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DRAFT STAFF REPORT

2023–2024 Investment Plan Update for the Clean Transportation Program

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ABSTRACT

The *2023–2024 Investment Plan Update for the Clean Transportation Program* guides the allocation of program funding for the first six months of Fiscal Year 2023–2024, and also includes general fund allocations under the Budget Acts of 2021 and 2022, which project funding through 2026. Program funding, originally established in 2008 through Assembly Bill 118 (Núñez, Chapter 750, Statutes of 2007) and reauthorized in 2013 through Assembly Bill 8 (Perea, Chapter 401, Statutes of 2013), has averaged about \$100 million per year and is set to expire at the end of the calendar year 2023. The California Energy Commission (CEC) reviews the proposed allocations annually and adjusts as needed.

This 2023–2024 investment plan is the fifteenth in the history of the program and reflects laws, executive orders, regulations, and other funding programs to reduce greenhouse gas emissions, petroleum dependence, and criteria pollution emissions for all Californians. Program priorities are determined with input from interested and affected groups, the Disadvantaged Communities Advisory Group, the Clean Transportation Program Advisory Committee, and CEC analyses such as the:

- *Senate Bill 1000 Electric Vehicle Charging Infrastructure Deployment Assessment.*
- *Assembly Bill 2127 Electric Vehicle Charging Infrastructure Assessment — Analyzing Charging Needs to Support Zero-Emission Vehicles in 2030.*
- *Joint Agency Staff Report on Assembly Bill 8: Annual Assessment of Time and Cost Needed to Attain 100 Hydrogen Fueling Stations in California.*

These priorities are consistent with the overall program goal “to develop and deploy innovative technologies that transform California’s fuel and vehicle types to help attain the state’s climate change policies.”

This *2023–2024 Investment Plan Update* establishes funding allocations based on identified needs and opportunities, including a focus on zero-emission vehicle infrastructure. The investment plan also prioritizes jobs, economic stimulus, and equity.

This draft staff report represents the first step in developing the *2023–2024 Investment Plan Update*. Before the adoption of the report at a CEC business meeting, the Energy Commission expects to release a Lead Commissioner report later in the year, as well as convene at least two advisory committee meetings and conduct outreach and engagement with other interested and affected groups.

Keywords: California Energy Commission, Clean Transportation Program, AB 118, AB 8, funding program, alternative transportation fuels, investment plan, equity, electric vehicles, hydrogen, biofuels, biomethane, biodiesel, renewable diesel, diesel substitutes, gasoline substitutes, disadvantaged communities, workforce, training, sustainability, fueling stations, fuel production, alternative fuel infrastructure, manufacturing, COVID-19

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TABLE OF CONTENTS

	Page
2023–2024 Investment Plan Update for the Clean Transportation Program.....	i
Acknowledgements	i
Abstract	iii
Table of Contents	v
List of Figures	vii
List of Tables.....	vii
Executive Summary	1
Purpose of the Clean Transportation Program	1
Description of the Investment Plan	3
Highlights of Investments	3
Commitment to Inclusion, Diversity, Equity, and Access	5
Zero-Emission Vehicle Infrastructure Gap.....	7
The Zero-Emission Vehicle Infrastructure Plan (ZIP)	8
Federal Support for ZEV Infrastructure	9
Recent State Budgets Provide Significant Funding to Achieve Zero-Emission Transportation in California.....	10
Budget Act of 2021.....	10
Budget Act of 2022.....	10
Governor’s Proposed 2023–2024 State Budget	10
Proposed Clean Transportation Program Funding Allocations for 2023–2024	11
CHAPTER 1: Introduction	15
CHAPTER 2: Context of the 2023–2024 Investment Plan.....	17
Implementation of the Clean Transportation Program	17
Description of Funding Mechanisms.....	18
Program Outreach and Engagement.....	19
Highlights of Investments	20
Summary of Program Funding for Disadvantaged Communities	23
Related Policies and Goals	24
Federal Laws.....	25
State Laws	27
Executive Orders	31
Regulations by the California Air Resources Board	31
Complementary Funding Programs	33
California Energy Commission’s School Bus Replacement Program.....	33
California Air Resources Board Funding Programs	33

Investor-Owned Utility Investments	35
Volkswagen Diesel Emissions Settlement.....	36
National Electric Vehicle Infrastructure (NEVI) Formula Program	37
Alternative Fuel Refueling Property Credit	37
CHAPTER 3: Funding Allocations for 2023–2024	39
CHAPTER 4: Zero-Emission Vehicle Infrastructure	41
Light-Duty Electric Vehicle Charging Infrastructure	41
Quantifying Charging Infrastructure for Light-Duty Vehicles	41
Clean Transportation Program Funding	46
Proposed Funding Allocation.....	51
Medium- and Heavy-Duty Zero-Emission Vehicles and Infrastructure.....	52
Charging Infrastructure for Medium- and Heavy-Duty Vehicles	52
Hydrogen Fueling Infrastructure for Medium- and Heavy-Duty Vehicles	53
Clean Transportation Program Funding	53
Proposition 98 Funding	57
Proposed Funding Allocation.....	57
Public Hydrogen Fueling Infrastructure	57
Evaluating the Deployment of FCEVs and Hydrogen Fueling Stations	57
Clean Transportation Program Funding to Date	58
Other Sources of Project Support.....	59
Proposed Funding Allocation.....	59
Emerging Opportunities	60
CHAPTER 5: Alternative Fuel Production and Supply	61
Zero- and Near-Zero-Carbon Fuel Production and Supply	61
Fuel Type Overview	61
Clean Transportation Program Funding to Date	63
Other Sources of Funding.....	65
Proposed Funding Allocation.....	66
CHAPTER 6: Related Opportunities.....	67
Manufacturing	67
Proposed Funding Allocation.....	70
Workforce Training and Development	70
Proposed Funding Allocation.....	71
GLOSSARY	72

LIST OF FIGURES

	Page
Figure ES-1: Disparities in Transportation-Related Pollution Exposure by Race and Income.....	2
Figure ES-2: Proportion of Clean Transportation Program Funding Awarded to Projects Located in Disadvantaged or Low-Income Communities (in Millions).....	6
Figure 1: Schematic of the Clean Transportation Program Implementation	18
Figure 2: Clean Transportation Program Funding in Disadvantaged and Low-Income Communities (in Millions)	24
Figure 3: Projected 2030 Charger Counts to Support 5 Million and 8 Million Light-Duty Zero-Emission Vehicles	43
Figure 4: Drive Time to the Nearest DC Fast Charging Station by Urban and Rural Communities	45
Figure 5: Map of Los Angeles Area Disadvantaged Community Drive Times to the Nearest DC Fast Charging Station.....	46

LIST OF TABLES

	Page
Table ES-1: Progress Toward 250,000 Chargers and 200 Hydrogen Stations by 2025	8
Table ES-2: Proposed Investment Plan Allocations for FY 2023–2024 and Beyond, Including Clean Transportation Program (Program) and General Funds (in Millions).....	13
Table 1: Clean Transportation Program Investments as of March 2023.....	22
Table 2: Greenhouse Gas, Fuel, and Air Quality Goals and Milestones	25
Table 3: Recommendations From the Disadvantaged Communities Advisory Group and Others, Along With the Actions Taken by the Energy Commission	28
Table 4: FY 2022–2023 CARB Clean Transportation Incentives Allocations (in Millions)	35
Table 5: Proposed Investment Plan Allocations for FY 2023–2024 and Beyond, Including Clean Transportation Program (Program) and General Funds (in Millions).....	40
Table 6: Progress Toward 250,000 Chargers by 2025	41
Table 7: Drive Time Ranges by Income Level and Urban or Rural Area	45
Table 8: Chargers Funded by the Clean Transportation Program as of March 2023.....	47
Table 9: CALeVIP 1.0 Investments	48
Table 10: Summary of Clean Transportation Program Low-Carbon Fuel Production Awards as of January 25, 2023	64

Table 11: Summary of Proposed Awards for GFO-21-605, Zero-Emission Transportation Manufacturing	68
Table 12: GFO-21-605 Zero-Emission Transportation Manufacturing Awardees	69

EXECUTIVE SUMMARY

California leads the nation in addressing the climate crisis through aggressive greenhouse gas (GHG) emission reduction goals, regulations, and innovative funding programs. The California Energy Commission's (CEC) Clean Transportation Program is one of the first transportation-focused funding programs created by the California Legislature to help achieve the state's climate policies. The Clean Transportation Program has made significant progress through grant-focused investments designed to transition California to a clean transportation system. Now in its fifteenth year, the Clean Transportation Program has provided more than \$1.5 billion in funding for a broad spectrum of zero-emission vehicle (ZEV) and infrastructure, alternative fuels and technologies, and workforce development projects in communities that will accrue health, environmental, and economic benefits from these investments.

California has experienced rapid growth in the sales of plug-in electric vehicles, along with the introduction of hydrogen fuel cell electric vehicles. According to the CEC's Zero-Emission Vehicles and Infrastructure Statistics online dashboard, in 2022, the share of new light-duty ZEV sales reached 18.8 percent of new vehicles. The state reached 1 million passenger ZEVs sold in the fourth quarter of 2021, with nearly 1.4 million ZEVs sold through December 2022. While behind the passenger ZEV market, the number of medium- and heavy-duty ZEVs on the road reached more than 1,900 as of June 2022, with transit, school, and delivery vehicles at the forefront.

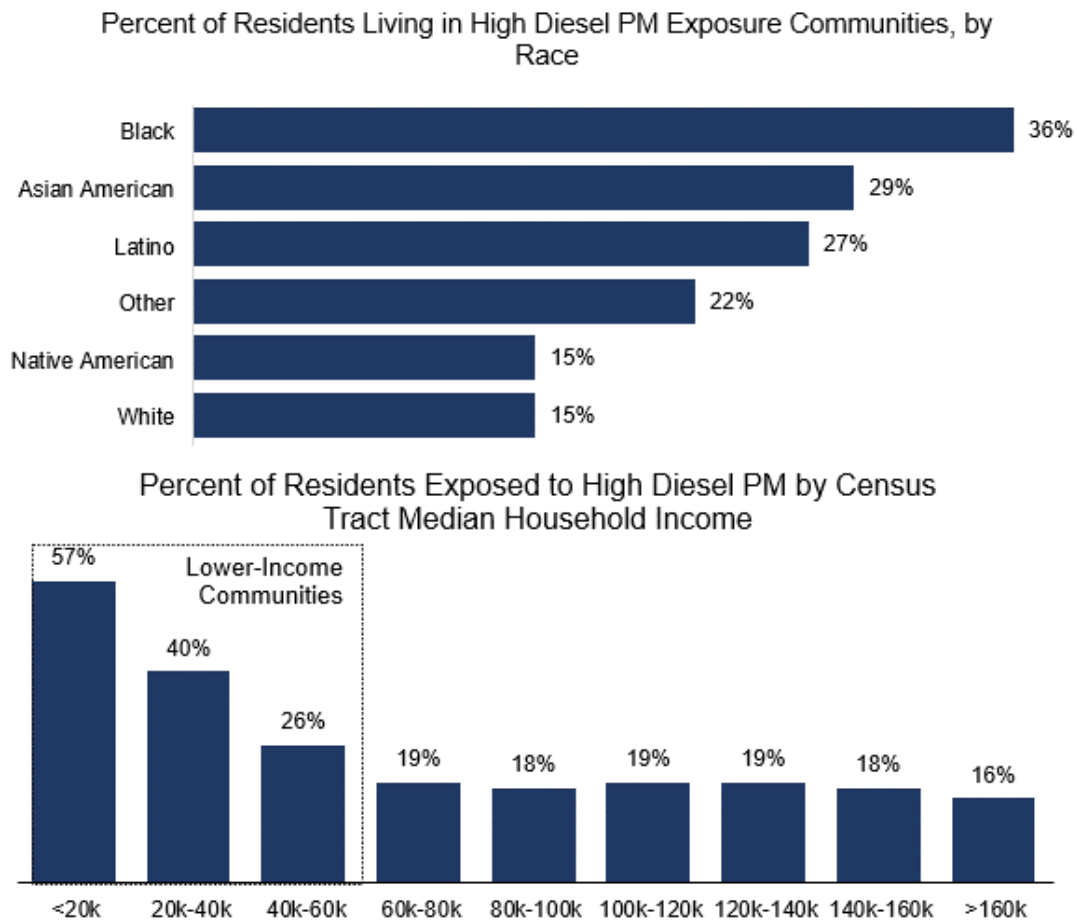
Purpose of the Clean Transportation Program

Since 2006, California has set pivotal goals to reduce GHG emissions, address the threat posed by global climate change, and improve the public health of its residents. These goals require incremental progress that will ultimately lead to major emission reductions, including:

- Reducing GHG emissions to 40 percent below 1990 levels by 2030 (Senate Bill 32, Pavley, Chapter 249, Statutes of 2016).
- Reducing short-lived climate pollutant emissions, such as methane, to 40 to 50 percent below 2013 levels by 2030 (Senate Bill 1383, Lara, Chapter 395, Statutes of 2016).
- Requiring renewable energy and zero-carbon resources supply 100 percent of retail sales of electricity by 2045, with interim goals of 90 percent by 2035 and 95 percent by 2040 (Senate Bill 1020, Laird, Chapter 361, Statutes of 2022).
- Requiring a carbon-neutral economy by 2045 (Assembly Bill 1279, Muratsuchi, Chapter 337, Statutes of 2022).

In addition to these GHG emission reduction goals, the state must reduce emissions of criteria pollutants to attain federal and state ambient air quality standards. Reducing air pollution is important to improve equitable outcomes, given that air quality burdens fall disproportionately on low-income residents and people of color (Figure ES-1).

Figure ES-1: Disparities in Transportation-Related Pollution Exposure by Race and Income



Source: CEC analysis of census and CalEnviroScreen 2021 data. "High Diesel PM Exposure" communities are census tracts that score in the seventy-fifth percentile of census tracts for diesel particulate matter. Most (90 percent) diesel PM emissions come from vehicles.

