of NO_x, DPM, and GHG emissions resulting from the adoption of the ACT regulation have been estimated in the ACT ISOR under Appendix F³⁰. Here, CARB staff estimate the potential impacts on criteria pollutants from Class 7 through 8 tractor trucks using the EMFAC2017 model and CA GREET 3.0 to determine tank-to-wheel (TTW)³¹ emission rates under baseline and ACT rule scenarios. The modeled results for statewide TTW NO_x emissions reductions are illustrated in Figure 4, and statewide TTW DPM emissions reductions are shown in Figure 5, respectively.

Figure 4. Tank to Wheel (TTW) Emissions of NO_x for Class 7-8 Tractors in California

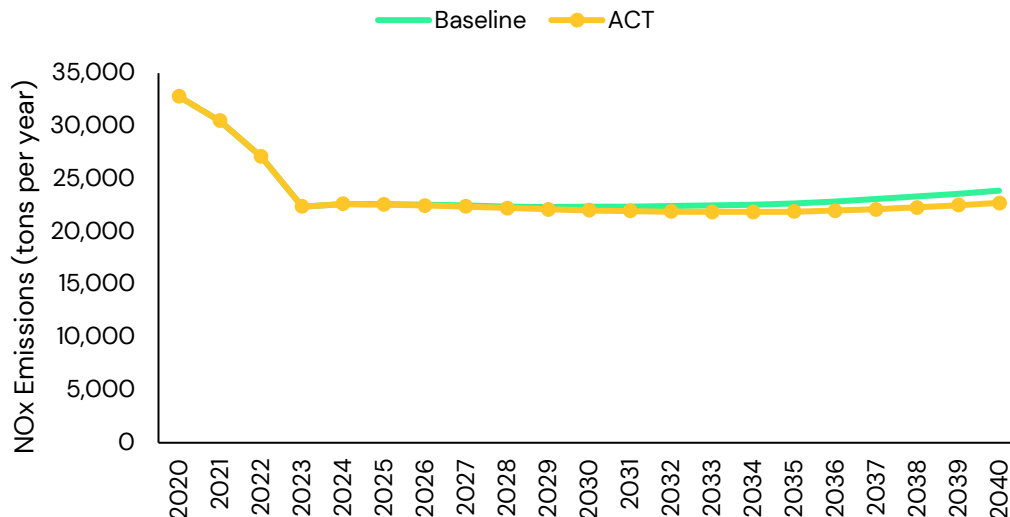
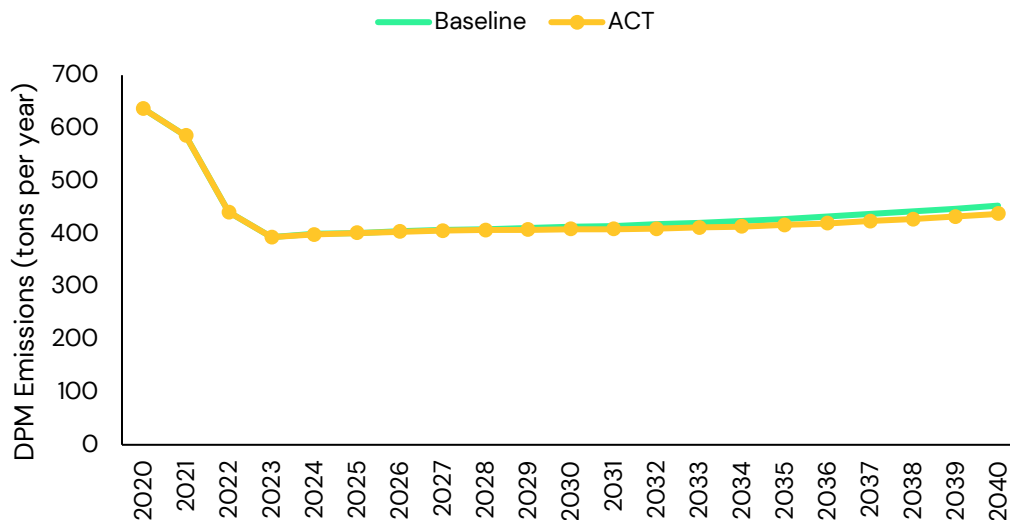


Figure 5. TTW Emissions of DPM (including brake wear) for Class 7-8 Tractors in California



³⁰ [Appendix F – Emissions Inventory Methods and Results \(ca.gov\)](#)

³¹ Tank to wheel refers to a subrange in the energy chain of a vehicle that extends from the point at which energy is absorbed (i.e., charging point, fuel pump) to discharge (i.e., vehicle in operation), commonly assessed to describe energy consumption and emissions while driving.

By 2040, Class 7–8 tractor NO_x and DPM emissions are estimated to be reduced by 1,163 tons per year and 16 tons per year, respectively. In CARB’s analysis, baseline and ACT rule scenario GHG emissions are aggregated across all vehicle classes and estimate that a WTW GHG emissions reduction of 1.68 MMT CO₂e per year will be achieved by 2040.

Public Health Benefits

In addition to an emissions reductions benefits assessment, CARB staff have also performed public health benefits assessments based on the potential impacts of the ACT regulation. The ACT regulation reduces NO_x and DPM emissions, resulting in fewer instances of premature mortality and fewer hospital and emergency room (ER) visits. In the ACT ISOR, CARB estimates the potential health outcomes of the ACT regulation based on U.S. EPA health benefit methodology and other health studies. Their results for the estimated avoided premature mortality, hospitalizations, and ER visits between 2020 through 2040 by California air basin are detailed in Table 13. In the South Coast region alone, nearly 400 avoided premature deaths and over 100 avoided hospitalizations for cardiovascular and respiratory illnesses combined are achieved between 2020 through 2040 because of the ACT regulation.

*Table 13. Regional and Statewide Avoided Mortality and Morbidity Incidents from 2020 to 2040 under ACT Regulation**

Air Basin	Avoided Premature Deaths	Avoided Hospitalizations for Cardiovascular Illness	Avoided Hospitalizations for Respiratory Illness	Avoided ER Visits
Mojave Desert	4 (3 – 5)	1 (0 – 1)	1 (0 – 1)	1 (1 – 2)
Mountain Counties	4 (3 – 5)	0 (0 – 1)	0 (0 – 1)	1 (1 – 2)
North Central Coast	3 (2 – 3)	0 (0 – 1)	1 (0 – 1)	2 (1 – 2)
North Coast	1 (1 – 1)	0 (0 – 0)	0 (0 – 0)	0 (0 – 0)
Northeast Plateau	0 (0 – 0)	0 (0 – 0)	0 (0 – 0)	0 (0 – 0)
Sacramento Valley	25 (19 – 30)	3 (0 – 6)	4 (1 – 6)	9 (6 – 13)
Salton Sea	3 (2 – 4)	0 (0 – 1)	1 (0 – 1)	1 (1 – 2)
San Diego County	27 (21 – 33)	4 (0 – 8)	5 (1 – 8)	11 (7 – 15)
San Francisco Bay	55 (43 – 67)	9 (0 – 17)	10 (2 – 18)	30 (19 – 41)
San Joaquin Valley	73 (57 – 89)	9 (0 – 17)	10 (2 – 18)	27 (17 – 36)
South Central Coast	10 (8 – 13)	2 (0 – 3)	2 (0 – 3)	4 (3 – 6)
South Coast	395 (309 – 483)	67 (0 – 131)	79 (19 – 140)	201 (127 – 275)
Statewide	601 (470 – 734)	94 (0 – 185)	113 (26 – 199)	289 (183 – 396)

**Values in parenthesis represent the 95% confidence interval. Totals may not add due to rounding*

In accordance with U.S. EPA practice, health outcomes are monetized by the values as shown in Table 14, and the statewide valuation of health benefits were calculated by multiplying the value per incident by the statewide total number of incidents for 2020 through 2040. The statewide estimated valuation from avoided health outcomes is detailed in Table 15, in which the total statewide health benefits are valued at \$5.7 billion by 2040.