Achieving these GHG and air-quality goals will require significant investments to support and accelerate the market transformation that is underway within the transportation sector, which accounts for roughly 50 percent of state greenhouse gas emissions when considering "upstream emissions" from fuel production. Accordingly, the state has adopted similarly aggressive goals for zero-emission vehicles and associated refueling infrastructure, including:

- By 2025:
 - Reaching at least 1.5 million ZEVs. (Executive Order B-16-12).
 - Installing 200 hydrogen-fueling stations and 250,000 battery-electric vehicle chargers, including 10,000 direct current fast chargers. (Executive Order B-48-18).
- By 2030:
 - Reaching at least 5 million ZEVs. (Executive Order B-48-18).
- By 2035:

- Achieving 100 percent of new sales of passenger vehicles and trucks to ZEVs. (Executive Order N-79-20/Advanced Clean Cars II Regulations).
- Transitioning 100 percent of operating drayage trucks to zero emission. (Executive Order N-79-20).
- Transitioning 100 percent of operating off-road vehicles and equipment to zero emission everywhere feasible. (Executive Order N-79-20).
- By 2045:
 - Transitioning 100 percent of operating medium- and heavy-duty trucks and buses to zero emission by 2045 everywhere feasible. (Executive Order N-79-20).

To help the state achieve its climate change policies, the California Legislature passed Assembly Bill 118 (Núñez, Chapter 750, Statutes of 2007) and created the Clean Transportation Program, to be administered by the CEC. With funds collected from vehicle and vessel registration, vehicle identification plates, and smog-abatement fees, the Clean Transportation Program funds projects that will "transform California's fuel and vehicle types to help attain the state's climate change policies." Assembly Bill 8 (Perea, Chapter 401, Statutes of 2013) subsequently extended the collection of fees that support the Clean Transportation Program to January 1, 2024. The Clean Transportation Program must be reauthorized this year or it will sunset at the end of 2023.

Description of the Investment Plan

As part of the Clean Transportation Program, the CEC prepares and adopts an annual investment plan update that identifies the funding priorities for the coming fiscal years. Assembly Bill 1314 (Wieckowski, Chapter 487, Statutes of 2011) focused the scope of the annual Clean Transportation Program investment plan to an update. The update builds on the work of previous investment plans while highlighting differences from previous years. The resulting funding allocations reflect the unique technological and market conditions for clean transportation fuels and technologies, as well as state goals, policies, and directives.

The CEC's multiyear approach to Investment Plan allocations provides a consistent signal about the state's planned clean transportation investments. These updates cover investments through the Clean Transportation Program expiration at the end of 2023, as well as general funds approved through the annual state budget through 2026. For the fourth year in a row, the CEC is implementing a multiyear funding plan to provide the public and interested and affected groups improved funding certainty and convey short-term and long-term transformative goals of the Clean Transportation Program. The CEC engages in a rigorous public process to evaluate whether adjustments should be made to the allocations.

Highlights of Investments

The Clean Transportation Program has been an essential part of making California a leader in zero-emission transportation. Since the first Clean Transportation Program investment plan was released in 2009, the CEC has invested more than \$1.5 billion in projects supporting zero-emission vehicle infrastructure, alternative fuels, and advanced vehicle technologies. Key highlights through March 2023 include:

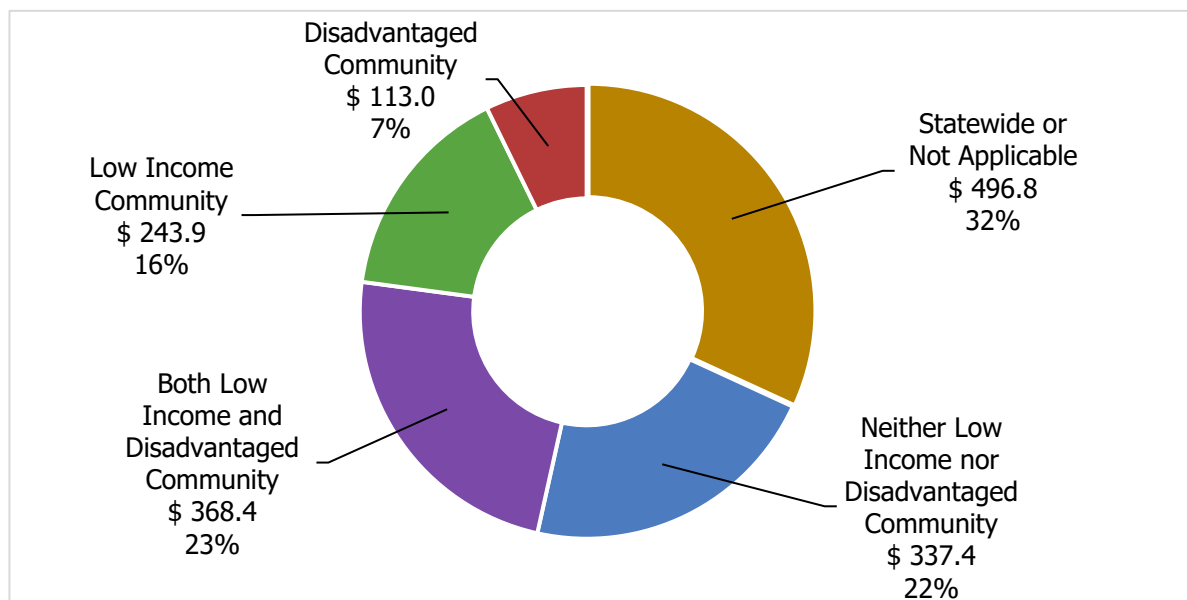
- Installing or planning nearly 23,800 chargers for plug-in electric vehicles, including approximately 6,000 at multi- and single-family homes; 155 for fleets; 420 at workplaces; 15,000 public and shared-private Level 2 and Level 1 chargers; and 2,200 public and fleet direct current (DC) fast chargers along highway corridors and urban metropolitan areas.
- Creating the California Electric Vehicle Infrastructure Project (CALeVIP) to provide streamlined Clean Transportation Program incentives for light-duty electric vehicle charging infrastructure. Two additional block grant projects are underway to implement up to \$250 million each in incentives to install light-duty electric vehicle chargers. One project, called CALeVIP 2.0, will offer rebates for high-powered (150 kilowatt+) DC fast chargers. The other, called Communities in Charge, offers incentives for Level 2 chargers with scoring priority given to disadvantaged and low-income communities.
- Funding 86 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.
- Releasing new solicitations targeting high-priority or underserved EV charging needs, including multifamily housing, rural communities, and infrastructure for high-mileage on-demand transportation services.
- Funding 78 publicly available hydrogen fueling stations and approving funding for an additional 74 stations. Additional funding from the state's general fund is expected to help California meet the 200-station goal. As of March 2023, 63 hydrogen fueling stations had achieved open retail status in California. These open retail stations include seven that are considered temporarily nonoperational (unavailable for more than 30 days) and are expected to become available for customer fueling again in the future.
- Funding five projects to produce 100 percent renewable hydrogen from in-state renewable resources.
- Launching the nation's first commercial vehicle fleet incentive project titled Energy Infrastructure Incentives for Zero-Emission Commercial Vehicles (EnergIIIZE Commercial Vehicles). This project will accelerate the deployment of electric and hydrogen infrastructure needed to fuel zero-emission trucks, buses, and equipment. The multiyear project includes a requirement that 60 percent of funds support low-income and disadvantaged communities.
- Releasing targeted grant funding solicitations to provide zero-emission charging and hydrogen refueling infrastructure for transit buses and drayage trucks, the latter in direct partnership with the California Air Resources Board (CARB) to provide vehicle funding incentives.
- Funding 27 manufacturing projects supporting in-state economic growth. Projects include ZEVs, ZEV components (including batteries), and ZEV infrastructure such as hydrogen refueling stations. The CEC is developing funding agreements for 13 additional in-state ZEV manufacturing projects using one-time funding from the general fund. Furthermore, from this same one-time funding, a ZEV Battery Block Grant project is being developed to help battery manufacturers expand operations within the state.

- Providing workforce training for more than 32,000 trainees and trainers, helping prepare workers for the clean transportation economy and the opportunity to earn sustainable wages and expand career employment pathways.
- Launching 71 projects to promote the production of sustainable, low-carbon alternative fuels within California. Most of the projects use waste-based feedstocks, which have some of the lowest carbon intensity pathways of alternative fuels within the state.

Commitment to Inclusion, Diversity, Equity, and Access

The CEC is committed to inclusion, diversity, equity, and access, ensuring that all Californians have an opportunity to participate in and directly benefit from programs and services, and supporting in-state employment, in-state manufacturing, and state/local economic development. Furthermore, the CEC will seek to provide more than 50 percent of Clean Transportation Program funds from this investment plan toward projects that benefit low-income and disadvantaged communities. The CEC is working to quantify these benefits in ways that go beyond measuring funding within a given location and will continue to investigate new metrics to ensure these investments enhance equity within the state. Once it has completed the process to better identify and track benefits, the CEC may consider whether to increase or redefine the 50 percent target. As depicted in Figure ES-2, 47 percent of awarded Clean Transportation Program project funds to date have gone to projects within disadvantaged or low-income communities or both. When excluding projects considered to be “statewide,” or having locations that are yet to be determined, this is closer to 68 percent.

Figure ES-2: Proportion of Clean Transportation Program Funding Awarded to Projects Located in Disadvantaged or Low-Income Communities (in Millions)



Source: California Energy Commission. Totals may not match due to rounding. As of December 2022. "Disadvantaged communities" are defined as communities within the top 25 percent scoring areas under CalEnviroScreen, as well as areas of high pollution and low population (such as ports). "Low-income communities" are defined as communities that are at or below 80 percent of the statewide median income.

The Disadvantaged Communities Advisory Group (DACAG), established under Senate Bill 350 (De León, Chapter 547, Statutes of 2015), consults with and advises the CEC and the California Public Utilities Commission (CPUC) in determining how programs can be more effective and beneficial for disadvantaged and other communities. The DACAG and other interested and affected groups have encouraged the CEC to prioritize investments that directly benefit low-income, disadvantaged, rural, and tribal communities and to conduct outreach and engagement in partnership with local community-based organizations.

Expanding outreach is particularly important for smaller, tribal, or rural communities that may not have the resources to compete for funding opportunities nor the information and awareness of state program offerings. CEC staff is launching a stakeholder effort to better track and improve Clean Transportation Program community benefits assessments. The effort is a public process to engage directly and listen to community members to better understand the barriers, needs, and priorities of the communities.

The Advisory Committee for the Clean Transportation Program has 30 members and reflects a broad array of interested and affected groups representing community-based organizations, social and environmental justice advocates, alternative vehicle technologies, as well as workforce and labor interests. The perspectives and recommendations of the members and other interested and affected groups help guide an inclusive approach for Clean Transportation Program investments.

In addition, Senate Bill 1000 (Lara, Chapter 368, Statutes of 2018) requires the CEC to assess whether chargers are disproportionately deployed by population density, geographical area, or

population income level, including low-, middle-, and high-income levels. Staff published the first *SB 1000 Electric Vehicle Charging Infrastructure Deployment Assessment* on December 30, 2020. The report found that low-income communities, on average, have fewer public chargers per capita than middle- or high-income communities. The second report, published July 14, 2022, assessed drive times to public direct current fast charging stations. This second assessment found that rural communities have less public fast charging station coverage than urban communities, with low-income rural communities particularly lacking coverage.

Zero-Emission Vehicle Infrastructure Gap

Assembly Bill 2127 (Ting, Chapter 365, Statutes of 2018) requires the CEC to evaluate charger needs biennially through 2030 to meet the state goal of 5 million ZEVs on the road and reducing greenhouse gas emissions to 40 percent below 1990 levels by 2030. Executive Order N-79-20, signed by Governor Gavin Newsom on September 23, 2020, provided even more ambitious ZEV goals above the 5 million ZEV target and tasked the CEC with assessing charging infrastructure needs for this higher level of ZEV adoption.

In response, the CEC issued the *Assembly Bill 2127 Electric Vehicle Charging Infrastructure Assessment — Analyzing Charging Needs to Support Zero-Emission Vehicles in 2030*. For passenger vehicle charging in 2030, the report projects that California will need nearly 1.2 million public and shared-private chargers to support the roughly 8 million ZEVs that CARB projects in its *Mobile Source Strategy*. An additional 157,000 chargers are needed to support 180,000 medium- and heavy-duty vehicles anticipated for 2030. The CEC is in the process of updating this charger needs analysis with plans to publish the final report by the end of 2023. With funding from the Budget Acts of 2021 and 2022, CEC analysis finds that the state is on track to have over 250,000 light duty vehicle chargers, of which 18,000 are direct current fast chargers (Table ES-1).

The CEC also conducts extensive analysis on hydrogen fuel cell electric vehicle (FCEV) infrastructure. This includes interagency collaborations such as the *Joint Agency Staff Report on Assembly Bill 8: Annual Assessment of Time and Cost Needed to Attain 100 Hydrogen Fueling Stations in California*, written by the CEC and CARB. Between public and private investments, staff anticipates that California will meet the goal of 200 hydrogen refueling stations, with sufficient capacity to serve 274,000 fuel cell vehicles. As of the end of 2021 there were around 10,100 FCEVs in California.¹ Automakers project there will be 65,600 light-duty FCEVs on the road in 2028, so station capacity should not be a near-term barrier to light-duty fuel cell vehicle deployment once these stations are operational. However, medium- and heavy-duty FCEVs could play an important role in goods movement and transit, and additional infrastructure will be needed to support both electric and hydrogen for these fleets.

1 California Energy Commission. "[Light-Duty Vehicle Population in California](https://www.energy.ca.gov/data-reports/energy-almanac/zero-emission-vehicle-and-infrastructure-statistics/light-duty-vehicle)." Accessed April 10, 2023. Available at <https://www.energy.ca.gov/data-reports/energy-almanac/zero-emission-vehicle-and-infrastructure-statistics/light-duty-vehicle>.

Table ES-1: Progress Toward 250,000 Chargers and 200 Hydrogen Stations and Beyond

Category	Level 2 Chargers	DC Fast Chargers	Total Chargers	Hydrogen Fueling Stations
Existing Chargers/Open Retail Hydrogen Fueling Stations (Estimated)*	78,500	9,207	87,707	63
Number of Chargers/Fueling Stations for Which Funding Has Been Allocated (includes anticipated funding from Clean Transportation Program)†	163,000	9,000	172,000	137
Total	241,500	18,207	259,707	200***
2025 Goal (Executive Order B-48-18)	240,000**	10,000**	250,000	200
Gap From Near-Term Goal	0	0	0	0
Inaugural AB 2127 Report's 2030 Estimate of Charging Needs	1,126,855	37,461	1,164,316	-
Gap From 2030 Estimates	885,355	19,254	904,609	-

Source: California Energy Commission. Analysis as of March 2023.