Table 14. Valuation per Incident for Avoided Health Outcomes

Outcome	Value per incident (2018\$)
Avoided Premature Mortality	\$9,419,320
Avoided Cardiovascular Hospitalizations	\$56,588
Avoided Acute Respiratory Hospitalizations	\$49,359
Avoided Emergency Room Visits	\$810

Table 15. Statewide Estimated Annual Valuation from Avoided Health Outcomes

Outcome	Avoided Incidents	Valuation (Million 2018\$)
Avoided Premature Mortality	602	\$5,659
Avoided Cardiovascular Hospitalizations	95	\$5.3
Avoided Acute Respiratory Hospitalizations	111	\$5.6
Avoided Emergency Room Visits	288	\$0.2
Total	1,096	\$5,670

3.2 Heavy-Duty Omnibus

The Heavy-Duty Omnibus Regulation (HD Omnibus Regulation) originates from a Low NOx Demonstration Program initiated by CARB and Southwest Research Institute, which evaluated the feasibility of attaining 0.02 g/bhp-hr tailpipe NOx emission standard on modern heavy-duty engines. In 2013, California established optional low-NOx standards with the most aggressive being 0.02 g/bhp-hr, which is 90% below the previous standard (i.e., 2010 HD engine standard). The optional NOx standards were developed to pave the way for mandatory standards by encouraging manufacturers to develop and certify low NOx engines and incentivizing the purchase of certified low NOx engines. As a result, since 2016, several natural gas- and propane-fueled Otto-cycle engine families have been certified to the most stringent optional low NOx standards of 0.02 g/bhp-hr.

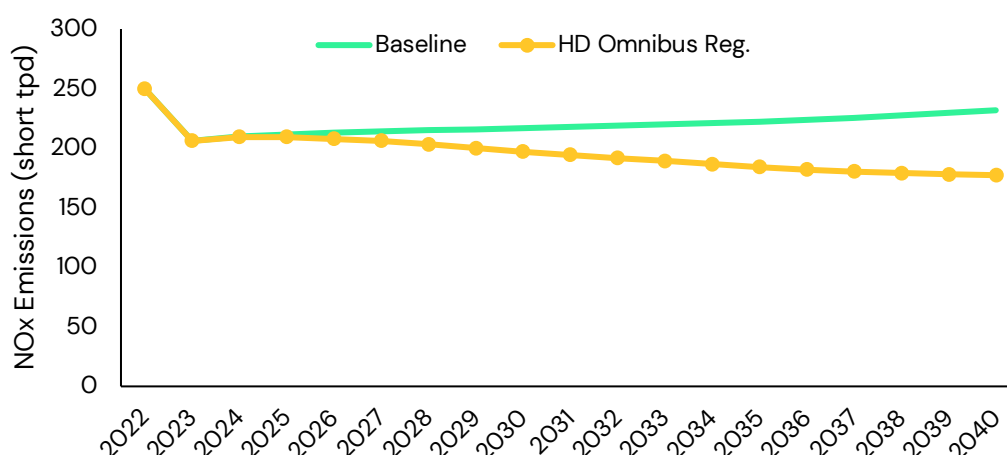
The Low NOx Demonstration Program led CARB staff to implement the HD Omnibus Regulation (effective December 22, 2021) that requires all heavy-duty engines of model year 2024–2026 to meet 0.05 g/bhp-hr NOx standard, with more stringent standards (0.02 g/bhp-hr) for the subsequent model years. This regulation is aimed at ensuring real-world emissions performance critical for attaining federal health-based air quality standards for ozone in 2031 in the South Coast and San Joaquin Valley Air Basins. With these standards on the book in California, and U.S. EPA releasing proposed plans to lower the emissions standards nationwide, we expect to see the clean diesel technology (i.e., 0.05 g/bhp-hr and possibly 0.02 g/bhp-hr) to be commercially available nationwide in the next 3 – 5 years.

Emissions Reductions

The HD Omnibus Regulation will support the adoption of cleaner technologies by promoting clean combustion and ensuring that heavy-duty engines will emit much lower NOx emissions throughout their lifetimes by extending the warranty and durability requirements of the HD engines. An emissions inventory comparing baseline NOx emissions to expected reductions in a HD Omnibus rule scenario has been developed in the HD Omnibus Regulation ISOR under Appendix D³². Here, CARB staff estimate the NOx emissions reductions from a business-as-usual scenario without HD Omnibus using EMFAC2017 model and apply the HD Omnibus Regulation as would be applied to heavy-duty vehicles. Figure 6 shows the legal baseline NOx emissions, as well as the impact of the HD Omnibus rule. It is estimated that statewide NOx emissions are nearly 30% lower than baseline levels by calendar year 2040 due to the HD Omnibus Regulation.

³² [Appendix D – Emissions Inventory Methods and Results for the Proposed Amendments \(ca.gov\)](#)

Figure 6. Projected Statewide NOx Emissions for all Heavy-Duty Vehicles, Baseline and HD Omnibus



Public Health Benefits

In the HD Omnibus Regulation ISOR, under Appendix C³³, the potential public health benefits are assessed for the state of California. These health benefits would be due to reductions in NOx, and subsequent reductions in ozone and PM exposure from secondary chemical formations. Similar to the public health benefit assessment performed for the ACT regulation as shown in Table 13, CARB quantified health outcomes by California Air Basin from 2022 through 2032 for the HD Omnibus Regulation, detailed in Table 16 (note that only the regions with values of one or higher are shown, and regions with zero or less than one impacts are not shown). In the South Coast region alone, 196 avoided premature deaths and nearly 70 avoided hospitalizations for cardiovascular and respiratory illnesses combined are achieved between 2022 through 2032 because of the HD Omnibus Regulation. The statewide estimated valuation from avoided health outcomes is detailed in Table 17, in which the total statewide health benefits are valued at \$3.1 billion by 2032.

Table 16. Regional and Statewide Avoided Mortality and Morbidity Incidents from 2022 through 2032 Under HD Omnibus Regulation*

Air Basin	Cardiopulmonary Mortality	Hospitalizations for cardiovascular illness	Hospitalizations for respiratory illness	Emergency room visits
Mojave Desert	3 (1 – 3)	0 (0 – 0)	0 (0 – 0)	0 (0 – 0)
Sacramento Valley	16 (12 – 17)	0 (0 – 3)	0 (0 – 0)	5 (4 – 8)
San Diego County	13 (10 – 16)	0 (0 – 3)	0 (0 – 0)	5 (3 – 7)
San Francisco Bay	26 (19 – 31)	2 (0 – 8)	4 (0 – 7)	15 (9 – 20)
San Joaquin Valley	69 (54 – 85)	8 (0 – 15)	9 (0 – 16)	26 (16 – 36)
South Central Coast	4 (3 – 5)	0 (0 – 0)	0 (0 – 0)	0 (0 – 2)
South Coast	196 (154 – 240)	31 (0 – 61)	38 (0 – 66)	102 (64 – 140)
Statewide	334 (262 – 406)	48 (0 – 94)	57 (13 – 100)	160 (102 – 219)

*Values in parentheses represent the 95% confidence interval. Totals may not add due to rounding but are within the 95% confidence interval.

³³ [Appendix C-1: Original SRIA Submitted to DOF \(ca.gov\)](#)

Table 17. Statewide Valuation from Avoided Health Outcomes Under HD Omnibus Regulation

Outcome	Avoided Incidents	Valuation (Million 2018\$)
Avoided Premature Mortality	334	\$3,144
Avoided Cardiovascular Hospitalizations	48	\$2.7
Avoided Acute Respiratory Hospitalizations	57	\$2.8
Avoided Emergency Room Visits	160	\$0.1
Total	599	\$3,149

3.3 Heavy-Duty Inspection and Maintenance

In September 2019, Governor Gavin Newsom signed Senate Bill (SB) 210 (Leyva, Chapter 5.5, Statutes of 2019) into law which directed CARB to develop a new, comprehensive HD I&M program to control emissions more effectively from non-gasoline on-road heavy-duty vehicles with a GVWR greater than 14,000 pounds operating in California. In 2020, these vehicles emitted about 52% of statewide on-road mobile source NOx emissions, and about 54% of the statewide on-road mobile source DPM emissions. Most modern trucks are equipped with aftertreatment systems to reduce total emissions, but there was no set requirement to assure that these systems worked properly. CARB field testing of heavy-duty vehicles had shown that between 11% through 17% of tested on-board diagnostic (OBD) vehicles had illuminated OBD malfunction indicator light, meaning that a significant number of heavy-duty vehicles were operating in California with malfunctioning emissions control systems. The HD I&M program, adopted in December 2021, requires affected heavy-duty vehicles to perform periodic emissions testing to ensure and demonstrate that their emission control systems operate properly. Significant emissions reductions are expected to come to fruition by identifying malfunctioning emissions control systems and prompting vehicle owners to repair them.