* Existing charging ports estimated based on available data from U.S. Department of Energy's Alternative Fuels Data Center and surveys to electric vehicle network service providers, utilities, and public agencies in California. Not included in this table are an estimated 560 statewide public or shared-private Level 1 chargers, which are included in the CEC [ZEV and Infrastructure Statistics page](https://www.energy.ca.gov/data-reports/energy-insights/zero-emission-vehicle-and-charger-statistics) (<https://www.energy.ca.gov/data-reports/energy-insights/zero-emission-vehicle-and-charger-statistics>) but are not part of the goal of 250,000 chargers.

† Estimate of ports from other state programs derived from public presentations and statements by utilities, CPUC, CARB, other entities, and CEC. Includes funding from the State Budget Act of 2021 and State Budget Act of 2022 intended to close the gaps for Level 2 and DC fast chargers and hydrogen fueling stations and federal NEVI funding; the estimated number of chargers and fueling stations could change as solicitations are released.

** CEC expects to reach 240,000 Level 2 chargers in 2026. However, the CEC anticipates reaching 10,000 DC fast chargers in 2023.

*** These hydrogen fueling stations include privately funded stations.

The Zero-Emission Vehicle Infrastructure Plan (ZIP)

CEC staff, in coordination with various state agencies including the CPUC, CARB, California State Transportation Agency (CalSTA), California Department of Transportation (Caltrans), California Governor's Office of Business and Economic Development (GO-Biz), and Department of General Services (DGS), has developed the Zero-Emission Vehicle Infrastructure Plan.² This document supports decision-making in the public and private sectors by documenting plans and strategies to deploy ZEV infrastructure for all Californians. The document divides ZEV

² Lopez, Thanh, and Madison Jarvis. December 2022. [Zero-Emission Vehicle Infrastructure Plan \(ZIP\)](https://www.energy.ca.gov/publications/2022/zero-emission-vehicle-infrastructure-plan-zip). California Energy Commission. Publication Number: CEC-600-2022-054. Accessed April 10, 2023. Available at <https://www.energy.ca.gov/publications/2022/zero-emission-vehicle-infrastructure-plan-zip>.

infrastructure into five market segments to address the specific challenges and opportunities unique to each sector. The market segments include:

- Hydrogen fueling for light-duty FCEVs.
- Charging and hydrogen fueling for medium- and heavy-duty ZEVs.
- Level 1 and Level 2 charging for light-duty EVs.
- DC fast charging for light-duty EVs.
- Emerging technologies.

The revised staff report was published in December 2022 and is a resource for public and private entities to better understand the status and short-term and long-term state actions to support ZEV infrastructure.

Federal Support for ZEV Infrastructure

President Joseph R. Biden Jr. signed the \$1.2 trillion Infrastructure Investment and Jobs Act into law in November 2021 (Public Law 117-58). The law authorizes hundreds of billions of dollars in new investments in a wide array of infrastructure categories, including roads and bridges, water infrastructure, passenger rail, energy, and broadband internet. Electric vehicle charging infrastructure will see significant new funding, with \$5 billion to accelerate EV infrastructure deployment nationally titled the National Electric Vehicle Infrastructure (NEVI) Formula Program. California's share is expected to be \$384 million, allocated over five years. An additional \$2.5 billion nationally is available on a competitive basis for EV and hydrogen infrastructure.

On August 1, 2022, the CEC and Caltrans released *California's Deployment Plan for the National Electric Vehicle Infrastructure Program*, and on September 14, 2022, the Biden-Harris administration approved California's plan. The deployment plan will be updated each year to reflect the progress of the previous year, identify new challenges and opportunities, highlight future deployment plans, and ensure alignment with California's EV charging infrastructure planning. The current plan is to build out a network of modern, high-powered DC fast chargers along Interstates and National Highways throughout California. The CEC expects to deploy 28 high-powered DC fast charging stations and a total of 291 fast charging ports as a result of its initial NEVI Formula Program solicitation.

President Biden also signed the Inflation Reduction Act of 2022 into law in August 2022 (Public Law 117-169). The law extends a federal tax credit for the sale of new ZEVs, lifts a manufacturer's eligibility cap on the new ZEV sales, and provides a new tax credit for used ZEV purchases. Importantly for ZEV infrastructure, the law extended the alternative fuel infrastructure tax credit of up to 30 percent of the equipment cost, to a new maximum of \$100,000 (up from \$30,000) for equipment subject to depreciation, or \$1,000 for other equipment. The equipment must be installed in a low-income or nonurban community. The amount of the credit can also be significantly increased under certain prevailing wage and apprenticeship circumstances.

Recent State Budgets Provide Significant Funding to Achieve Zero-Emission Transportation in California

Budget Act of 2021

On July 12, 2021, Governor Gavin Newsom strengthened California's commitment to a zero-emission transportation future by approving the State Budget Act of 2021 (Senate Bill 129, Skinner, Chapter 69), which includes a three-year, \$3.9 billion budget for ZEV-related investments by CEC, CARB, and GO-Biz. The budget prioritizes diesel emission reduction by earmarking funding for 1,125 zero-emission drayage trucks, 1,000 zero-emission school buses, and 1,000 zero-emission transit buses, along with associated appropriate charging and refueling infrastructure. Of that package amount, the CEC would administer \$1.165 billion over three years.

The CEC funding also includes funding for grants to promote in-state ZEV and ZEV-related manufacturing, such as infrastructure equipment and ZEV components including EV batteries.

Budget Act of 2022

The Governor's 2022–2023 budget framework includes \$6.1 billion for the transportation system and other related ZEV efforts. The funding builds on the already historic clean transportation funding from the Budget Act of 2021. Of the \$6.1 billion, the CEC would administer more than \$2.4 billion over four fiscal years to continue deploying ZEV infrastructure to support the goals outlined in the Governor's Executive Order N-79-20.

The funding will help increase ZEV charging for light-duty vehicles with a focus on equity and access, with an emphasis on broader access and equitable at-home charging to support those who live in multi-unit dwellings.

The four-year budget provides \$1.385 billion in infrastructure funding to power medium-duty and heavy-duty vehicles and equipment. This funding would include ZEV infrastructure funding totaling:

- \$250 million for drayage trucks.
- \$140 million for transit buses.
- \$375 million for school buses.
- \$470 million for trucks, buses, and off-road equipment.
- \$150 million for ports.

The budget includes \$60 million specific to hydrogen infrastructure, on top of the hydrogen infrastructure funding which will occur through the medium- and heavy-duty ZEV programs. Finally, the budget framework allocates \$100 million to an emerging opportunities category dedicated to zero-emission aviation, locomotive, and marine vehicles and vehicle-grid integration efforts.

Governor's Proposed 2023–2024 State Budget

On January 10, 2023, Governor Newsom released a proposed budget for Fiscal Year 2023–2024. The proposed budget would preserve 88 percent of the CEC's funding for zero-emission

transportation allocated from the general fund under the Budget Acts of 2021 and 2022. The CEC is closely monitoring the budget-development process. Staff will incorporate final budget information in a future version of the *2023–2024 Investment Plan Update*.

Proposed Clean Transportation Program Funding Allocations for 2023–2024

The Investment Plan Update includes Clean Transportation Program funding and the General Fund ZEV Package investments. Table ES-2 shows the proposed program funding allocation for the first six months of Fiscal Year 2023–2024, as well as the recent general fund allocations under the Budget Acts of 2021 and 2022. The CEC can make adjustments only in Clean Transportation Program funding; the Budget Acts of 2021 and 2022 are prescriptive and cannot be modified.

Funding allocations for the *2023–2024 Investment Plan Update* are unchanged from the multiyear allocations in last year’s *2022–2023 Investment Plan Update*. They are subject to change with the development of the Fiscal Year 2023–2024 and subsequent budgets.

Table ES-2 shows combined allocations of more than \$600 million to support light-duty passenger vehicle infrastructure (first three rows) and nearly \$1 billion to support medium- and heavy-duty ZEV infrastructure (next six rows). Investments in medium- and heavy-duty ZEV infrastructure reflect the need to swiftly transition the most polluting vehicles toward zero-emission technologies in the most sensitive regions of the state. At the same time, there must be continued infrastructure investments to support light-duty passenger vehicles.

Combined with previous investments from the Clean Transportation Program and other public and private investments, the funding from this investment plan should be sufficient to meet the state’s goal of having 250,000 chargers. The general fund provides \$340 million over the next three fiscal years to build out a broad network of grid-integrated, high-powered fast chargers to support travel across the state and supplement federal NEVI funding for corridor fast charging. The general fund also provides \$280 million for equitable at-home charging for multifamily residents and priority community single-family homes.

Assembly Bill 8 (AB 8, Perea, Chapter 401, Statutes of 2013) directs the CEC to allocate \$20 million annually, not to exceed 20 percent of the funds appropriated by the Legislature, from the Clean Transportation Program to deploy hydrogen fueling stations until there are at least 100 publicly available stations in operation. This Investment Plan allocates \$70 million for hydrogen infrastructure; this amount is a minimum, not a maximum, since funding for medium- and heavy-duty ZEV infrastructure will also be used for hydrogen infrastructure, as will funding from Emerging Opportunities. Funding from the Clean Transportation Program (\$10 million for the remaining half fiscal year) will be sufficient to meet and significantly exceed the 100-station goal set by AB 8, while additional funding from the state’s general fund is expected to help California meet the 200-station goal. The Budget Act of 2022 allocates hydrogen infrastructure funding at \$20 million per year for three years starting in Fiscal Year 2023–2024. This new funding from the Budget Act of 2022 will allow the state to further expand access to hydrogen infrastructure, including for medium- and heavy-duty vehicles.

The Investment Plan allocates \$953.8 million for medium- and heavy-duty ZEV infrastructure. The Budget Acts of 2021 and 2022 require the CEC to fund ZEV infrastructure for specific categories: \$234 million for electric and hydrogen drayage trucks; \$170 million for electric and hydrogen transit buses; \$15 million for school bus ZEV infrastructure; \$371 million for ZEV truck, bus, and off-road equipment; and \$150 million for ports. The CEC is allocating an additional \$13.8 million of Clean Transportation Program funding for medium- and heavy-duty ZEV infrastructure. These funds will support the deployment of thousands of ZEV drayage trucks, school buses, transit buses, and other medium- and heavy-duty vehicles within the state. In addition to grant funding, the CEC is working with partner agencies and exploring alternative funding mechanisms, such as loan financing.

Allocations from the program fund and general fund will also support a broader portfolio of activities. The Emerging Opportunities allocation, for instance, includes \$46 million from the general fund over two years for sectors that are only beginning to transition to zero-emission technologies, including zero-emission aviation, locomotive, and marine vehicles. The allocation will also support vehicle-grid integration efforts, such as reducing charging during peak demand or high-carbon intensity hours for electric vehicles, and bidirectional charging to support the grid. Investments will support charging technologies and behaviors that benefit California's electric grid system.

To support the development of clean, low-carbon fuels, the Investment Plan allocates \$5 million of Clean Transportation Program funding over the remaining half fiscal year. An additional \$5 million of Clean Transportation Program funding will support ZEV workforce development, prioritizing members of disadvantaged and low-income communities. Workforce development strategies and investments will be refined through continued public engagement workshops.

Table ES-2: Proposed Investment Plan Allocations for FY 2023–2024 and Beyond, Including Clean Transportation Program (Program) and General Funds (in Millions)

Category	Funding Source	2023–2024*	2024–2025†	2025–2026†
Light-Duty Electric Vehicle Charging Infrastructure**	Program	\$13.8	-	-
Light-Duty Electric Vehicle Charging Infrastructure	General Fund	\$210.0	\$90.0	\$40.0
Equitable At-Home Charging	General Fund	\$160.0	\$80.0	\$40.0
Medium- and Heavy-Duty Zero-Emission Vehicle (ZEV) Infrastructure	Program	\$13.8	-	-
Drayage Truck ZEV Infrastructure	General Fund	\$185.0	\$49.0	-
Transit Bus ZEV Infrastructure	General Fund	\$90.0	\$50.0	\$30.0
School Bus ZEV Infrastructure††	General Fund	\$15.0	-	-
Clean Trucks, Buses, and Off-Road Equipment ZEV Infrastructure	General Fund	\$315.0	\$31.0	\$25.0
Port ZEV Infrastructure	General Fund	\$40.0	\$80.0	\$30.0
Emerging Opportunities	General Fund	\$35.0	\$11.0	-
Hydrogen Fueling Infrastructure	Program	\$10.0	-	-
Hydrogen Fueling Infrastructure	General Fund	\$20.0	\$20.0	\$20.0
Zero- and Near Zero-Carbon Fuel Production and Supply	Program	\$5.0	-	-
Workforce Training and Development	Program	\$5.0	-	-
	Total Program	\$47.6		
	Total General Fund	\$1,070	\$411	\$185

Source: California Energy Commission.

* The Clean Transportation Program is authorized through December 31, 2023; therefore, only half of the revenues/appropriations are anticipated in FY 2023–2024.

† Subject to future budget act appropriations. Also, the anticipated general fund amounts in FY 2024–2025 and FY 2025–2026 have not been reduced to reflect administrative costs. Those fiscal year allocations will be reduced in accordance with direction in the associated budget act.

** Does not include \$384 million over five years under the federal NEVI program for charging along highways and interstates.

†† Does not include \$375 million under Proposition 98 for ZEV school bus infrastructure, since that was allocated for the previous fiscal year (2022–2023). Those funds will continue to be spent over multiple years, however.

CHAPTER 1:

Introduction

California has been at the forefront of national efforts to combat climate change since the passage of the Global Warming Solutions Act of 2006, which established a goal of reducing statewide greenhouse gas (GHG) emissions to 1990 levels by 2020.³ Senate Bill 32 established a goal of 40 percent below 1990 levels by 2030.⁴ Assembly Bill 1279 established a goal to achieve carbon neutrality as soon as possible, no later than 2045, and achieve and maintain net negative emissions thereafter.⁵

The state's efforts to address the climate crisis are showing progress, including in the transportation sector. GHG emissions from transportation decreased modestly in recent years and more sharply in 2020, as Californians reduced travel due to the COVID-19 pandemic. It remains to be seen how much of this drop in emissions was permanent, however. When including upstream emissions, transportation is still the largest source of GHG emissions in California. Vehicle use and associated oil extraction, refining, and pipelines accounted for nearly 50 percent of in-state emissions in 2020.⁶

In addition to greenhouse gases, the transportation sector is a major emitter of criteria pollutants, with mobile sources responsible for nearly 80 percent of nitrogen oxide emissions and 96 percent of diesel particulate matter emissions statewide.⁷ Protecting and improving public health in the state will require substantial reductions in criteria pollutant emissions. The California Air Resources Board (CARB) estimates that attaining federal air quality standards in 2023, 2024, 2031, and 2037 will require significant reductions of nitrogen oxide emissions in parts of the state.⁸

To help address state climate change and air pollution, the California Legislature passed Assembly Bill 118 (Núñez, Chapter 750, Statutes of 2007). This legislation created the Clean Transportation Program. With funds collected from vehicle and vessel registration, vehicle identification plates, and smog abatement fees, the Clean Transportation Program funds projects that will "transform California's fuel and vehicle types to help attain the state's climate

3 [Assembly Bill 32 \(Núñez, Chapter 488, Statutes of 2006\)](#), https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=200520060AB32.

4 [Senate Bill 32 \(Pavley, Chapter 249, Statutes of 2016\)](#), https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201520160SB32.

5 [Assembly Bill 1279 \(Muratsuchi, Chapter 337, Statutes of 2022\)](#). Accessed April 10, 2023. Available at https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=202120220AB1279.

6 California Air Resources Board. October 26, 2022. [California Greenhouse Gas Emissions for 2000 to 2020: Trends of Emissions and Other Indicators](#). Accessed April 4, 2023. Available at https://ww2.arb.ca.gov/sites/default/files/classic/cc/inventory/2000-2020_ghg_inventory_trends.pdf.

7 California Air Resources Board. October 2021. [2020 Mobile Source Strategy](#). Accessed March 21, 2023. Available at https://ww2.arb.ca.gov/sites/default/files/2021-12/2020_Mobile_Source_Strategy.pdf.

8 Ibid.

change policies." Assembly Bill 8 (Perea, Chapter 401, Statutes of 2013) extended the collection of fees that support the Clean Transportation Program to January 1, 2024. The Governor has proposed reauthorization of the program and the process is currently underway at the state legislature.

As part of the Clean Transportation Program, the California Energy Commission (CEC) prepares and adopts an annual Investment Plan Update that identifies the funding priorities for the coming fiscal year. The funding allocations reflect state policy goals and support the transition away from fossil fuels. The Investment Plan Update also describes how the allocations will complement existing public and private efforts, including related state programs.

This *2023–2024 Investment Plan Update* is the fifteenth investment plan in the history of the Clean Transportation Program and builds on the analyses and recommendations contained in prior documents. The draft staff report is the first version of the *2023–2024 Investment Plan Update*. As part of developing the *2023–2024 Investment Plan Update*, the CEC will hold two public meetings with the Clean Transportation Program Advisory Committee. The first meeting will be held April 27, 2023, with the second meeting to be held later in the year. The advisory committee is a broad representation of interests that reflect California communities and provide representation of clean transportation industries, environmental justice communities, rural communities, tribes, and others. Representatives from the advisory committee, other interested and affected groups, and the public are encouraged to discuss and comment on drafts of this document during these meetings and through the CEC's docket system.⁹

Chapter 2 of this document provides the context for the current investment plan, including an update on the CEC's implementation of the Clean Transportation Program to date and a review of related policies and programs. Chapter 3 summarizes the funding allocations for FY 2023–2024. The subsequent chapters are organized by specific investment areas. Chapter 4 focuses on zero-emission infrastructure. Chapter 5 addresses the types of opportunities for zero- and near-zero-emission fuel production and supply within California. Chapter 6 describes related opportunities to support the development and deployment of zero-emission vehicle infrastructure and fuel production such as manufacturing and workforce development.

⁹ The Energy Commission's [docket](https://efiling.energy.ca.gov/Lists/DocketLog.aspx?docketnumber=19-ALT-01) for the *2020–2021 Investment Plan Update for the Clean Transportation Program* (Docket #19-ALT-01) can be found at <https://efiling.energy.ca.gov/Lists/DocketLog.aspx?docketnumber=19-ALT-01>.

CHAPTER 2:

Context of the 2023–2024 Investment Plan

Implementation of the Clean Transportation Program

Since the inception of the program, the CEC has followed a consistent approach toward implementing the Clean Transportation Program. Each annual Investment Plan Update allows the program to be responsive and can shift funds in response to gaps in investments by utilities, the private sector, and settlement agreements. As summarized in Figure 1, the process begins with an investment plan that determines the coming fiscal-year funding allocation for categories of projects.

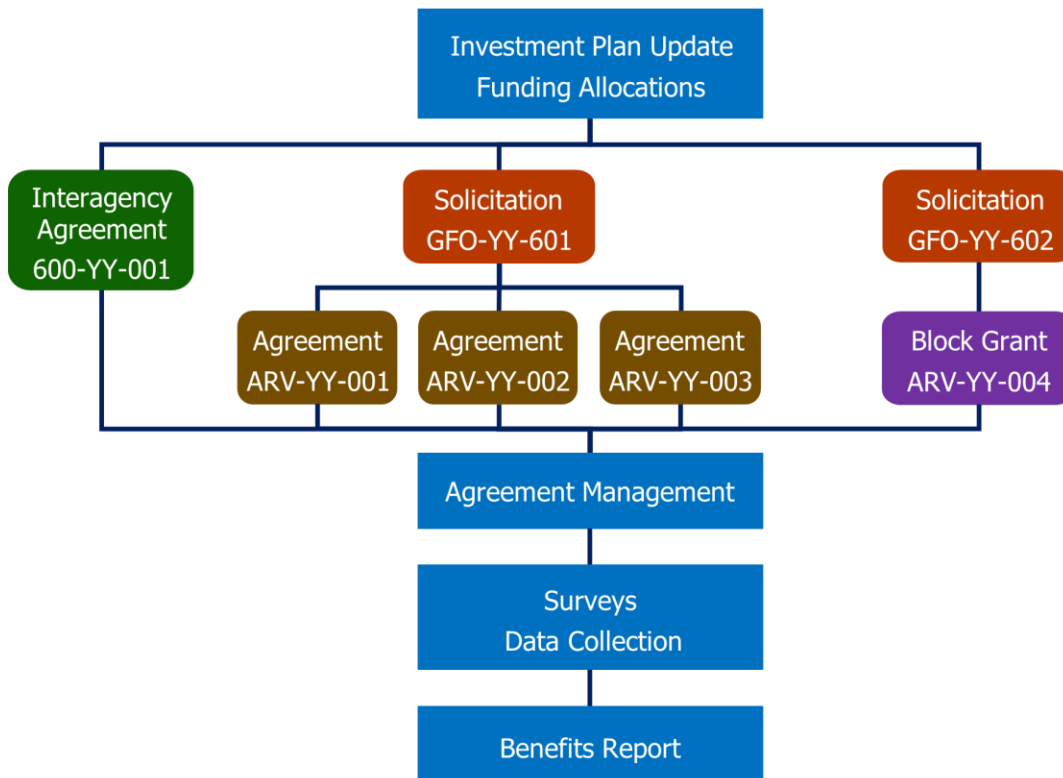
The funding allocations typically do not determine the specific funding solicitations and grant programs that will be issued. Rather, based on these funding allocations, the CEC subsequently issues a series of competitive solicitations, known as “grant funding opportunities” (GFOs).

CEC staff reviews, scores, and ranks the proposals for each solicitation using the evaluation criteria developed for the solicitation. Based on the total scores of each application, the CEC releases a notice of proposed awards (NOPA) for each solicitation. For specialized agreements with certain partner agencies, the CEC may develop interagency agreements without using the solicitation process.

Each funded application becomes a funding agreement once it has been approved and signed by the CEC and the applicant. CEC staff oversees completion of these agreements according to the respective schedules, budgets, scopes of work, and terms and conditions.

Data collection and project review are key aspects of the Clean Transportation Program implementation. The CEC surveys funding recipients on the anticipated results of their projects, with questions relating to alternative fuel use, petroleum displacement, GHG emission reductions, air quality benefits, and in-state economic benefits.

Figure 1: Schematic of the Clean Transportation Program Implementation



Source: California Energy Commission

Description of Funding Mechanisms

To date, the CEC has predominantly used grants to distribute funding, with awardees selected through competitive solicitations. The suite of potential funding and financing mechanisms have strengths and weaknesses, and the CEC weighs these options when developing the funding implementation strategy for each allocation. The most prominent funding mechanisms used for the Clean Transportation Program are described below.

- **Competitive Solicitation for Grants** — This type of solicitation represents the most common funding mechanism for the Clean Transportation Program. It is flexible, as project requirements and scoring criteria can be adapted for a broad variety of commercial and technological maturity levels. Competitive scoring 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.
- **Block Grants** — The CEC has used this funding mechanism to distribute Clean Transportation Program funding through third-party implementers. The block grant implementer is selected through a competitive process. Block grants allow 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** — Once eligibility requirements are established, the funding can be administered relatively quickly and provide greater market certainty for a project type.
- **Direct Agreements** — The CEC may make a sole source award for applied research. The CEC may also enter into interagency agreements or contracts with public entities to obtain technical, scientific, or administrative services to support the Clean Transportation Program.
- **Loans** — CEC is embarking on an in-depth examination of loan programs to be administered by a partner agency on the CEC's behalf.

Program Outreach and Engagement

The CEC seeks to increase the participation of disadvantaged and underrepresented communities from a diverse range of geographical regions and populations. The CEC also seeks to effectively engage communities disproportionately burdened by pollution and improve economic resiliency, including rural and tribal communities. This effort includes:

- Diversifying the Clean Transportation Program Advisory Committee, as accomplished in 2020, to better reflect California communities and provide increased representation of program beneficiaries, environmental justice communities, rural communities, tribes, and others.
- Consulting with the Disadvantaged Communities Advisory Group¹⁰ for guidance and recommendations on program effectiveness as it relates to disadvantaged communities and other vulnerable and underrepresented groups.
- Consulting with the CEC's Tribal Program and the Tribal Lead Commissioner for assistance with outreach and promotion of transportation-related funding opportunities to tribes.
- The IDEAL Communities Partnership Project, which the CEC launched through an agreement with the Foundation for California Community Colleges. Since the start of the project in early 2021, the Foundation has completed an equity-focused assessment of the Clean Transportation Program, drafted an outreach and engagement plan, created outreach materials, and launched the ZEV IDEAL Student Ambassadors Program (a cohort of eight community college students across five rural geographic focus areas). In 2022, the IDEAL Communities Partnership Forum provided a public venue for community-based partners to share their clean transportation needs, outline charging infrastructure issues, and provide essential feedback to the CEC and Clean Transportation Program.
- The Foundation also held two listening sessions, and set the stage for additional sessions, with community-based organizations so that staff can engage and hear directly from the communities about barriers, needs, and priorities.

¹⁰ More information available on the [Disadvantaged Communities Advisory Group Page](https://www.energy.ca.gov/about/campaigns/equity-and-diversity/disadvantaged-communities-advisory-group). Available at <https://www.energy.ca.gov/about/campaigns/equity-and-diversity/disadvantaged-communities-advisory-group>.

- CEC staff held two public workshops (November 29, 2022, and March 28, 2023) to share a proposed framework for community benefits and seek public feedback on suggested benefits and metrics for tracking the progress of those benefits.

Highlights of Investments

As of March 2023, the CEC has invested more than \$1.5 billion through the Clean Transportation Program. In many cases, projects are in progress, with ongoing siting, installation, construction, and demonstrations. Table 1 summarizes program investments, including the following highlights:

- Installed or planned nearly 23,800 chargers for plug-in electric vehicles, including approximately 6,000 at multi- and single-family homes, 155 for fleets, and 420 at workplaces; 15,000 public and shared-private Level 2 and Level 1 chargers; and 2,200 public and fleet DC fast chargers along highway corridors and urban metropolitan areas.
- Created the California Electric Vehicle Infrastructure Project (CALeVIP) to provide streamlined Clean Transportation Program incentives for light-duty electric vehicle charging infrastructure.
- Approved up to \$250 million for the CALeVIP 2.0 block grant project, which will offer rebates for high-powered (150 kilowatt+) DC fast chargers. The first incentive project of \$30 million launched in January 2023 and is open only to sites in disadvantaged and low-income communities.
- Approved up to \$250 million for the Communities in Charge block grant project, which launched its first \$30 million funding window in March 2023 offering statewide incentives for Level 2 chargers with scoring priority given to disadvantaged and low-income communities.
- Funded 86 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.
- Released new solicitations targeting high-priority or underserved EV charging needs, including multifamily housing, rural communities, and infrastructure for high-mileage, on-demand transportation services.
- Released new solicitations to expand innovative and interoperable charging opportunities, including a vehicle-grid innovation laboratory, a future symposium on electric vehicle charging interoperability, and the demonstration of innovative charging solutions to accelerate commercialization.
- Funded 78 publicly available hydrogen fueling stations and approved funding for an additional 74 stations. Of these stations, 13 will be capable of serving medium- and heavy-duty vehicles, as well as passenger vehicles. In addition, there are 23 privately funded stations (16 privately funded stations under CEC agreement and 7 privately funded stations outside any CEC agreement) under development. With the expended funds and committed allocation of funds, California is on track to meet the AB 8 requirement of 100 stations. Additional funding from the state's general fund is

expected to help California meet the 200-station goal. As of March 2023, 63 hydrogen fueling stations had achieved open retail status in California.

- Funded five projects to produce 100 percent renewable hydrogen from in-state renewable resources. The hydrogen will be used for on-road fuel cell electric vehicles, both light-duty and medium-/heavy-duty.
- Developed retail fueling standards to enable hydrogen sales on a per-kilogram basis.
- Launched the nation's first commercial vehicle fleet incentive project in March 2022 titled "EnergiIZE Commercial Vehicles" to accelerate deployment of electric and hydrogen infrastructure needed to fuel zero-emission trucks, buses, and equipment. The project uses a concierge-like model to work directly with eligible applicants to plan and fund the purchase of charging and hydrogen fueling infrastructure. The multiyear project, approved for up to \$276 million, will help communities most impacted by transportation-related pollution by meeting essential infrastructure needs and has a requirement that 60 percent of funds support low-income and disadvantaged communities.
- Released targeted grant funding solicitations to provide zero-emission charging and hydrogen refueling infrastructure for transit buses and drayage trucks, the latter in direct partnership with CARB to provide vehicle funding incentives.
- Funded 27 manufacturing projects supporting in-state economic growth. The CEC is developing funding agreements for 13 additional in-state ZEV manufacturing projects using one-time funding from the general fund. Furthermore, from this same one-time funding, a ZEV Battery Block Grant project is being developed to assist battery manufacturers with expanding operations within the state.
- Provided workforce training for more than 32,000 trainees and 277 businesses, helping prepare workers for the clean transportation economy and the opportunity to earn sustainable wages and expand employment opportunities.
- Launched 71 projects to promote the production of sustainable, low-carbon alternative fuels within California, with a cumulative annual production capacity equivalent to more than 158 million gallons of diesel fuel. Most of the projects use waste-based feedstocks such as municipal solid waste, which have some of the lowest carbon intensity pathways recognized under the Low Carbon Fuel Standard, a CARB regulation that requires the carbon intensity of transportation fuels to be cut by 20 percent by 2030.