With the HD I&M regulation expected to begin in 2023, it is projected to be one of CARB's grandest efforts in relieving air quality burdens for disadvantaged communities. By requiring heavy-duty vehicles' emissions control systems be well-maintained for annual inspections, CARB has estimated that the HD I&M regulation will have prevented 65% of DPM emissions and 47% of NOx emissions due to deteriorated systems³⁴. The prospective emissions benefits for the South Coast Air Basin after total implementation are compelling, slashing NOx emissions by 22.1 tons per day and DPM emissions by 0.171 tons per day by 2037.

While the HD I&M program does not promote any advanced technologies, it ensures that the HD diesel vehicles remain clean throughout their lifetime through regular maintenance and immediate repair upon failure of one or more of their emissions control systems.

Emissions Reductions

The expected NOx and PM emissions reductions for the South Coast and San Joaquin Valley Air Basins in the immediate- through long-term are taken from CARB's emission inventory methodology report and shown in

³⁴ [06. HD I-M App D – Emissions Inventory Method and Results \(ca.gov\)](#)

Table 18.

Table 18. Emissions Benefits from Proposed HD I&M Regulation

Year	Statewide	Statewide	South Coast	South Coast	San Joaquin Valley	San Joaquin Valley
	NOx (tpd)	DPM (tpd)	NOx (tpd)	DPM (tpd)	NOx (tpd)	DPM (tpd)
2023	6.4	0.072	2.1	0.023	2.7	0.030
2024	30.3	0.324	8.4	0.083	8.6	0.089
2025	54.5	0.604	14.5	0.149	14.3	0.152
2031	71.6	0.658	19.5	0.165	18.7	0.169
2037	81.3	0.698	22.1	0.171	21.5	0.184

Public Health Benefits

The pollutant reductions from the HD I&M bears significant public health prospects, primarily reductions in hospitalizations due to cardiovascular illness³⁵. Initial public health benefit estimates in CARB's ISOR on the HD I&M regulation present cumulative regional and statewide avoided health incidents³⁶. Here in the South Coast Air Basin, the cumulative avoided regional health incidents from 2023 through 2050 under the HD I&M regulation are shown in Table 19. Though CARB believes that the full scope of health benefits is underestimated in their work³⁷, the HD I&M as implemented would result in nearly 8,000 avoided premature deaths and \$75.8 billion in monetary health benefits statewide from 2023 to 2050.

Table 19. South Coast Avoided Health Incidents from 2023 through 2050 Under the HD I&M

Air Basin	Cardiopulmonary Mortality	Hospitalizations for Cardiovascular Illness	Hospitalizations for Respiratory Illness	Emergency Room Visits
South Coast	4,278	723	863	2,171

3.4 Advanced Clean Fleets

In addition to HD I&M, which aims at reducing emissions from the existing diesel and natural gas vehicles, CARB is also pursuing a regulation that seeks transition of fleets to zero emission vehicles. The proposed ACF regulation would focus on setting two major ZE truck requirements. The first is a ZE vehicle purchase schedules for public fleets. The second are 100% ZE requirements for drayage and high priority/federal fleets³⁸. Beginning 2024, a large fraction of heavy-duty vehicles operating in California would be subject to the following requirements:

- a) **State and Local Government Fleets:** This piece of the ACF regulation targets public vehicles. In calendar years 2024 through 2026, at least 50% of new public vehicle additions must be ZE vehicles, and the 100% purchase requirement starting in 2027.

³⁵ [Appendix E – Further Details on Health Benefit Modeling Methodology \(ca.gov\)](#)

³⁶ [02. HD I-M ISOR \(ca.gov\)](#)

³⁷ An expansion of emissions inputs and an assessment for other health outcomes, including, but not limited to, additional cardiovascular and respiratory illnesses, nonfatal/fatal cancers, nervous system diseases, and lost workdays would provide a more complete picture of the benefits from reduced exposure to air pollution.

³⁸ [draft2022aqmp.pdf \(aqmd.gov\)](#)

- b) **Drayage Fleets:** This portion of the ACF regulation looks towards transitioning drayage trucks to ZE at the seaports (i.e., POLA and POLB) and intermodal railyards. Beginning in calendar year 2024, new drayage trucks added to Port registries must be ZE, and all drayage trucks must be ZE by 2035. The ACF regulation notes that legacy drayage trucks (i.e., diesel and natural gas drayage trucks) may enter the Port registry prior to 2024 and operate to the extent of their useful life. These legacy drayage trucks would be required to have model year (MY) 2010 or newer engines, and if entering the San Pedro Bay Ports for the first time, need MY 2014 or newer engines. Regardless, all drayage trucks must be ZE by 2035 – legacy trucks will not be allowed to renew their registration even if they have not reached useful life. ,
- c) **High Priority and Federal Fleets:** This section of the ACF regulation broadly focus on large private and federal fleets operating in California. According to CARB, this measure would apply similar purchasing and turnover requirements as in drayage to priority fleets in California. California heavy-duty truck fleets are high-priority if: 1) the fleet has 50 or more vehicles, or 2) the fleet procures \$50 million in gross annual revenue – otherwise, the fleet is not subject to this regulation. The project team assumed that these trucks have 15 years useful life. This is a conservative assumption, as some of the Class 8 truck, especially single unit trucks, may have useful life of 18 years (since they do not exceed 800,000 mileage limit).

Under the default option presented in the current ACF proposal, regulated fleets (i.e., high priority, federal, drayage, and public fleets³⁹) can only add ZEVs to their fleets starting 2024. and technically no new combustion vehicles, whether it is meeting HD Omnibus standards or not, can be added. There is also a Milestone option in the current ACF proposal, in which fleets are not restricted from procuring ICE vehicles after 2024, but are required to hit pre-established ZEV milestones each year. The prospective vehicle and emission impacts due to the proposed ACF regulation in Reports 3, 4, and 6 consider the default option of the ACF regulation. While such requirements accelerate the adoption of zero emission technologies and avoid fleets to undergo multiple forced turnover to get to zero emissions, the requirements will certainly impede the near term emission reductions that could be achieved through clean combustion options. Of course, the unregulated fleets (e.g., non-drayage trucks operating in fleets with less than 50 trucks and less than \$50 million in revenue) can still benefit from purchasing cleaner combustion technologies. According to CARB⁴⁰, only 32% of Class 7/8 trucks in California will be considered unregulated under ACF, whereas 68% of those trucks are subject to ACF regulation.

Emissions Reductions

The ACF regulation Standard Regulatory Impact Assessment (SRIA) uses the EMFAC2021 model to determine the emissions benefits that would be associated with the proposed regulation. NOx, PM, and GHG emissions benefits are projected by assuming zero tailpipe emissions for the forecasted number of medium- and heavy-duty ZEVs operating in California with the proposed ACF requirements in place and assuming no change in total VMT, compared to the baseline. The projected baseline and proposed regulation on NOx emissions are shown in Figure 7. With the proposed regulation, NOx emissions decline from 195 tpd in 2024 to 67 tpd in 2040. Just as compelling are the results for PM2.5 emissions, as shown in Figure 8; PM2.5 emissions under the proposed regulation would fall from 5.9 tpd in 2024 to 4.68 tpd in 2040. An assessment is also performed for projected baseline and proposed regulation GHG emissions, shown in Figure 9. The proposed regulation would bring Tank-to-Wheel GHG emissions from 44 MMT/year in 2024 down to 23 MMT/year by 2040.