Table 1: Clean Transportation Program Investments as of March 2023

Funded Activity	Cumulative Awards to Date (in Millions)*	# of Projects or Units
Alternative Fuel Production		
Biomethane Production	\$72.66	29 Projects
Gasoline Substitutes Production	\$26.94	14 Projects
Diesel Substitutes Production	\$66.76	26 Projects
Renewable Hydrogen Production	\$16.93	5 Projects
Alternative Fuel Infrastructure		
Electric Vehicle Charging Infrastructure**	\$412.75	23,793 chargers
Hydrogen Fueling Infrastructure (Including Operations and Maintenance)	\$166.00	78 Public Fueling Stations
Medium- and Heavy-Duty ZEV Infrastructure	\$182.41	97 Projects
E85 Fueling Infrastructure	\$3.61	21 Fueling Stations
Upstream Biodiesel Infrastructure	\$6.98	7 Infrastructure Sites
Natural Gas Fueling Infrastructure	\$24.07	70 Fueling Stations
Alternative Fuel and Advanced Technology Vehicles		
Natural Gas 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+ Natural Gas, Propane, Hybrid and ZEVs and 54 Demonstrations
Related Needs and Opportunities		
Manufacturing	\$278.04	40 Manufacturing Agreements
Workforce Training and Development	\$39.71	32,000 Trainees
Fuel Standards and Equipment Certification	\$3.90	1 Project
Sustainability Studies	\$2.04	2 Projects
Regional Alternative Fuel Readiness	\$17.91	86 Regional Plans
Centers for Alternative Fuels	\$5.41	5 Centers
Technical Assistance and Program Evaluation	\$17.52	n/a
Total	\$1.594 Billion	-

Source: California Energy Commission.

* Includes all agreements that have been approved at a CEC business meeting or are expected for business meeting approval following a notice of proposed award. For canceled and completed projects, includes only funding received.

** Includes a total of \$186 million for the California Electric Vehicle Infrastructure Project to provide EV incentives throughout California, which will fund a yet-to-be-determined number of EV chargers.

Using funds from the Clean Transportation Program, the CEC has also leveraged more than \$1.1 billion in private and other public funds. However, this amount represents only the

minimal, contractually obligated amount of match funding provided toward Clean Transportation Program projects; the actual amount of investment prompted by Clean Transportation Program funding exceeds this amount.

Summary of Program Funding for Disadvantaged Communities

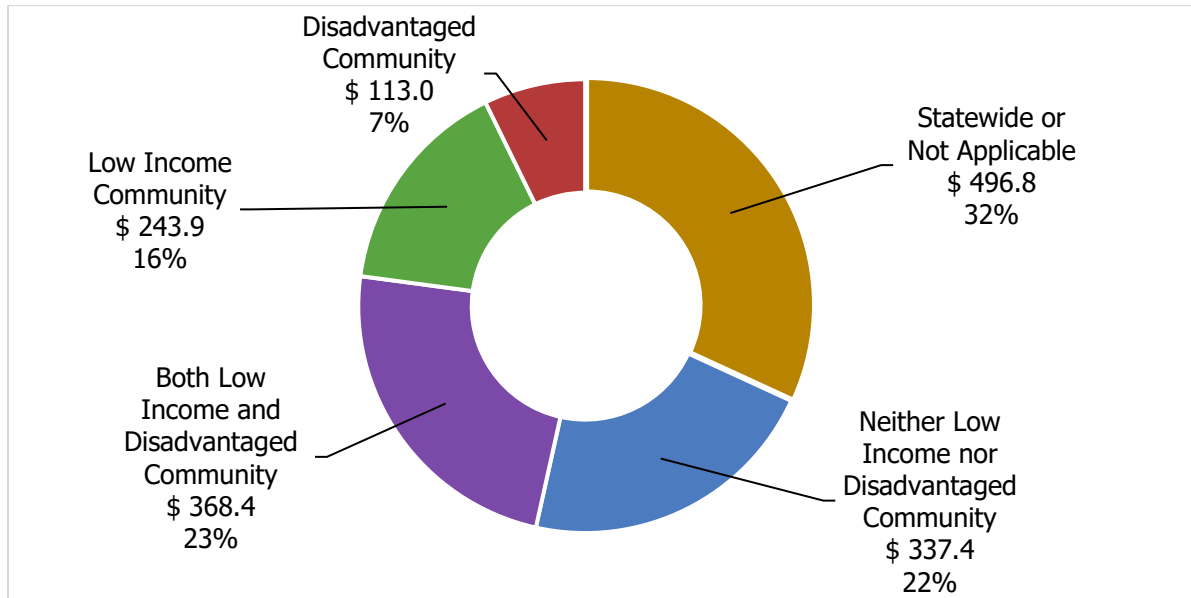
The CEC seeks to increase participation and benefits to disadvantaged and underrepresented communities from a diverse range of regions in implementing the Clean Transportation Program. As depicted in Figure 2, roughly 47 percent of Clean Transportation Program project funding has gone into disadvantaged communities or low-income communities or both.¹¹ The CEC seeks to invest more than 50 percent of funding to support projects benefitting low-income and disadvantaged communities for the remainder of the Clean Transportation Program. When excluding projects considered to be “statewide,” or having locations that are yet to be determined, this is closer to 68 percent.

The CEC recognizes that the location of a project is not the only metric of whether a project will benefit low-income and disadvantaged communities. The CEC will continue to work with the Clean Transportation Program Advisory Committee, DACAG, communities, and interested and affected groups to define and track project benefits to increase program equity and inclusion. These efforts include engaging in partnerships with community-based organizations and community organizers in project scoping and grant applications. The Foundation for California Community Colleges held two listening sessions in March 2023 with community-based organizations, which laid the groundwork for additional engagement with CEC staff. Efforts also include identifying new qualitative and quantitative metrics beyond project location to evaluate the effects of projects on local communities and continuing to work with other state and local agencies to share critical lessons and community needs.

The CEC held two public workshops (November 29, 2022, and March 28, 2023) to share the proposed Community Benefits Framework and seek public feedback on the proposed benefits and metrics for assessing progress.

11 These funding percentages incorporate CARB’s Priority Population Maps, which show disadvantaged communities and low-income communities as defined for California Climate Investments. This map provides a more precise geospatial analysis tool for finding which projects fell within low-income or disadvantaged communities’ boundaries. Previous CEC analysis used older demographic data and less granular GIS mapping. In conjunction with the SB 1000 Report (published December 2020) analysis, the demographic data and mapping have been refined to provide more accurate mapping and better count low-income and disadvantaged communities investments.

Figure 2: Clean Transportation Program Funding in Disadvantaged and Low-Income Communities (in Millions)



Source: California Energy Commission. As of December 2022.

Related Policies and Goals

The CEC's implementation of the Clean Transportation Program reflects the effect of numerous policies and goals. Table 2 highlights examples of the significant policy goals and milestones developed to reduce emissions and reduce petroleum use in California. CEC staff consulted with other state agencies and considered state policies when developing this Investment Plan Update.

Table 2: Greenhouse Gas, Fuel, and Air Quality Goals and Milestones

Policy Origin	Objectives	Goals and Milestones
Senate Bill 32	GHG Reduction	Reduce GHG emissions to 40 percent below 1990 levels by 2030
Assembly Bill 1279	GHG Reduction	Achieve carbon neutrality by 2045
Senate Bill 1020	Renewable Electricity	Achieve 90 percent renewable or zero-carbon electricity sales by 2035, 95 percent by 2040, and 100 percent by 2045 Achieve 100 percent renewable or zero-carbon electricity procured by state agencies by 2035
Assembly Bill 1279	GHG Reduction	Reduce GHG emissions to 85 percent below 1990 levels and net-zero-GHG emissions by 2045
Low Carbon Fuel Standard	GHG Reduction	Reduce carbon intensity of transportation fuels in California by 20 percent by 2030 Increase zero-emission vehicle infrastructure
Clean Air Act; California State Implementation Plans	Air Quality	80 percent reduction in NOx by 2031
Senate Bill 1275; Executive Order B-16-2012; Executive Order B-48-18; Executive Order N-79-20	Increase Zero-Emission Vehicles	Infrastructure to accommodate 1 million electric vehicles by 2020 1 million zero-emission and near-zero-emission vehicles by 2023 1.5 million electric vehicles by 2025 250,000 electric vehicle chargers, including 10,000 DC fast chargers, and 200 hydrogen fueling stations by 2025 5 million zero-emission vehicles by 2030 100% of new passenger cars and truck sales will be ZEVs by 2035 100% of operating drayage trucks, off-road vehicles, and equipment will be ZEVs by 2035 100% of operating medium- and heavy-duty trucks and buses will be ZEVs, where feasible by 2045
Advanced Clean Cars II Regulations	Increase Zero-Emission Vehicles	100% of all new passenger cars sales in California to be zero-emission by 2035, including 35% by 2026 and 68% by 2030.
Innovative Clean Transit Regulation	Increase Zero-Emission Vehicles	100 percent of all new transit buses will be zero-emission by 2029; all operating buses will be zero-emission by 2040
Advanced Clean Trucks Regulation	Increase Zero-Emission Vehicles	Requires truck manufacturers to transition from diesel trucks and vans to zero-emission trucks beginning in 2024. By 2045, every new truck sold in California will be zero-emission.

Source: California Energy Commission

Federal Laws

Clean Air Act, State Implementation Plans, and Mobile Source Strategy

The federal Clean Air Act of 1970 (42 U.S.C. 7401) authorizes the U.S. Environmental Protection Agency (U.S. EPA) to establish National Ambient Air Quality Standards (NAAQS) for

criteria air pollutants that are harmful to public health. To achieve these standards, the Clean Air Act directs states to develop State Implementation Plans that describe how an area will attain the NAAQS.

CARB reports that more than 28 million Californians live in communities that exceed the ozone and particulate matter standards set by the U.S. EPA and that the South Coast and San Joaquin Valley have the most severe near-term air pollution problems in the nation. The concepts described in the *2020 Mobile Source Strategy* intend to address these problems through transitioning the mobile fleet to zero-emission, where feasible.¹²

Infrastructure Investment and Jobs Act

President Joseph R. Biden Jr. signed the \$1.2 trillion Infrastructure Investment and Jobs Act into law in November 2021 (Public Law 117-58). The law authorizes hundreds of billions of dollars in new investments in a wide array of infrastructure categories, including roads and bridges, water infrastructure, passenger rail, energy, and broadband internet. Of particular interest to the CEC are the new investments in clean transportation, clean energy generation, and grid resiliency.

Electric vehicle charging infrastructure will see significant new funding, with \$5 billion to accelerate EV infrastructure deployment nationally titled the National Electric Vehicle Infrastructure Formula Program (NEVI). California's share is expected to be \$384 million, allocated over five years. (The NEVI Program is discussed further below in the "Complementary Funding Programs" section.) An additional \$2.5 billion nationally is available on a competitive basis for EV and hydrogen infrastructure. The Infrastructure Investment and Jobs Act also allocates more than \$6 billion for lithium-ion battery materials processing and cell manufacturing.

Inflation Reduction Act of 2022

President Biden signed the Inflation Reduction Act (IRA) of 2022 into law in August 2022. The law will transform the U.S. energy sector in profound ways through substantial and transformative investments toward 40 percent nationwide GHG reductions by 2030. The act represents the biggest climate and clean energy legislation ever adopted in the United States. In addition to 10 years of support for clean technologies such as solar, wind, energy storage, and electric heat pumps, the legislation will provide an extensive and imperative boost in EV sales and domestic EV manufacturing.

Beginning in 2023, EV manufacturers no longer face a 200,000-unit-per-manufacturer cap on eligibility for federal tax credits. New fully electric vehicles are eligible for up to a \$7,500 tax credit, which will be available as a rebate at the point of sale starting in 2024. Up to \$4,000 is

12 California Air Resources Board. October 2021. [2020 Mobile Source Strategy](https://ww2.arb.ca.gov/sites/default/files/2021-12/2020_Mobile_Source_Strategy.pdf). Accessed March 21, 2023. Available at https://ww2.arb.ca.gov/sites/default/files/2021-12/2020_Mobile_Source_Strategy.pdf.

available for used electric vehicles and up to \$40,000 for vehicles heavier than 14,000 pounds.¹³

There are two new components of the tax credit. Qualifying vehicles will receive up to \$3,750 for meeting each of the critical mineral and battery component sourcing requirements. The requirements are based on the vehicle having at least 40 percent of the critical minerals and 50 percent of the battery components from the United States or countries with a free trade agreement. This requirement could be a major boon to California manufacturers and suppliers in the zero-emission vehicle and battery space.

The legislation also provides alternative fuel vehicle refueling infrastructure tax credits while significantly enhancing the amount of the credit available in rural and low-income communities.

State Laws

Assembly Bill 32, Senate Bill 32, and the Greenhouse Gas Reduction Fund

Assembly Bill 32 (Núñez, Chapter 488, Statutes of 2006), also known as the Global Warming Solutions Act of 2006, required CARB to adopt a statewide GHG emission limit for 2020 equivalent to the statewide GHG emission levels in 1990. Senate Bill 32 (Pavley, Chapter 249, Statutes of 2016) amended the Global Warming Solutions Act of 2006 to expand the emission targets of AB 32. The amendment set a statewide GHG emission limit for 2030 equivalent to 40 percent below emission levels in 1990. AB 32 and SB 32 directed CARB to develop a climate change scoping plan to describe the approach that California will take to reduce GHG emissions and achieve the state's climate change goals.

In November 2022, CARB released an update to its AB 32 Climate Change Scoping Plan. The update addresses both the statutory 2030 target and the path to achieving carbon neutrality by 2045. This includes reducing GHG emissions 85 percent compared to 1990 levels by 2045 and carbon removal strategies to make up the difference.¹⁴

Assembly Bill 1279: Carbon Neutrality

AB 1279 (Muratsuchi, Chapter 337, Statutes of 2022), also known as the California Climate Crisis Act, established a goal to achieve carbon neutrality as soon as possible and no later than 2045. The law also requires the state to achieve and maintain net-negative greenhouse gas emissions thereafter.

13 Domonoske, Camila. February 3, 2023. "[Buying an Electric Car? You Can Get a \\$7,500 tax credit, but It Won't Be Easy](https://www.npr.org/2023/01/07/1147209505/electric-car-tax-credit-climate-bill-tesla-volkswagen-ev)." National Public Radio. Accessed March 14, 2023. Available at <https://www.npr.org/2023/01/07/1147209505/electric-car-tax-credit-climate-bill-tesla-volkswagen-ev>.

14 CARB. "[2022 Scoping Plan Documents](https://www2.arb.ca.gov/our-work/programs/ab-32-climate-change-scoping-plan/2022-scoping-plan-documents)." Accessed March 15, 2023. Available at <https://www2.arb.ca.gov/our-work/programs/ab-32-climate-change-scoping-plan/2022-scoping-plan-documents>.

Senate Bill 350 and the Disadvantaged Communities Advisory Group

SB 350, the Clean Energy and Pollution Reduction Act of 2015, requires that the CPUC and the CEC create a Disadvantaged Communities Advisory Group (DACAG) to advise on programs proposed to achieve clean energy and reduce pollution.

At a June 21, 2019 meeting of the DACAG, Clean Transportation Program staff solicited feedback on the March 27, 2019 draft of the *2019–2020 Investment Plan Update* from the DACAG members.¹⁵ In response, the DACAG provided comments on the *2019–2020 Investment Plan Update* on June 28, 2019.¹⁶ These comments included recommendations on how the plan update can effectively benefit communities disproportionately burdened by pollution and socioeconomic challenges. On April 16, 2020, DACAG provided comments on the *2020–2023 Investment Plan Update*.¹⁷ Recommendations from both DACAG letters are included in Table 3, along with actions taken by the Clean Transportation Program to better address equity. Members of the Clean Transportation Program Advisory Committee, DACAG, and others will also have the opportunity to provide recommendations for the *2023–2024 Investment Plan Update*, as well as future investment plans.

Table 3: Recommendations From the Disadvantaged Communities Advisory Group and Others, Along With the Actions Taken by the Energy Commission

Recommendations	Actions Taken by CEC
Moving 100 percent of program funding toward zero-emission fuels.	The Clean Transportation Program is supporting the emerging revolution in the transportation sector with significant investments in zero-emission vehicle infrastructure (both battery-electric and hydrogen fuel cell).
Funding projects exclusively in and benefiting disadvantaged communities.	Committed to seeking to award at least 50 percent of funding to support projects benefitting low-income and disadvantaged communities for the remainder of the Clean Transportation program. Working to better define, measure, track, and increase community benefits from the Clean Transportation Program.

15 [DACAG meeting materials](https://www.cpuc.ca.gov/DACAG/) available at <https://www.cpuc.ca.gov/DACAG/>. The [previous version of the 2019–2020 Investment Plan Update \(Lead Commissioner Report version\)](https://efiling.energy.ca.gov/GetDocument.aspx?tn=227444) is available at <https://efiling.energy.ca.gov/GetDocument.aspx?tn=227444>.

16 SB 350 Disadvantaged Communities Advisory Group. June 28, 2019. ["SB 350 Disadvantaged Communities Advisory Group Comments on 2019-2020 Investment Plan Update."](https://efiling.energy.ca.gov/GetDocument.aspx?tn=228878&DocumentContentId=60238) Submitted to Docket 18-ALT-01, TN# 228878. Available at <https://efiling.energy.ca.gov/GetDocument.aspx?tn=228878&DocumentContentId=60238>.

17 SB 350 Disadvantaged Communities Advisory Group, ["SB 350 Disadvantaged Communities Advisory Group comments on 2020-2023 Investment Plan Update,"](https://efiling.energy.ca.gov/Lists/DocketLog.aspx?docketnumber=19-ALT-01) written on April 16, 2020, and submitted April 30, 2020, to Docket 19-ALT-01, TN# 232879. Available at <https://efiling.energy.ca.gov/Lists/DocketLog.aspx?docketnumber=19-ALT-01>.

Expanding the definition of disadvantaged communities beyond the CalEnviroScreen definition.	<p>Expanded solicitation eligibility and statutory change to Clean Transportation Program to explicitly include California Native American tribes.</p> <p>Through the CEC's CALeVIP 1.0 project, some projects required 25% of funds be spent in unincorporated towns and 50% of funds be spent in low-income or disadvantaged communities or both. CALeVIP 2.0 and Communities in Charge require at least 50% of funds to be spent in low-income or disadvantaged communities.</p>
Increasing transparency and tracking expanded metrics to measure how projects "benefit" disadvantaged communities.	CEC staff continues to work with the CEC's Public Advisor's Office to inform and receive input from DACAG during solicitation development. The CEC is also expanding its focus and methods to track and increase 1) benefits for underrepresented communities and 2) air quality impacts and associated health outcomes from the Clean Transportation Program
Prioritizing and investing in community outreach and engagement.	1) Explicit inclusion of scoring criteria for various funding solicitations that emphasize location in disadvantaged and low-income communities and development of an equity outreach and engagement plan ¹⁸ and 2) established the IDEAL Communities Partnership focused on community engagement activities such as technical assistance, ZEV Community Survey and Outreach Forum, and ZEV Student Ambassador Program in partnership with the Foundation for California Community Colleges. These activities are in addition to continued engagement with the DACAG and its transportation experts.
Continued investments in workforce training and development.	Dedicated Clean Transportation Program funding allocations that will expand workforce training and development including community-based workforce training and development projects in and near ZEV deployments in priority communities.
Expanding the Clean Transportation Program Advisory Committee to increase representation of program beneficiaries, environmental justice communities, rural communities, tribes, and others.	Reconstituted and diversified the Clean Transportation Program Advisory Committee in 2020 to better reflect California communities and provide increased representation of program beneficiaries.
Prioritize investments in the medium- and heavy-duty vehicle categories and target disadvantaged communities.	Funding allocations for these activities have increased to meet the growing needs of charging and hydrogen fueling infrastructure for medium- and heavy-duty ZEVs and improve air quality, especially in low-income and disadvantaged communities.

Source: California Energy Commission

Assembly Bill 841: Electric Vehicle Infrastructure Training Program

The Electric Vehicle Infrastructure Training Program (EVITP) website states that it is "a collaboration of industry stakeholders including automakers, electric vehicle supply equipment

18 One example: "[GFO-20-606 Zero-Emission Drayage Truck and Infrastructure Pilot Project](https://web.archive.org/web/20221226124352/https://www.energy.ca.gov/solicitations/2020-11/gfo-20-606-zero-emission-drayage-truck-and-infrastructure-pilot-project)." Archived page available at <https://web.archive.org/web/20221226124352/https://www.energy.ca.gov/solicitations/2020-11/gfo-20-606-zero-emission-drayage-truck-and-infrastructure-pilot-project>.

(EVSE) manufacturers, educational institutions, utility companies, electric industry professionals, and key EV industry stakeholders.”¹⁹ According to Assembly Bill 841 (Ting, Chapter 372, Statutes of 2020), the CPUC, CEC, and CARB shall require that EV charging infrastructure on the customer side of the electrical meter that is funded by those state entities be installed by a contractor with the appropriate license classification and at least one electrician on each crew who holds an EVITP certification. On February 10, 2023, staff held a workshop²⁰ to discuss, among other items, strategies and actions aimed at increasing EVITP training and certification across the state. An EVITP 4.0 curriculum is under development.

Senate Bill 643: Fuel Cell Electric Vehicle Fueling Infrastructure and Hydrogen Production Statewide Assessment

Senate Bill 643 (Archuleta, Chapter 646, Statutes of 2021) requires that the CEC, in consultation with CARB and the CPUC, prepare a statewide assessment of the fuel cell electric vehicle fueling infrastructure and fuel production needed to support the adoption of zero-emission trucks, buses, and off-road vehicles at levels that will meet statewide goals, including those set forth in Executive Order N-79-20, and regulations including Advanced Clean Fleets. The CEC expects to release a staff report in June 2023, hold a public workshop in July 2023 to receive feedback from interested parties, and complete the inaugural version of this report by December 31, 2023.

Assembly Bill 2061: Charging Station Reliability and Uptime

Ensuring a reliable charging experience will be critical to encouraging wider adoption of electric vehicles. The CEC held a workshop on this topic in March 2022, focused on (1) how to define and measure reliability, and (2) how to set reliability standards for charging infrastructure funded by the CEC.²¹

Assembly Bill 2061 (Ting, Chapter 345, Statutes of 2022) subsequently requires the CEC, in consultation with the CPUC, to develop uptime recordkeeping and reporting standards for publicly funded and ratepayer-funded charging stations by January 1, 2024. The CEC will conduct an assessment of reliability of charging station infrastructure and update the assessment every two years, beginning January 1, 2025. The law also authorizes the CEC to adopt tools to increase charging station uptime, including requirements and incentives for uptime and operations and maintenance.

19 “[Electric Vehicle Infrastructure Training Program](https://evitp.org/about-us/)” is available at <https://evitp.org/about-us/>.

20 California Energy Commission. “[Clean Transportation Program Proposed Workforce Investments and Activities Workshop](https://www.energy.ca.gov/event/workshop/2023-02/clean-transportation-program-proposed-workforce-investments-and-activities).” Accessed April 4, 2023. Available at <https://www.energy.ca.gov/event/workshop/2023-02/clean-transportation-program-proposed-workforce-investments-and-activities>.

21 CEC. March 11, 2022. “[Electric Vehicle Charging Infrastructure Reliability Workshop](https://www.energy.ca.gov/event/workshop/2022-03/electric-vehicle-charging-infrastructure-reliability-workshop).” Materials and recording are available at <https://www.energy.ca.gov/event/workshop/2022-03/electric-vehicle-charging-infrastructure-reliability-workshop>.

On January 25, 2023, the CEC began a rulemaking proceeding to develop charger reliability regulations in accordance with AB 2061.²²

Executive Orders

Executive Orders B-16-12, B-48-18, and N-79-20: Zero-Emission Vehicles

Executive Order B-16-12 set a target of 1.5 million zero-emission vehicles by 2025 and tasked various state agencies with specific actions needed to support this goal.²³ Subsequently, in January 2018, Executive Order B-48-18 set an expanded target of 5 million zero-emission vehicles by 2030, as well as a network of 200 hydrogen fueling stations and 250,000 electric vehicle charging stations, including 10,000 DC fast chargers, installed or constructed by 2025.²⁴ These executive orders have been part of the guidance for the electric vehicle charging and hydrogen fueling infrastructure investments of the Clean Transportation Program.

Executive Order N-79-20, signed by Governor Gavin Newsom on September 23, 2020, provides even more ambitious goals and requirements. These include 100 percent of in-state sales of passenger cars and trucks being ZEVs by 2035; 100 percent of operating medium- and heavy-duty vehicles being ZEVs by 2045, where feasible; and 100 percent of operating drayage trucks and off-road vehicles and equipment being ZEVs by 2035. The order also tasks CEC with providing an updated assessment of the infrastructure needed to support this level of ZEV adoption.

To meet the ambitious statewide targets set in Executive Order N-79-20, Governor Newsom tasked GO-Biz with collaborating with several agencies and partners to shepherd the administration's ZEV Market Development Strategy. The *California Zero-Emission Vehicle Market Development Strategy*²⁵ was published in February 2021 and is part of the ongoing effort to turn California's 100 percent ZEV vision into reality. The strategy is centered around four market pillars: vehicles, infrastructure, end users, and workforce.

Regulations by the California Air Resources Board

Low Carbon Fuel Standard

CARB adopted the Low Carbon Fuel Standard (LCFS) regulation in April 2009 with a goal of reducing the overall carbon intensity of fuels within the transportation sector by 20 percent by

22 California Energy Commission. January 31, 2023. [Order Instituting Rulemaking Proceeding: Rulemaking to Establish Uptime Recordkeeping and Reporting Standards for Electric Vehicle Chargers and Charging Stations](https://efiling.energy.ca.gov/GetDocument.aspx?tn=248612&DocumentContentId=83100). Accessed March 28, 2023. Available at <https://efiling.energy.ca.gov/GetDocument.aspx?tn=248612&DocumentContentId=83100>.

23 [Executive Order B-16-12](https://www.ca.gov/archive/gov39/2012/03/23/news17463/index.html) available at <https://www.ca.gov/archive/gov39/2012/03/23/news17463/index.html>.

24 [Executive Order B-48-18](https://www.ca.gov/archive/gov39/2018/01/26/governor-brown-takes-action-to-increase-zero-emission-vehicles-fund-new-climate-investments/index.html) available at <https://www.ca.gov/archive/gov39/2018/01/26/governor-brown-takes-action-to-increase-zero-emission-vehicles-fund-new-climate-investments/index.html>.

25 Governor's Office of Business and Economic Development. February 2021. [California Zero-Emission Vehicle Market Development Strategy](https://static.business.ca.gov/wp-content/uploads/2021/02/ZEV_Strategy_Feb2021.pdf). Accessed March 16, 2023. Available at https://static.business.ca.gov/wp-content/uploads/2021/02/ZEV_Strategy_Feb2021.pdf.

2030. The LCFS sets a carbon intensity standard (or benchmark) that declines each year. Providers of low-carbon fuels earn credits under the LCFS by producing fuels with a carbon intensity below the annual carbon intensity standard. CARB is considering strengthening the carbon intensity targets through 2030 and establishing longer-term targets post-2030.

The LCFS benefits ZEVs and ZEV infrastructure by allowing publicly accessible hydrogen fueling stations to earn hydrogen fueling infrastructure credits based on the capacity of the station. The amendments also provide credits for DC fast charging equipment based on the power rating of the equipment.

Advanced Clean Cars Regulations

CARB's Advanced Clean Cars program consists of a suite of regulations for reducing emissions from the state's light-duty fleet. One element of the Advanced Clean Cars program is the ZEV Regulation, which requires auto manufacturers to offer for sale specific numbers of the cleanest cars available, including full battery-electric vehicles (BEVs), hydrogen fuel cell electric vehicles, and plug-in hybrid electric vehicles. On August 25, 2022, CARB approved ZEV regulations under the Advanced Clean Cars II rulemaking, requiring 100 percent of new car sales in California to be ZEVs by 2035. The yearly targets of the plan would require 35 percent of new sales be ZEVs by 2026, 68 percent by 2030, and 100 percent by 2035.