³⁹ For public fleet only 50 percent of their new purchases should be ZEV in 2024 and the 100 percent starts in 2027

⁴⁰ Slide 23 of CARB's presentation: https://ww2.arb.ca.gov/sites/default/files/2021-11/211117acfpres_ADA.pdf

Figure 7. Projected Statewide NOx Emissions for Class 2b-8 Vehicles, Baseline and Proposed ACF Regulation

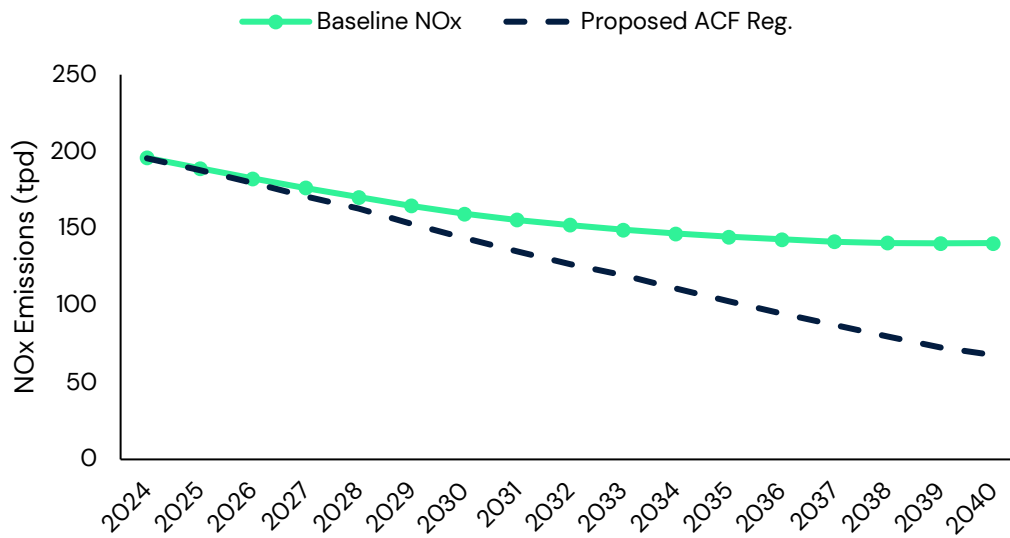


Figure 8. Projected Statewide PM2.5 Emissions for Class 2b-8 Vehicles, Baseline and Proposed ACF Regulation

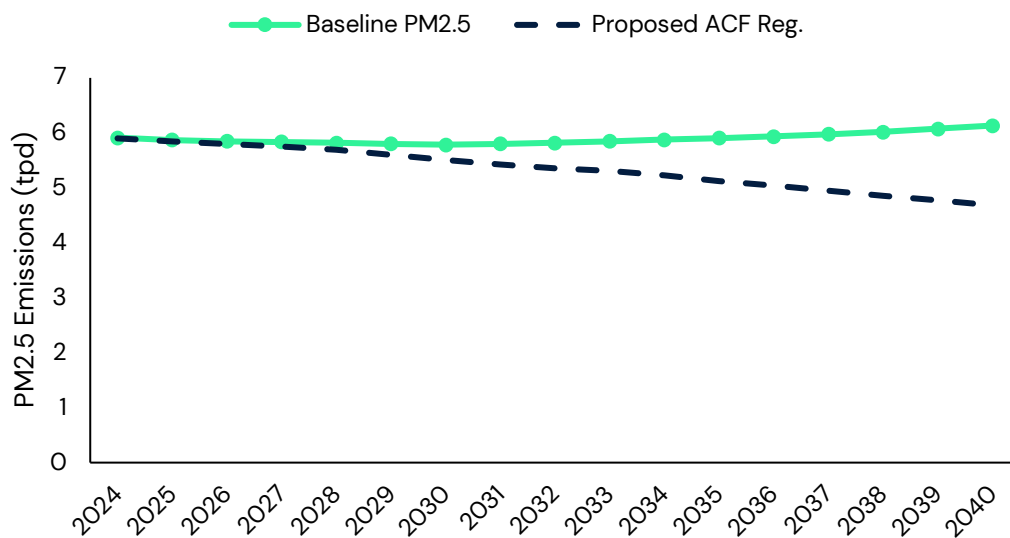
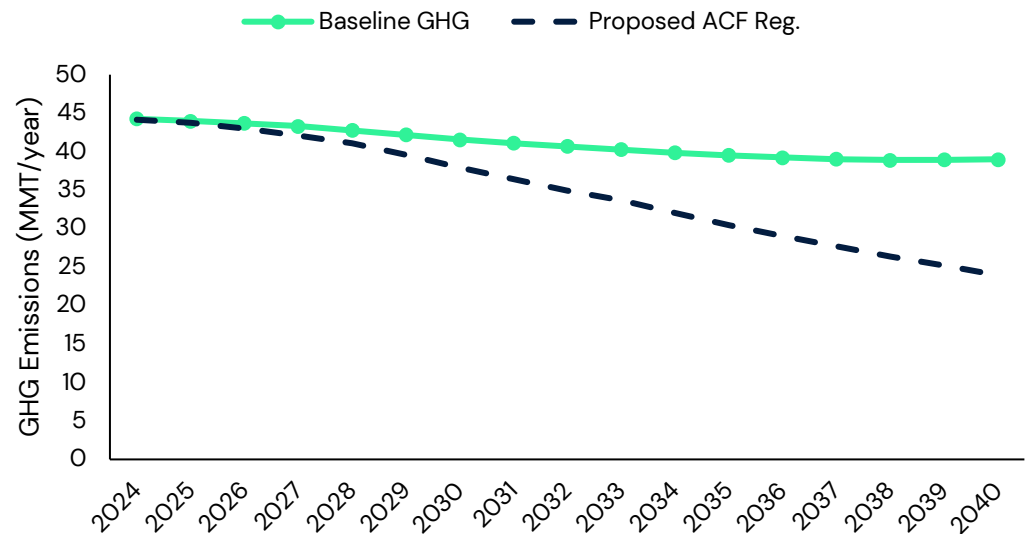


Figure 9. Projected Statewide GHG Emissions for Class 2b–8 Vehicles, Baseline and Proposed Regulation



Public Health Benefits

As with the HD I&M regulation, initial public health benefit estimates are developed in CARB’s Standardized Regulatory Impact Assessment (SRIA) of the ACF regulation, in which cumulative regional and statewide avoided mortality and morbidity incidents are assessed from 2024 through 2050. In Table 20, cumulative avoided mortality and morbidity incidents for the South Coast Air Basin are summarized from 2024 through 2050. According to CARB’s SRIA, the ACF regulation would result in nearly 6,000 avoided mortalities statewide and \$61.6 billion monetary health benefits by 2050.

Table 20. South Coast Avoided Mortality and Morbidity Incidents from 2024 through 2050

Air Basin	Cardiopulmonary Mortality	Hospitalizations for Cardiovascular Illness	Hospitalizations for Respiratory Illness	Emergency Room Visits
South Coast	3,429	592	707	1,721

3.5 EPA Clean Truck Plan

As of March 2022, EPA’s Office of Transportation and Air Quality (OTAQ) has proposed a series of regulations over the next three years to reduce pollution from trucks and buses to advance the transition to a ZE transportation future. In accordance to President Biden’s Executive Order 14307, “Strengthening American Leadership in Clean Cars and Trucks”, EPA intends to propose stronger NOx and GHG standards to reduce pollution from heavy-duty vehicles and engines starting in model year 2027. EPA’s “Clean Trucks Plan” would result in significant emissions reductions from new medium- and heavy-duty gasoline and diesel engines.

EPA last revised the NOx standards for on-highway heavy-duty trucks and engines in 2001—more than 20 years ago. Although those standards achieved important NOx reductions, new technologies that are an evolution of those available today can help achieve the additional reductions we need to improve air quality and health in our communities. This proposed rule would ensure heavy-duty vehicles and engines are as clean as possible while helping jump-start the transition to ZE vehicles in

the heavy-duty fleet. It should be noted that this regulation is still under development, and that EPA intends to finalize their proposal by the end of 2022.

Prospective NOx Emissions Reductions at National Level

The EPA Clean Truck Plan as proposed would primarily target NOx emissions reductions at low vehicle speeds, idling, and in stop-and-go traffic conditions. The proposed rule would also seek to encourage manufacturers to design and build engines with longer useful life periods in mind, as well as increase warranty periods to reduce the likelihood for owners to tamper with emissions controls⁴¹. Currently, EPA is exploring two regulatory options to set stronger standards for NOx emissions for model year 2027 and beyond, as described below:

1. Proposed Option 1: Increment NOx standard stringency twice, the first time for model year 2027 and the second time for model year 2031 and beyond.
2. Proposed Option 2: Immediately require full implementation of a NOx standard for model year 2027.

Additional context to the Proposed Rule published by EPA discusses the implications of NOx emissions standards based on Proposed Option 1 and Proposed Option 2, including preliminary emissions standards and national NOx emissions reductions⁴². The NOx emissions standards for laboratory and for “on-the-road” testing procedures are presented in Table 21 and

⁴¹ <https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P1014874.pdf>

⁴² <https://www.govinfo.gov/content/pkg/FR-2022-03-28/pdf/2022-04934.pdf>

Table 22, respectively.