Innovative Clean Transit Regulation

CARB adopted the Innovative Clean Transit Regulation²⁶ in December 2018 to replace the Fleet Rule for Transit Agencies. This regulation requires all public transit agencies to gradually transition to a 100-percent zero-emission bus fleet and encourages them to provide innovative first- and last-mile connectivity and improved mobility for transit riders. The Innovative Clean Transit Regulation mandates an increasing annual zero-emission bus purchase percentage. The purchase requirements begin in 2023 with a 25 percent ZEV share of new bus purchases for large transit agencies, phasing in small transit agencies in 2026, and increasing to a 100 percent ZEV purchase requirement beginning in 2029. As of December 31, 2021, there were 510 zero-emission buses (56 FCEVs and 454 BEVs) in service and another 424 (62 FCEVs and 362 BEVs) on order, for a total of 934 zero-emission buses.

Advanced Clean Trucks

In June 2020, CARB adopted the Advanced Clean Trucks regulation, a first-in-the-world rule requiring truck manufacturers to transition trucks and vans toward zero-emission technologies beginning in 2024. The goal of the Advanced Clean Trucks regulation is to achieve NO_x and GHG emissions reductions by accelerating the first wave of zero-emission heavy-duty technology into applications that are well suited to its use. Manufacturers are required to sell ZEVs as a percentage of their annual total sales. By 2035, required ZEV sales percentages will

26 California Air Resources Board. "[Innovative Clean Transit](https://www2.arb.ca.gov/our-work/programs/innovative-clean-transit/about)." Available at <https://www2.arb.ca.gov/our-work/programs/innovative-clean-transit/about>.

be as follows: 55 percent of Classes 2b–3 truck sales, 75 percent of Classes²⁷ 4–8 truck sales, and 40 percent of tractor sales. The Advanced Clean Trucks regulation is expected to result in 100,000 ZEV trucks in California by 2030 and 300,000 by 2035.

Advanced Clean Fleets

The proposed Advanced Clean Fleets regulation is part of a comprehensive strategy that would, consistent with public health needs, accelerate the widespread adoption of ZEVs in the medium- and heavy-duty truck sector. The proposed regulation builds on other policies including the Advanced Clean Trucks regulation to continue reducing emissions. It would be the next significant step in accelerating toward a zero-emission transportation system as well as a more equitable future in California. The proposed Advanced Clean Fleets regulation would require state and local government fleets, drayage trucks, high-priority fleets, and federal fleets to phase in medium- and heavy-duty ZEVs over time. The proposed regulation additionally sets a clear end date for new internal combustion-powered medium- and heavy-duty vehicle sales in California.

Complementary Funding Programs

California Energy Commission’s School Bus Replacement Program

In the November 2012 California general election, voters approved Proposition 39 to improve energy efficiency and expand clean energy generation in schools and community colleges. Senate Bill 110 (Committee on Budget and Fiscal Review, Chapter 55, Statutes of 2017) allocated funds from the implementation of Proposition 39 to improve energy efficiency at California schools. The energy efficiency measures in SB 110 include one-time funding of \$75 million for the retrofit or replacement of school buses.

The CEC administers this funding, and priority is given to school districts operating the oldest and most polluting diesel school buses, as well as to school buses operating in disadvantaged and low-income communities. The \$75 million in funding provided by SB 110 is being used exclusively for the purchase of battery-electric school buses, and this amount is being supplemented with more than \$14 million in Clean Transportation Program funds to provide the necessary charging infrastructure to operate the buses.

As of March 2023, 53 school districts have received a total of 194 electric school buses. The CEC anticipates that all electric school buses and charging infrastructure awarded through the School Bus Replacement Program will be completed by the end of 2024.

California Air Resources Board Funding Programs

In addition to the CEC’s Clean Transportation Program, AB 118 also created the Air Quality Improvement Program (AQIP), which CARB administers. The CEC and CARB have complementary responsibilities, with CARB serving as the lead agency on ZEV deployment and the CEC as the lead agency on ZEV infrastructure and vehicle-grid integration. Coordination

²⁷ According to CARB, Classes 2b–3 cover on-road vehicles with a gross vehicle weight rating of 8,501 to 14,000 pounds. Classes 4–8 cover those over 14,000 pounds.

between agencies continues to be paramount to ensure strategic use of limited state funds. Since 2009, AQIP has provided:

- Deployment incentives for light-duty electric vehicles through the Clean Vehicle Rebate Project (CVRP).
- Deployment incentives for alternative medium- and heavy-duty vehicles through the Hybrid and Zero-Emission Truck and Bus Voucher Incentive Project (also known as HVIP).
- The Truck Loan Assistance Program, which helps small business truckers secure financing for upgrading their fleets with newer trucks.
- Funding for other advanced emission-reduction technologies for vehicles and equipment.

CARB also distributes Greenhouse Gas Reduction Fund capital through its Low Carbon Transportation Investments. The Legislature appropriated more than \$2.5 billion to CARB for Low Carbon Transportation Investments since 2013. To support the rapidly growing zero-emission vehicle market and support additional investments focused on equity, several funding sources are helping support Low Carbon Transportation Investments.

In September 2022, the final budget appropriation for FY 2022–2023 included a total of \$2.6 billion from the Greenhouse Gas Reduction Fund, the general fund, and AQIP. Table 4 below shows how CARB plans to invest this funding.

Table 4: FY 2022–2023 CARB Clean Transportation Incentives Allocations (in Millions)

Project Category	Greenhouse Gas Reduction Fund	General Fund	Proposition 98 General Fund	Air Quality Improvement Fund
Clean Transportation Equity Programs Established Under SB 1275				
Vehicle Purchase Incentive Programs	\$111	\$215		
Clean Mobility Investments	\$15	\$40		
Heavy-Duty Zero-Emission				
Drayage Trucks, School/Transit Buses		\$362	\$1,125	
Clean Trucks, Buses, and Off-Road Freight	\$578			
Emerging Opportunities	\$42	\$93		
AQIP				\$28.64

Source: California Air Resources Board²⁸

CARB released the proposed *Fiscal Year 2022–23 Funding Plan for Clean Transportation Incentives* on October 12, 2022, and approved it on November 17, 2022.

Investor-Owned Utility Investments

The CPUC initially approved infrastructure pilot programs for Pacific Gas and Electric Company (PG&E),²⁹ San Diego Gas & Electric Company (SDG&E),³⁰ and Southern California Edison (SCE)³¹. Subsequently, in December 2018, the CPUC approved \$22 million in bridge funding for the SCE Charge Ready Pilot to build at least 1,000 Level 2 chargers. In August 2020, the CPUC approved SCE's Charge Ready 2 infrastructure program, with a \$436 million budget that will fund about 38,000 electric vehicle chargers in the utility's service territory. In April 2021, the CPUC approved SDG&E's Power Your Drive Extension Program for \$43.5 million that will fund nearly 2,000 electric vehicle chargers.

28 CARB. October 2022. [Fiscal Year 2022–23 Funding Plan for Clean Transportation Incentives](https://www2.arb.ca.gov/sites/default/files/2022-10/proposed_fy2022_23_funding_plan_final.pdf). Available at https://www2.arb.ca.gov/sites/default/files/2022-10/proposed_fy2022_23_funding_plan_final.pdf.

29 California Public Utilities Commission. December 2016. [Decision \(D.\) 16-12-065](https://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M171/K539/171539218.PDF). Available at <https://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M171/K539/171539218.PDF>.

30 California Public Utilities Commission. January 2016. [D.16-01-045](https://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M158/K241/158241020.PDF). Available at <https://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M158/K241/158241020.PDF>.

31 California Public Utilities Commission. January 2016. [D.16-01-023](https://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M157/K835/157835660.PDF). Available at <https://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M157/K835/157835660.PDF>.

Starting in 2022, after the passage of AB 841, utility-side EV infrastructure is funded by ratepayers under the IOUs' general rate case proceedings instead of the aforementioned programs. These changes, formalized under Rule 29 for PG&E and SCE and Rule 45 for SDG&E, provide greater consistency and certainty for cost recovery of utility-side infrastructure upgrades in support of EV charging.

Much of the CPUC's current ZEV work is focused on SB 350 implementation. The CPUC directed the six investor-owned electric utilities (IOUs) under the CPUC's jurisdiction to propose portfolios of transportation electrification programs and investments. Under this array of programs, the CPUC reports that the IOUs collectively hold \$1.48 billion in authorized unspent funding. The CPUC's current transportation electrification funding policy will last through 2024. In November 2022, the CPUC approved a new funding strategy to start in 2025. This strategy includes \$600 million (potentially up to \$1 billion) in transportation electrification rebates administered by third parties instead of the IOUs.³²

Volkswagen Diesel Emissions Settlement

California received about \$423 million from the Volkswagen Environmental Mitigation Trust for projects to reduce the lifetime excess nitrogen oxides (NO_x) emissions caused by illegal devices installed in certain 2.0- and 3.0-liter diesel vehicles to defeat emissions tests. In May 2018, CARB approved a Beneficiary Mitigation Plan outlining how these funds will be spent.³³ California's three largest air districts are administering this funding statewide. The first installments across different categories have been made available starting with the release of zero-emission bus funds in fall 2019.

In addition, Volkswagen has an \$800 million ZEV Investment Commitment in the state and must offer and sell additional battery-electric vehicle models in California between 2019 and 2025. The ZEV Investment Commitment³⁴ will occur over a 10-year period. Eligible projects include:

- the design, planning, construction, and operation and maintenance of qualified fueling infrastructure for ZEVs.
- brand-neutral education and public outreach to increase consumer awareness of ZEVs.
- actions to increase public exposure or access or both to ZEVs without requiring a consumer purchase or lease (for example, programs for car-share and ride-hail services).

32 California Public Utilities Commission. "[Transportation Electrification](https://www.cpuc.ca.gov/zev/)." Accessed April 10, 2023. Available at <https://www.cpuc.ca.gov/zev/>.

33 California Air Resources Board. June 2018. [Beneficiary Mitigation Plan for the Volkswagen Environmental Mitigation Trust](https://ww2.arb.ca.gov/resources/documents/californias-beneficiary-mitigation-plan). Available at <https://ww2.arb.ca.gov/resources/documents/californias-beneficiary-mitigation-plan>.

34 California Air Resources Board. "[Volkswagen Zero-Emission Vehicle \(ZEV\) Investment Commitment](https://ww2.arb.ca.gov/our-work/programs/volkswagen-zero-emission-vehicle-zev-investment-commitment)." Accessed April 7, 2023. Available at <https://ww2.arb.ca.gov/our-work/programs/volkswagen-zero-emission-vehicle-zev-investment-commitment>.

- two “Green City” initiatives that may include ZEV car-sharing services, transit applications, and freight transport projects.

Volkswagen has submitted the first three of four 30-month, \$200 million ZEV investment plans to CARB for approval. In June 2021, CARB approved Electrify America’s third 30-month ZEV investment plan, which began January 1, 2022.

National Electric Vehicle Infrastructure (NEVI) Formula Program

Established under the Infrastructure Investment and Jobs Act mentioned above, the NEVI formula is expected to provide \$384 million over five years to expand California’s network of charging stations. The CEC is collaborating with the California Department of Transportation (Caltrans) to administer the funds.

A primary policy objective for the NEVI formula program is to establish a coast-to-coast network of 500,000 modern, high-powered DC fast chargers along the nation’s freeways and highways to enable long-distance travel in electric vehicles. Another key policy objective is to extend the benefits of this new charging network to disadvantaged, rural, and tribal communities under the Justice40 framework, which requires that 40 percent of program benefits accrue to disadvantaged communities.

On August 1, 2022, the CEC and Caltrans released California’s NEVI Deployment Plan. On September 14, 2022, the Biden-Harris administration approved California’s plan. To maximize NEVI investments and benefits, California’s initial deployment plan includes ongoing engagement and outreach, including labor, to shape the continued development and refinement of plan elements. The initial deployment plan focuses on investments in light-duty vehicle charging infrastructure and will consider projects that can also accommodate medium- and heavy-duty charging infrastructure. Subsequent plans will reevaluate NEVI formula funding investments across segments and continue to evaluate the NEVI formula funding in the context of the broader set of state and federal investments in light-duty, medium-duty, and heavy-duty vehicle infrastructure.

Charging and Fueling Infrastructure Discretionary Grant Program

The Infrastructure Investment and Jobs Act also authorized \$2.5 billion in competitive grants nationwide to expand EV charging and other alternative-fuel infrastructure along corridors and in communities. This is intended to complement the NEVI formula program, which focuses on long-distance travel between communities. On March 14, 2023, the Biden-Harris administration opened applications for the first round of funding, totaling up to \$700 million.³⁵

Alternative Fuel Refueling Property Credit

The Inflation Reduction Act of 2022, signed into law by President Biden in August 2022, extends and expands a federal tax credit for alternative fuel infrastructure, including charging

³⁵ Federal Highway Administration. “[Biden-Harris Administration Opens Applications for First Round of \\$2.5 Billion Program to Build EV Charging in Communities & Neighborhoods Nationwide](https://highways.dot.gov/newsroom/biden-harris-administration-opens-applications-first-round-25-billion-program-build-ev).” Accessed April 11, 2023. <https://highways.dot.gov/newsroom/biden-harris-administration-opens-applications-first-round-25-billion-program-build-ev>.

equipment and hydrogen refueling equipment. The law extended the alternative fuel infrastructure tax credit of up to 30 percent of the equipment cost, to a new maximum of \$100,000 (up from \$30,000) for equipment subject to depreciation (such as chargers installed for business or investment purposes). In other situations the maximum is \$1,000.³⁶ The credited equipment must be installed in a low-income or nonurban community. The amount of the credit can also be significantly increased under certain prevailing wage and apprenticeship circumstances.

³⁶ Internal Revenue Service. "[Instructions for Form 8911 \(01/2023\): Alternative Fuel Vehicle Refueling Property Credit](https://www.irs.gov/instructions/i8911)." Accessed April 11, 2023. Available at <https://www.irs.gov/instructions/i8911>.

CHAPTER 3:

Funding Allocations for 2023–2024

The funding allocations for FY 2023–2024, and the projected funding allocations for the subsequent fiscal years, are outlined in Table 5. For FY 2023–2024, \$47.6 million of Clean Transportation Program funds may be available for the purposes described in this Investment Plan Update. If a different amount of funding is available, the allocations in this document may be amended either before or after final adoption.