Table 21. Proposed Option 1 and 2 NO_x Emission Standards for Heavy-Duty Compression Ignition (CI) and Spark Ignition (SI) Engines on Specific Duty Cycles [Milligrams/horsepower-hour or mg/hp-hr]

Duty Cycle	Proposed Option 1				Proposed Option 2	Current NOx Emission Standards
	Model Years 2027–2030	Model years 2031 and later			Model Years 2027 and later	
	All HD Engines	SI, HDE, light HDE, and medium HDE	Heavy HDE through intermediate useful life (IUL)	Heavy HDE from IUL to full useful life (FUL)		
FTP (transient mid/high load conditions)	35	20	20	40	50	200*
SET (steady-state conditions)	35	20	20	40	50	
LLC (low-load conditions)	90	50	50	100	100	N/A

*Source: [Heavy-Duty Highway Spark-Ignition Engines: Exhaust Emission Standards, March 2016](#)

Table 22. Proposed Options 1 and 2 "On-the-Road" NOx Standards for Heavy-Duty CI Engines

Operation Bin	Proposed Option 1				Proposed Option 2	Current NOx Emission Standards*
	Model Years 2027–2030	Model years 2031 and later			Model Years 2027 and later	
	All HD Engines	Light HDE, and medium HDE	Heavy HDE through IUL	Heavy HDE from IUL to FUL		
Idle (g/hr)	10	7.5	7.5	7.5	15	30**
Low Load (mg/hp–hr)	180	75	7.5	150	150	N/A
Medium/High Load (mg/hp–hr)	70	30	30	60	75	N/A

*Source: [Heavy-Duty Highway Compression-Ignition Engines and Urban Buses: Exhaust Emission Standards](#)

** California set an idling emissions limit of 30 g/hr idle for engines of model year 2007 and newer. Considering that most of the engines in the U.S. are 50 state certified, it is fair to assume that most of the current 2007+ HD engines are meeting the California idle emissions standards.

If finalized as proposed, at national level, Proposed Option 1 would reduce NOx emissions from heavy-duty vehicles in 2040 by more than 50% (from legal baseline); by 2045, a year by which most of the regulated fleet would have turned over, heavy-duty NOx emissions would be more than 60% lower than they would have been without the rule. As for Proposed Option 2, heavy-duty NOx emissions in 2045 would be reduced by 47% (from legal baseline). The projected percent reduction of key pollutants (at the national level) is described in Table 23 for reference.

Table 23. Projected Heavy-Duty Emission Reductions in 2045 at national level from the Proposed Options 1 and 2 Standards

Pollutant	Percent reduction in highway heavy-duty emissions	
	Proposed Option 1	Proposed Option 2
NOx	61%	47%
DPM	26%	24%
VOC	21%	20%
CO	17%	16%

Prospective Emissions Benefits for Southern California

In addition to EPA's Regulatory Impact Analysis (RIA), the Draft 2022 California Statewide SIP Strategy, provide separate estimates of NOx emissions reductions based on federal low-NOx standards for the state of California, as well as the South Coast and San Joaquin Valley Air Basins⁴³. The federal low-NOx standards would apply to new model-year 2024 and later heavy-duty trucks to ensure that all trucks traveling in California would eventually be equipped with an engine that meets lower NOx standards. However, as EPA proposed regulatory options are both not effective until 2027, we believe the emission reduction estimates provided in CARB's 2022 State SIP Strategy are likely overstated. Table 24 shows CARB's estimated emissions reductions for the state of California, as well as the South Coast and San Joaquin Valley Air Basins by calendar year 2037.

⁴³ https://ww2.arb.ca.gov/sites/default/files/2022-01/Draft_2022_State_SIP_Strategy.pdf

Table 24. Federal Action for On-Road Heavy-Duty Vehicle Low-NOx Engine Standards Estimated Emissions Reductions

Region	2037 NOx (tpd)
Statewide	47.4
South Coast	10.2
San Joaquin Valley	11.7

Prospective Public Health Benefits at National Level

Furthermore, EPA provides national health benefit valuations in the published Proposed Rule, which is described in detail in Table 25. To reflect broad economic scenarios, 3% and 7% discount rates are applied to the costs and monetized health benefits analysis – here, the benefits are the monetized economic value of the reduction in PM_{2.5} and ozone-related premature deaths and illnesses that result from reductions in NOx emissions and directly emitted PM_{2.5} attributable to implementation of the proposed options. Proposed Option 1 would result in total annual monetized ozone and DPM related benefits between \$10–\$33 billion. EPA’s initial assessment found that for Proposed Option 2, total annual monetized ozone and DPM related benefits fall between \$8–26 billion. Given their analysis, EPA advocates for the stringency of Proposed Option 1, as it would result in greater public health benefits and fall in greater alignment with NAAQS.

Table 25. Annual Value of Costs, Benefits and Net Benefits of the Proposed Options 1 and 2 [Billions, 2017\$]

Calendar Year 2045	Proposed Option 1		Proposed Option 2	
	3% Discount	7% Discount	3% Discount	7% Discount
Benefits	\$12–\$33	\$10–30	\$9.1–\$26	\$8.2–\$23
Costs	\$2.3	\$2.3	\$2.9	\$2.9
Net Benefits	\$9.2–\$31	\$8.1–\$28	\$6.2–23	\$5.3–21

3.6 South Coast AQMD Warehouse Actions and Investments to Reduce Emissions Program

The Warehouse Actions and Investments to Reduce Emissions (WAIRE) Program aims to reduce NOx and DPM emissions associated with warehouses, help meet federal standards and improve public health, especially in communities located near warehouses in the South Coast Air Basin. The WAIRE Program is set to be phased in over time based on warehouse size, as described in

Table 26.

Table 26. WAIRE Schedule

Phase	Warehouse Size (sq ft)	Warehouse Operations Notification* Due Date	Initial Site Information Report Due Date	First Annual WAIRE Report (AWR)	
				Compliance Period	Due Date***
1	≥ 250,000	9/1/2021**	7/1/2022	1/1/2022 to 12/31/2022	1/31/2023
2	≥ 150,000 – <250,000		7/1/2023	1/1/2023 to 12/31/2023	1/31/2024
3	≥ 100,000 – <150,000		7/1/2024	1/1/2024 to 12/31/2024	1/31/2025

*Warehouse Operations Notification is the only required reporting obligation for warehouse owners under Rule 2305

**Or within 14 days of operator change or 30 days after renovation that changes the square footage

***If the warehouse operator vacates the warehouse during the compliance period the AWR is due the date the operator leaves

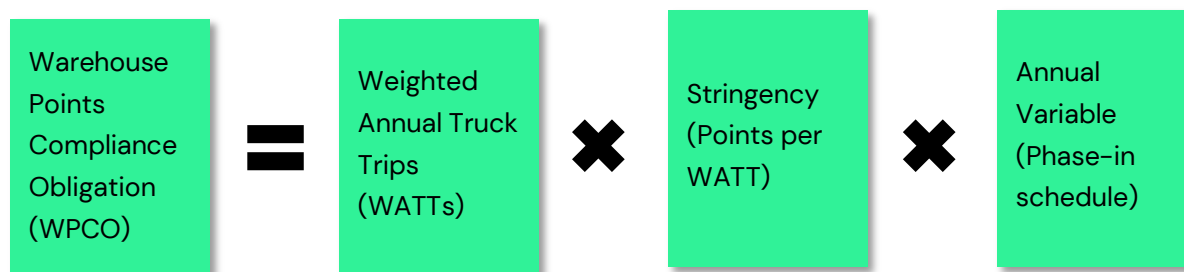
The WAIRE Program is backed by Rule 2305 and Rule 316. Rule 2305 is the Warehouse Indirect Source Rule (ISR) which provides the WAIRE Program with a menu-based points system to determine warehouse operator compliance to emissions reductions requirements. A sample of the WAIRE menu as of May 2021 is shown in Table 27.

Table 27. WAIRE Menu

WAIRE Menu Item	WAIRE Menu Sub-Item			Reporting Metric	Annualized Metric	WAIRE Points	Discounted WAIRE Points for Transfer Rule 2305 Subparagraph (d)(6)(A)	
Acquire NZE/ZE Trucks in Warehouse Operator Truck Fleet	Purchase Truck	Class 8 Truck	NZE	Number of trucks	1 truck purchased	55	55	
		Class 4 – 7 Truck				26	26	
		Class 8 Truck	ZE			126	126	
		Class 4 – 7 Truck				68	68	
		Class 2b-3				14	14	
NZE/ZE Truck Visits	Truck Visits	Class 8 Truck	NZE	Number of Visits	365 truck visits	42	24	
		Class 4 – 7 Truck				12	9	
		Class 8 Truck	ZE			51	33	
		Class 4 – 7 Truck				12	9	
		Class 2b-3				9	6	
Acquire ZE Yard Truck	Purchase Yard Truck		ZE	Number of yard trucks	1 truck purchased	177	177	
Use ZE Yard Truck	Onsite Yard Truck Use		ZE	Hours of use	1000	291	51	
Install Onsite ZE Charging or Fueling Infrastructure	Electric Charger	150-350 kW EVSE	EVSE Purchase	Number of EVSE purchased	1 EVSE Purchased	118	118	
		51-149 kW EVSE				51	51	
		19.2-50 kW EVSE				26	26	
		Up to 19.2 kW EVSE				5	5	
		TRU Plug			1 Plug Purchased	3	3	
		19.2-350 kW EVSE	Construction Mobilization	First day of construction	1 construction project	9	9	
		Up to 19.2 kW EVSE				5	5	
		TRU Plug				5	5	
		19.2-350 kW EVSE	Final Permit Sign Off & Charger Energization	The latter of the final permit sign off or charger energization	1 construction project	59	59	
		Up to 19.2 kW EVSE				5	5	
		TRU Plug				7	7	
		Hydrogen Station	Liquid or Gaseous H ₂		Total kg of dispensed H ₂ capacity per day	700 kg/day project	1680	1680
	Use Onsite ZE Charging or Fueling Infrastructure	Electric Charger	Car or truck charging		kWh of dispensed electricity	165,000 kWh	42	24
TRU Plug			kWh of dispensed electricity beyond CARB requirements	10,658 kWh	10	3		
Hydrogen Station		Car or truck fueling		Total kg of dispensed H ₂	6,152	43	25	
Install and Energize Onsite Solar Panels	Solar Panels	Rooftop Solar		Average System Design Purchased	100 kW	15	15	
		Carport Solar		Average System Design Purchased	100 kW	19	19	
Use Onsite Solar Panels		kWh Production		Estimated annual production (kWh)	165,000 kWh	1	1	
Install MERV 16 or greater Filters or Filter Systems in Residences, Schools, Daycares, Hospitals, or Community Centers	Air Filters for Sensitive Receptors	Stand-alone systems		Number of systems	25 systems	55	55	
		Filters		Number of filters	200 filters	51	51	

The WAIRE Points Compliance Obligation (WPCO) is based on annual truck trips to each applicable new and existing warehouse that has at least 100,000 square feet of indoor floorspace within a single building that may be used for warehousing activities. Rule 316 establishes fees to fund South Coast AQMD compliance activities associated with the ISR⁴⁴. Warehouse operators are required to earn a specific number of points every year. The WPCO is based on the number of truck trips made to and from the warehouse each year and is calculated using the formula in Figure 10.

Figure 10 – WPCO Calculation



In Figure 10, truck trips are defined as one-way trips that tractors and straight trucks make to a warehouse facility when delivering goods to or from another location – for example, a single visit from a truck is equal to two trips. Weighted Annual Truck Trips (WATTs) are calculated by inputting the actual truck trip counts of the number and type of trucks, as in the following equation:

$$\text{WATTs} = [\text{Class 2b through 7 truck trips}] + [2.5 \times \text{Class 8 truck trips}]$$

Warehouse operators can earn points by complying with the WAIRE Plan actions or paying mitigation fees. If a warehouse operator earns more points than needed during the compliance period, they can bank extra points for a future year, or transfer points to another warehouse they operate. Otherwise, warehouse operators must pay a mitigation fee at \$1,000 per WAIRE point and an additional 6.25% administration fee to support South Coast AQMD facilitation of the WAIRE program. The WAIRE Mitigation Fee Program is expected to provide incentives towards the purchase of clean truck technologies, as well as ZE charging and fueling infrastructure in communities near the warehouse(s) that paid the fee.

While the WAIRE program does not require a specific technology to comply with the rule (i.e., it provides fleets and warehouses the flexibility to choose from a menu of options including zero emission as well as clean combustion trucks), the program will help with the adoption of clean technologies especially in communities neighboring these warehouses.

Prospective Emissions Reductions for South Coast Air Basin

In the Second Draft Report on Proposed Rule 2305 and Proposed Rule 316 from South Coast AQMD, a baseline emissions inventory is developed to estimate NO_x and DPM emissions from nearly 3,000 warehouses expected to be required to earn WAIRE Points under Rule 2305⁴⁵. In the joint analysis by CARB, SCAG, and South Coast AQMD, 19 scenarios that vary clean truck quantities, charging and fueling infrastructure, and mitigation fee payment strategies are modeled to broadly account for various emission reductions pathways through the WAIRE program. The results across all scenarios are the surplus emissions reductions after considering emissions reductions from CARB's ACT, HD Omnibus, and Heavy-Duty I&M rules. The results indicate that the WAIRE Program would achieve surplus NO_x emissions reductions between 0.0–20.3 tons per day from 2022 through 2031 calendar years; the

⁴⁴ <http://www.aqmd.gov/docs/default-source/planning/fbmsm-docs/waire-implementation-guidelines.pdf?sfvrsn=12>

⁴⁵ http://www.aqmd.gov/docs/default-source/planning/fbmsm-docs/pr-2305_sr_2nd-draft_4-7-21_clean.pdf?sfvrsn=8

results also show that surplus DPM emissions reductions between 0.0–0.025 tons per day from 2022 through 2031 calendar years could be achieved through implementation of the WAIRE program.

3.7 San Pedro Bay Ports Clean Truck Fund Rate

In 2006, the respective Boards of Harbor Commissioners on behalf of POLA and POLB adopted the San Pedro Bay Ports Clean Air Action Plan (CAAP). The original CAAP planned measures that the Ports would take to reduce emissions from Port-related operations, specifically from ocean-going vessels, trains, trucks, cargo hauling equipment and harbor craft. One of the most successful strategies contained in the CAAP was the Clean Truck Program (CTP), which led the trucking industry to replace the existing fleet of trucks that provided drayage services at the Ports with cleaner trucks. Starting in 2008, the Ports accelerated the industry transition towards the State Drayage Truck Rule, which required statewide port trucks to use 2007 U.S. EPA compliant trucks by 2014, by advancing phased adoption at the Ports by 2012⁴⁶.

In 2017, POLB and POLA adopted a CAAP Update, which outlines strategies to further reduce pollution from Ports-related sources. One of the key strategies outlined in the 2017 CAAP Update is the development and implementation of a Clean Truck Fund (CTF) rate. As of April 1, 2022, the CTF rate will charge cargo owners \$10 per loaded twenty-foot equivalent unit (TEU) (\$20 for containers longer than 20 feet) hauled by drayage trucks in and out of container terminals. The purpose of the CTF rate is to generate funds to accelerate the deployment of clean trucks, in support of achieving the goal of a ZE drayage truck fleet by 2035. To this end, certain exemptions apply for trucks that have engines certified to the CARB ZE standard and low NOx emissions manufacturing standard or better. Both POLA and POLB have lifetime exemptions to the CTF rate for ZE trucks, however each Port applies different limited exemptions to low-NOx trucks based on registration date with the Port Drayage Truck Registry (PDTR)⁴⁷ – Table 28 outlines these differences.

Table 28. Low-NOx Only Truck Exemptions Duration

Port of Los Angeles	Port of Long Beach
Truck registered in PDTR and placed into service by Dec. 31, 2022 = Exemption until Dec 31, 2027	Truck purchased before Nov. 8, 2021 = Exemption until Dec. 31, 2034
	Truck registered in PDTR and in service by Dec. 31, 2022 = Exemption until Dec. 31, 2031
	Truck is purchased by July 31, 2022, and registered in the PDTR within 30 days of receipt of the truck = Exemption until Dec. 31, 2031

Although there have yet to be any emissions reductions public health benefit assessments made for the newly implemented CTF rate, an economic study prepared by staff at the Ports has estimated that the CTF rate is expected to generate up to \$90 million in the first year⁴⁸. As the CTF rate is collected, the Ports intend to publish spending plans that will establish near-term investments, priority targets for spending, and specific funding contributions to infrastructure to support use of ZE technologies

⁴⁶ <https://cleanairactionplan.org/download/222/other-documents/5022/final-resolution-on-clean-truck-fund-rate-3-9-2020.pdf>

⁴⁷ <https://cleanairactionplan.org/download/240/trucks/5165/clean-truck-fund-rate-fact-sheet-3-16-22.pdf>

⁴⁸ <https://cleanairactionplan.org/download/222/other-documents/5033/final-economic-study-for-clean-truck-fund-rate.pdf>

throughout the region. Both ports established their three-year spending plans on March 24, 2022⁴⁹. With respect to allocation of funds resulting from the CTF rate, Port staff shall develop an annual report and recommendation, guided by the approved Spending Plan to allocate CTF Rate revenues to the specific incentive pathways established under the spending plan. For example, Table 29 below illustrate the Port of Los Angeles's staff proposed priorities for zero emission truck incentives. Note that the allocations are subject to Board approval.

Table 29. Anticipated Three-Year Funding Priorities for ZE Truck Incentives – Port of Los Angeles

Pathways	FY 22–23		FY 23–24		FY 24–25	
	Dollars	% Total	Dollars	% Total	Dollars	% Total
Truck Vouchers	\$40 million	89%	\$35 million–\$45 million	80%–100%	\$25 million–\$35 million	60%–80%
Infrastructure Match	–	–	up to \$10 million	up to 20%	Up to \$10 million	up to 20%
Small Fleet Support	–	–	\$4.5 million–\$10 million	10%–20%	\$4.5 million–\$10 million	10%–20%
Advanced Truck Technologies	\$5 million	11%	up to \$4.5 million	up to 10%	up to \$4.5 million	up to 10%
Innovative ZE Truck Concepts	–	–	up to \$4.5 million	up to 10%	up to \$4.5 million	up to 10%

The CTF Rate Program is a great example of a program with a consistent stream of revenue until the whole fleet is transitioned to zero emission technology. Unlike, most of state incentive programs where amount of funding fluctuates by the State annual budget, this program has established a revenue stream to fund cleaner technologies, especially zero emission technologies.

4 Air Quality Planning Efforts

This report has set focus on key incentive programs and regulations that will support the adoption of clean technologies in the commercial transportation sector. This section of the report seeks to highlight statewide air quality planning efforts. Unlike the proposed or now-effective incentives and regulations discussed above, these draft plans are primarily suggestions for setting long-term goals at the state level. These air quality management plans highlight the importance of the regulations and incentives already discussed by advocating for much of the same change, but also supplement the importance introduce future potential air quality projects that could be addressed via local and state agencies.

4.1 Draft 2022 State SIP Strategy

The Draft 2022 State Strategy for the State Implementation Plan (Draft 2022 State SIP Strategy) is one of CARB's most recent air quality planning efforts in development to identify the control measures and emissions reductions necessary to support attainment of the federal 70 ppb 8-hour ozone standard across California. Nineteen areas in California are designated as nonattainment for the 70 ppb 8-hour ozone standard, with the South Coast Air Basin and San Joaquin Valley Air Basins designated as Extreme for the 70 ppb 8-hour ozone standard. Per the Clean Air Act, nonattainment areas must develop SIPs to demonstrate attainment of federal air quality standards that include both the

⁴⁹ https://kentico.portoflosangeles.org/getmedia/854aefcb-3398-4166-9906-65d43a04934a/item-10_environmental_ctf-spending-plan_board-report

magnitude of emissions reductions needed by the required attainment deadline, and the actions necessary to achieve those reductions⁵⁰. Thus, the Draft 2022 State SIP Strategy includes potential control measures and standards across local, state, and federal levels. One of the measures in development is the ACF Regulation, which has been discussed earlier in this report. The following section provides an overview for a separate clean trucks measure included in the Draft 2022 State SIP Strategy.

Zero Emissions Trucks Measure⁵¹

The proposed Zero Emissions Trucks Measure would seek to accelerate the number of ZE vehicles by upgrading excess combustion engine trucks not impacted via the ACT or ACF regulations to new or used ZEVs, as opposed to trucks with cleaner combustion engines. The authority granted by the Zero Emissions Trucks Measure would be used to enable a smoother and more equitable path towards a 100% ZE California truck fleet by 2045. The proposed Zero Emissions Trucks Measure would use market signal tools and conditional restrictions, or fees based on low/ZE zoning to maximize emissions reductions, particularly in disadvantaged communities. For example, highly pollutant trucks would be assessed higher fees to enter low emission zones and eventually be forbidden from entering ZE zones or disadvantaged communities.

The proposed measure seeks to expand the ZEV market in a manner that is economically feasible for more than 100,000 fleets where some cannot afford to purchase new trucks and will not be able to operate without access to retail ZEV infrastructure, especially for long-haul and inter-state vehicles. The approaches as currently outlined would rapidly accelerate the transition from combustion to ZE trucks needed throughout the state. This approach would also avoid having to require turnover for all fleets and the prohibitively high costs associated with that type of air quality benefit strategy. Concerns regarding compliance to the Zero Emissions Trucks Measure include increased rate of fleet turnover, but there is not sufficient evidence to suggest that the market would not be able to meet the manufacturing needs for new ZE vehicles⁵². Because the proposed measure would capture the remaining combustion engine truck fleets and transition them towards ZE technologies, it is inferred that the measure would result in the development of more accessible charging and fueling infrastructure on top of what is already anticipated across other regulations. Currently CARB has not provided any further details on this measure, and therefore, there is no emissions reductions or public health assessment made available.

4.2 Draft 2022 South Coast Air Quality Management Plan

The Draft 2022 Air Quality Management Plan (AQMP) is South Coast AQMD's most recent air quality planning effort, intended to identify, develop, and implement strategies and control measures to meet the 70 ppb 8-hour ozone standard no later than the 2037 deadline for the South Coast Air Basin⁵³. The Draft 2022 AQMP includes a variety of strategies relying on NOx emissions reductions through economy-wide transition to zero emission technologies when cost-effective and feasible, and ultra-low emission technologies in other applications, best management practices, co-benefits from existing programs such as climate and energy efficiency policies, and incentive approaches where applicable. One of the more notable strategies outlined in the Draft 2022 AQMP, aside from the WAIRE Program, are related to commercial marine ports and their associated emissions.

The Facility-Based Mobile Source Measures, such as the Warehouse ISR mentioned above, are measures aimed at reducing the emissions from indirect sources, such as from heavy-duty vehicles

⁵⁰ https://ww2.arb.ca.gov/sites/default/files/2022-01/Draft_2022_SSS_Notice.pdf

⁵¹ https://ww2.arb.ca.gov/sites/default/files/2022-01/Draft_2022_State_SIP_Strategy.pdf

⁵² https://ww2.arb.ca.gov/sites/default/files/2022-03/2022_SSS_Appx_B_Draft_EA.pdf

⁵³ http://www.aqmd.gov/docs/default-source/clean-air-plans/air-quality-management-plans/2022-air-quality-management-plan/2022aqmp_pub-workshop-announcement-5-25-26-22-revised-051822.pdf?sfvrsn=32

and ocean-going vessels that visit ports. There are four proposed control measures within the Facility-Based Mobile Source Measures, including emission reductions for: commercial marine ports, new and existing rail yards and intermodal facilities, warehouse distribution centers, and commercial airports⁵⁴. These sub-measures seek to reduce NO_x, VOC, and DPM emissions from mobile sources at the Ports, focusing on deployment strategies for the cleanest technologies possible and supporting ZE charging and fueling infrastructure. The commercial marine ports measure is in alignment with existing incentive programs to support the transition to cleaner technologies. The South Coast AQMD has not provided any further details on the structure of these Facility-Based Mobile Source Measures outside of the WAIRE program, and therefore, no emissions benefits or public health assessments has been made available for the remaining measures.

5 Summary

In this report, an overview of pertinent policies and strategies is developed to highlight the role of incentives, regulations, and air quality plans in the adoption of clean truck technologies. Clean truck technologies, such as low-NO_x natural gas and ZEVs, will be the most effective transportation technologies to achieve significant emissions reductions and public health benefits especially in disadvantaged communities. Incentive programs, such as HVIP, Carl Moyer Program and Clean Transportation program, offer funding opportunities for large commercial entities looking to reduce emissions at freight facilities with ZE trucks and infrastructure. There are also other funding opportunities for smaller fleets (e.g., owner-operators) that do not always have the resources to apply to state grants or that the amount of funding is not sufficient for them to transition to zero emission technologies. Those include the Assistance and Ready Transport programs from SoCal Edison, which help secure initial ZE infrastructure development grants and installation. There are several regulations that will also promote clean truck adoption. The ACT regulation sets scheduled sales requirements of ZEVs for OEMs; the HD Omnibus uses an emissions control approach to promote clean combustion in heavy-duty engines. Upcoming regulations, such as the ACF regulation, are slated to completely redefine the heavy-duty truck portfolio in California by transitioning the majority of the fleet to zero emission technology. The regulations discussed in this report, as proposed or executed, have potential to result in significant emissions reductions within SCAB and the state of California, primarily through stringent engine and ZEV fleet requirements. For many of the strategies being executed by these regulations, or the pathways being developed by incentives and grants, supplemental action may be on its way through draft air quality planning efforts. Facilities or truck fleets not captured by current incentives or regulations may soon be able to tap into additional resources outlined by measures such as the Zero Emissions Trucks Measure and Facility-Based Mobile Source Measures as well as the suite of incentive programs offered to transition to clean and zero emission technologies.

⁵⁴ <http://www.aqmd.gov/docs/default-source/clean-air-plans/air-quality-management-plans/2022-air-quality-management-plan/draft2022aqmp.pdf?sfvrsn=12>

Key Takeaways

- Local and state agencies, such as CARB, CEC, the Ports, and South Coast AQMD have developed incentives and grant programs totaling to billions of dollars in funding opportunities per year to accelerate the adoption of clean trucks and ZE infrastructure.
- Although the current incentive portfolio has been effective at addressing some of the biggest barriers of clean heavy-duty truck adoption, there are gaps created by the incentive structures and eligibility requirements that need to be addressed. The HVIP, Carl Moyer, and VW Environmental Mitigation Trust offer large fleet owners some financial leverage over new ZE truck purchases but are oversubscribed and may not leave sufficient funds to develop infrastructure to support fleets.
- Some of these incentives and grants can be combined to yield maximum benefits. These include HVIP and Carl Moyer Program for vehicles (although Carl Moyer Program would require vehicle scrappage), and EnergiIZE and Charge Ready Programs from infrastructure.
- Other incentive programs, such as the CAP Incentives and Clean Transportation Program, have the potential to fill in the ZE infrastructure gaps, if applications are reviewed on a timely basis and that projects in disadvantaged communities are prioritized.
- Additionally, smaller fleets are often at disadvantage in using the current state and local funds either due to lack of ability to apply for these grants or due to insufficient funds that can cover the price gap between a conventional truck vs. a ZE model. The CEC's EV Jump Start program along with fleet size limitations introduced in HVIP are steps in the right direction to start shifting the funding toward fleets that could not bear the transition without financial assistance.
- In developing the infrastructure needed for zero emission technology (i.e., EV charging stations, as well as hydrogen fueling station), utilities could play a significant role. The SCE's CRT Program is a great example of such program that offers low-to no-cost electrical system upgrades to support the installation of EV charging equipment for fleets of medium and heavy-duty vehicles.
- Similarly, the current and upcoming regulation portfolio is anticipated to fundamentally transform the heavy-duty truck population between now and 2045, but successful adoption and implementation of these regulations will challenge zoning laws for sufficient land to buildout infrastructure, as well as concerted team efforts between policy enforcers and fleet owners to ensure that requirements can be met and avoid paying penalty fees where transitions are not yet feasible.

Table 30. Summary of Heavy-Duty Clean Truck Policies and Planning Efforts

Policy or Plan	Description	(Prospective) Impact on Clean Truck Adoption
HVIP	HVIP is a point-of-sale incentive program that provides a voucher for the vehicle incentive amount to a registered HVIP dealer for eligible vehicles.	Has supported the purchase of 1,700 natural gas and 1,500 BEV trucks since 2010, over half of all vouchers requested to date went to serve disadvantaged communities.
Carl Moyer	Carl Moyer Program provides incentives for clean-than-required on-road and off-road diesel engines and equipment. The program ensures early or extra emissions reductions through a scrappage requirement.	The program focuses on deploying the most advanced low- and ZE technologies while resulting in surplus emissions reductions.
Carl Moyer VIP	A streamlined funding option directed exclusively to small fleets with 10 vehicles or less to purchase cleaner vehicle replacements	Assist small fleet (<10 trucks) to transition to clean technologies by replacing their old diesel trucks
CAP	The CAP Incentives offer additional funds to the three air districts with the largest disadvantaged communities and follow the Carl Moyer guidelines, but without state funding caps for ZE on-road projects.	The removal of state funding caps for ZE on-road projects and co-funding ability propels ZE truck adoption in the state's disadvantaged communities.
VW Mitigation Trust	The VW Trust provides capped funding opportunities to mitigate NOx emissions from heavy-duty trucks and support ZE truck transitions at the Ports. Eligibility criteria on low-NOx and ZEVs is developed for public and private fleets.	The Trust has allocated millions for combustion freight and marine projects and has enabled fleet owners to introduce ZE drayage trucks at the Ports as a result.
Truck Loan Assistance	The program offers financing opportunities to qualified small-business truckers who fall below conventional lending criteria and are unable to qualify for traditional financing for cleaner trucks.	The loans are accessible to smaller fleet owners who experience greater barriers towards adopting low- and ZE technologies to comply with the Truck and Bus rule.
ZE Drayage Truck & Infrastructure	Funding for large-scale deployments of Class 8 drayage and local haul trucks, including infrastructure required to support new fleets.	By 2023, four battery-electric and one hydrogen fuel cell truck projects will have been deployed. This incentive strikes a balance between ZEV deployment and infrastructure buildout.
Clean Transportation Program	CEC's fuel and transportation portfolio includes public and private infrastructure developments, planning grants, and workforce training to prepare workers for the clean transportation economy.	The most current funding allocations are towards ZE medium- and heavy-duty vehicles, drayage trucks, and school buses.
SCE Grant Assistance	SCE's program to help qualified medium- and heavy-duty fleets apply for state and local grants to reduce the cost of purchasing ZEVs.	Eases the burden of initial capital costs for small commercial operators through grant application review.
SCE Charge Ready Transport	SCE's program to provide low- to no-cost electrical system upgrades in support of ZEV charging equipment for medium- and heavy-duty vehicle fleets.	Eases the burden of SCE customers who own fleets with at least two ZEVs by making utility system upgrades much more accessible.
LADWP Commercial Rebates	LADWP program to help offset the cost of installing commercial charging equipment	Reduce the cost of installing charging stations

Policy or Plan	Description	(Prospective) Impact on Clean Truck Adoption
LCFS	Owners of LVL2 and DC fast chargers can generate LCFS credits to sell as a means of revenue generation from using low-carbon fuels.	Incentivizes low-carbon fuel production and consumption, lowering carbon intensity of electricity portfolios and ZEVs by association.
ACT	The ACT regulation requires manufacturers to make a percentage of truck and bus sales ZE.	The ZEV sales requirement ensures surplus emissions reductions; the reporting requirement may assist infrastructure planning efforts.
HD Omnibus	Establishes NOx emissions standards 90 percent lower than the previous 0.20 g/bhp-hr emission standard.	Promotes the adoption of clean technologies by promoting clean combustion and sets more accountability on lower NOx emissions throughout engine lifetimes.
HD I&M	Requires quarterly inspections on heavy-duty vehicles' emissions control systems to ensure that significant emissions reductions over vehicle lifetimes.	Promotes clean combustion in real-world conditions and uses penalty fees to support ZEV projects throughout the state.
ACF	The ACF regulation would set ZEV purchase schedules for public, drayage, and high-priority public and private fleets, with the goal to have 100 percent of new fleet additions be ZE by 2035.	The ACF regulation promotes ZE truck adoption over phased intervals; the prospective emissions reductions have the potential to achieve local and state air quality goals.
EPA Clean Truck Plan	EPA would set new NOx emissions reduction targets for heavy-duty trucks that have characteristically low speed/idling duty cycles, such as drayage trucks.	The stringent NOx emissions reductions requirements may encourage fleet owners to find ZEV alternatives.
WAIRE Program	The WAIRE Program would use a points-based recordkeeping system to reduce NOx and DPM emissions from indirect sources, such as on-road mobile sources that make trips to warehouse facilities.	Mitigation fees collected by the Program will be used to provide funding for ZEV acquisitions and ZE charging and fueling infrastructure.
CTF Rate	The CTF Rate creates a revenue stream from deliveries made by conventional combustion drayage trucks at the Ports.	The CTF Rate is estimated to generate up to \$90 million in the first year; funds will contribute to low-NOx and ZE truck acquisitions.
Draft 2022 SIP Strategy	CARB's SIP Strategy lays out potential control measures and standards to ensure attainment of the federal 70 ppb 8-hour ozone standard.	Select measures, such as the Zero Emissions Trucks Measure, would seek to assist small fleet owners in transitioning to ZE technologies.
Draft 2022 SCAQMP	The Draft 2022 AQMP includes a variety of strategies relying on NOx emissions reductions through economy-wide transition to zero emission technologies.	Select measures, such as the Facility-Based Mobile Source Measures, promote clean combustion and adoption of cleaner technologies and infrastructure at the Ports.