Table 5 shows the proposed funding allocations for the first half of FY 2023–2024, since the Clean Transportation Program is set to expire on January 1, 2024. Table 5 also shows the anticipated general fund allocations under the Budget Act of 2021 and Budget Act of 2022. The additional funds will help close funding gaps in infrastructure deployment, accelerate charging and hydrogen fueling station deployment, and promote in-state ZEV and ZEV-related manufacturing, including infrastructure manufacturing and ZEV component manufacturing such as EV batteries. General fund allocations are subject to change with the development of the FY 2023–2024 and subsequent budgets.

The investments will help the markets for zero-emission vehicles and infrastructure grow to scale and, more importantly, serve as a foundation for an equitable transition to zero-emission transportation and create broader access. The increased funds will create jobs in manufacturing, construction, and engineering and invest in ZEV refueling infrastructure for passenger vehicles, big rigs, port equipment, transit, and school buses while supporting more domestic ZEV manufacturing. These investments will allow California to lead the nation and pave the way to a cleaner, healthier transportation system.

Table 5 shows combined allocations of more than \$600 million to support light-duty passenger vehicle infrastructure (first three rows) and nearly \$1 billion to support medium- and heavy-duty ZEV infrastructure (next six rows). Investments in medium- and heavy-duty ZEV infrastructure reflect the need to transition the most polluting vehicles swiftly toward zero-emission technologies in the most sensitive regions of the state. At the same time, there must be continued infrastructure investments to support light-duty passenger vehicles.

Table 5: Proposed Investment Plan Allocations for FY 2023–2024 and Beyond, Including Clean Transportation Program (Program) and General Funds (in Millions)

Category	Funding Source	2023–2024*	2024–2025†	2025–2026†
Light-Duty Electric Vehicle Charging Infrastructure**	Program	\$13.8	-	-
Light-Duty Electric Vehicle Charging Infrastructure	General Fund	\$210.0	\$90.0	\$40.0
Equitable At-home Charging	General Fund	\$160.0	\$80.0	\$40.0
Medium- and Heavy-Duty Zero-Emission Vehicle (ZEV) Infrastructure	Program	\$13.8	-	-
Drayage Truck ZEV Infrastructure	General Fund	\$185.0	\$49.0	-
Transit Bus ZEV Infrastructure	General Fund	\$90.0	\$50.0	\$30.0
School Bus ZEV Infrastructure††	General Fund	\$15.0	-	-
Clean Trucks, Buses and Off-Road Equipment ZEV Infrastructure	General Fund	\$315.0	\$31.0	\$25.0
Port ZEV Infrastructure	General Fund	\$40.0	\$80.0	\$30.0
Emerging Opportunities	General Fund	\$35.0	\$11.0	-
Hydrogen Fueling Infrastructure	Program	\$10.0	-	-
Hydrogen Fueling Infrastructure	General Fund	\$20.0	\$20.0	\$20.0
Zero- and Near Zero-Carbon Fuel Production and Supply	Program	\$5.0	-	-
Workforce Training and Development	Program	\$5.0	-	-
	Total Program	\$47.6		
	Total General Fund	\$1,070	\$411	\$185

Source: California Energy Commission.

* The Clean Transportation Program is authorized through December 31, 2023; therefore, only half of the revenues/appropriations are anticipated in FY 2023–2024.

† Subject to future Budget Act appropriations. Also, the anticipated general fund amounts in FY 2024–2025 and FY 2025–2026 have not been reduced to reflect administrative costs. Those fiscal year allocations will be reduced in accordance with direction in the associated Budget Act.

** Does not include \$384 million over five years under the federal NEVI program for charging along highways and interstates.

†† Does not include \$375 million under Proposition 98 for ZEV school bus infrastructure, since that was allocated for the previous fiscal year (2022–2023). Those funds will continue to be spent over multiple years, however.

CHAPTER 4:

Zero-Emission Vehicle Infrastructure

The mass adoption of zero-emission vehicles (ZEVs) is critical to California’s decarbonization goals, air-quality standards goals, and petroleum reduction goals. California has made significant progress toward advancing the adoption of ZEVs, with nearly 1.4 million plug-in electric vehicles (PEVs) sold through 2022 and nearly 19 percent of new light-duty sales being ZEVs in 2022.

The CEC is the lead agency on ZEV infrastructure investment and analysis. The CEC’s investments, and those of other public agencies, will catalyze the development and deployment of ZEV infrastructure, with a focus on gaps in access for California’s most impacted communities. The CEC investments will enable and leverage private sector investment in ZEV infrastructure.

Light-Duty Electric Vehicle Charging Infrastructure

Quantifying Charging Infrastructure for Light-Duty Vehicles

To track progress toward the state’s 2025 goal, the CEC conducts quarterly surveys, which started in July 2020, to obtain combined counts of public- and shared-access chargers within California. Table 6 below provides estimates of the existing number of public or shared Level 2 and DC fast chargers within the state as of March 2023. The table also provides estimates of the number of chargers to be installed from allocated or upcoming Clean Transportation Program funds, as well as the number of connectors to be installed based on announced plans from other major funding programs, which are tracked by the CEC.

Table 6: Progress Toward 250,000 Chargers and Beyond

Category	Level 2 Chargers	DC Fast Chargers	Total Chargers
Existing Chargers (Estimated)*	78,500	9,207	87,707
Anticipated Chargers for Which Funding Has Been Allocated (including anticipated funding from Clean Transportation Program)†	163,000	9,000	172,000
Total	241,500	18,207	259,707
2025 Goal (Executive Order B-48-18)	240,000**	10,000**	250,000
Gap From Near-Term Goal	0	0	0
Inaugural AB 2127 Report’s 2030 Estimate of Charging Needs	1,126,855	37,461	1,164,316
Gap from 2030 Estimates	885,355	19,254	904,609

Source: California Energy Commission. Analysis as of March 2023.

* Existing charging ports estimated based on available data from U.S. Department of Energy's Alternative Fuels Data Center surveys to electric vehicle network service providers, utilities, and public agencies in California. Not included in this table are an estimated 629 statewide public or shared-private Level 1 chargers.

† Derived from public presentations and statements by utilities, California Public Utilities Commission, CARB, other entities, and the CEC. Includes funding from State Budget Act of 2021 and State Budget Act of 2022 intended to close the gaps for both Level 2 and DC fast chargers and federal NEVI funding. The estimated number of chargers could change as solicitations are released.

** CEC expects to reach 240,000 Level 2 chargers in 2026. However, the CEC anticipates reaching 10,000 DC fast chargers in 2023.

Light-Duty Vehicle Findings From the Inaugural *AB 2127 Electric Vehicle Charging Infrastructure Assessment*

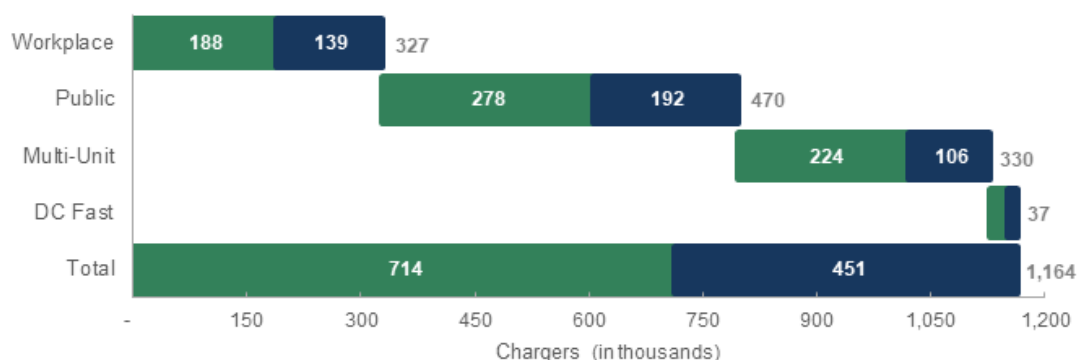
Assembly Bill 2127 (Ting, Chapter 365, Statutes of 2018) requires the CEC, working with CARB and the CPUC, to prepare and update biennially a statewide assessment of electric vehicle charging infrastructure. The assessment focuses on the number and types of charging infrastructure needed to support levels of electric vehicle adoption required for the state to meet its goals of deploying at least 5 million ZEVs on California roads by 2030. Executive Order N-79-20 directs the CEC to update the AB 2127 statewide assessment to evaluate the ZEV infrastructure needed to meet the new targets.

The first *Assembly Bill 2127 Electric Vehicle Charging Infrastructure Assessment Analyzing Charging Needs to Support Zero-Emission Vehicles in 2030*³⁷ (*AB 2127 Report*) was adopted by the CEC in June 2021. The *AB 2127 Report* included a scenario using CARB's *2020 Mobile Source Strategy*. The report projected nearly 8 million ZEVs by 2030, which, at that time, was an estimate of the trajectory needed to achieve the Executive Order N-79-20 target of 100 percent light-duty ZEV sales by 2035.

For passenger vehicle charging in 2030, the *AB 2127 Report* projects that nearly 1.2 million public and shared-private chargers will be needed to support 8 million ZEVs. Figure 3 shows the number and types of chargers estimated in the report.

37 Alexander, Matt, Noel Crisostomo, Wendell Krell, Jeffrey Lu, and Raja Ramesh. July 2021. [Assembly Bill 2127 Electric Vehicle Charging Infrastructure Assessment: Analyzing Charging Needs to Support Zero-Emission Vehicles in 2030 – Commission Report](https://www.energy.ca.gov/programs-and-topics/programs/electric-vehicle-charging-infrastructure-assessment-ab-2127). California Energy Commission. Publication Number: CEC-600-2021-001-CMR. Available at <https://www.energy.ca.gov/programs-and-topics/programs/electric-vehicle-charging-infrastructure-assessment-ab-2127>.

Figure 3: Projected 2030 Charger Counts to Support 5 Million and 8 Million Light-Duty Zero-Emission Vehicles



Models project that California will need more than 700,000 shared-private and public chargers in 2030 to support 5 million ZEVs as called for in AB 2127 and nearly 1.2 million chargers to support 8 million ZEVs by 2030. Counts for chargers at workplaces, public destinations, and multiunit dwellings generally indicate the number of Level 2 chargers needed. In some cases, Level 1 chargers may be sufficient at select multiunit dwellings. These values do not include chargers at single-family homes.

Source: CEC and National Renewable Energy Laboratory.

Staff is developing the second AB 2127 report for publication in 2023. The report will include updated ZEV adoption scenarios and improved charging infrastructure models for light-duty vehicles and medium-/heavy-duty vehicles. The report will use the Integrated Energy Policy Report (IEPR) Additional Achievable Transportation Electrification 3 scenario for ZEV adoption. This scenario includes 7.1 million ZEVs in 2030 and 15.3 million ZEVs in 2035. The scenario complies with CARB's Advanced Clean Cars II, Advanced Clean Trucks, and Advanced Clean Fleets regulations. Models for light-duty ZEV charging infrastructure are updated to produce results for a finer geographic scale of analysis (traffic analysis zones), more granularity of charging types, and more realistic behaviors for simulated BEV and PHEV drivers.

The report will include a chapter on vehicle-grid integration, discussing how charging management technologies and strategies can help the electric system to accommodate new charging load. It will also include a chapter on the workforce training and development programs needed to ensure California can achieve the rollout of charging infrastructure.

Findings From the *California Electric Vehicle Charging Infrastructure Assessment: Senate Bill 1000 Reports*

Senate Bill 1000 (Lara, Chapter 368, Statutes of 2018) requires the CEC to assess whether chargers are disproportionately deployed by income level, population density, or geographical area.³⁸ If the CEC finds that chargers have been disproportionately deployed, the CEC shall use program funds, to the extent authorized by law, and other mechanisms to deploy chargers

³⁸ [More information](https://www.energy.ca.gov/programs-and-topics/programs/clean-transportation-program/electric-vehicle-infrastructure) about the SB 1000 reporting is available at <https://www.energy.ca.gov/programs-and-topics/programs/clean-transportation-program/electric-vehicle-infrastructure>.

more proportionately, unless the CEC finds that the disproportionate deployment was reasonable and furthered state energy and environmental policies as articulated by the CEC.

Staff published the first SB 1000 assessment (*California Electric Vehicle Infrastructure Deployment Assessment: Senate Bill 1000 Report*) on December 30, 2020. The report assessed the geographic distribution and density of public Level 2 and direct current fast chargers by income level and population density. The report found that low-income communities,³⁹ on average, have fewer public chargers per capita than middle- or high-income communities.⁴⁰ Public chargers are unevenly distributed across state air districts and counties but correlated with county populations and plug-in electric vehicles.

Staff published the second assessment, *Senate Bill 1000 California Electric Vehicle Infrastructure Deployment Assessment Drive Times to Direct-Current Fast Chargers*, on July 14, 2022. The report assessed drive times from census tract residential population centers to the nearest public fast charging station to identify communities with sparse public charging coverage, defined as drive times of 10 minutes or more. Rural communities were found to have less public fast charging station coverage than urban communities⁴¹ (Figure 4). About 88 percent of urban communities are within 10 minutes of a public DC fast charger; in contrast, about 40 percent of rural communities are within 10 minutes of one. Low-income rural communities have the least access to public fast charging — 69 percent are 10 minutes or more from a public DC fast charger, which is more than any other group (Table 7). Finally, Figure 5 shows that several disadvantaged communities in the Los Angeles area have long drives to public fast charging.⁴² The CEC has created drive time maps showing rural, low-income, and disadvantaged communities with sparse public fast charging coverage.⁴³ These can be used to guide Clean Transportation Program DC fast charging investments within

39 Low-income communities are census tracts with median household incomes at or below 80 percent of the statewide median income or with median household incomes at or below the threshold designated as low income by the Department of Housing and Community Development's list of state income limits adopted under Health and Safety Code Section 50093.

40 Middle-income communities are census tracts with median household incomes between 80 and 120 percent of the statewide median income, or with median household incomes between the threshold designated as low- and moderate-income by the Department of Housing and Community Development's list of state income limits adopted pursuant to Health and Safety Code section 50093.

High-income communities are census tracts with median household incomes at or above 120 percent of the statewide median income, or with median household incomes at or above the threshold designated as moderate-income by the Department of Housing and Community Development's list of state income limits adopted pursuant to Health and Safety Code Section 50093.

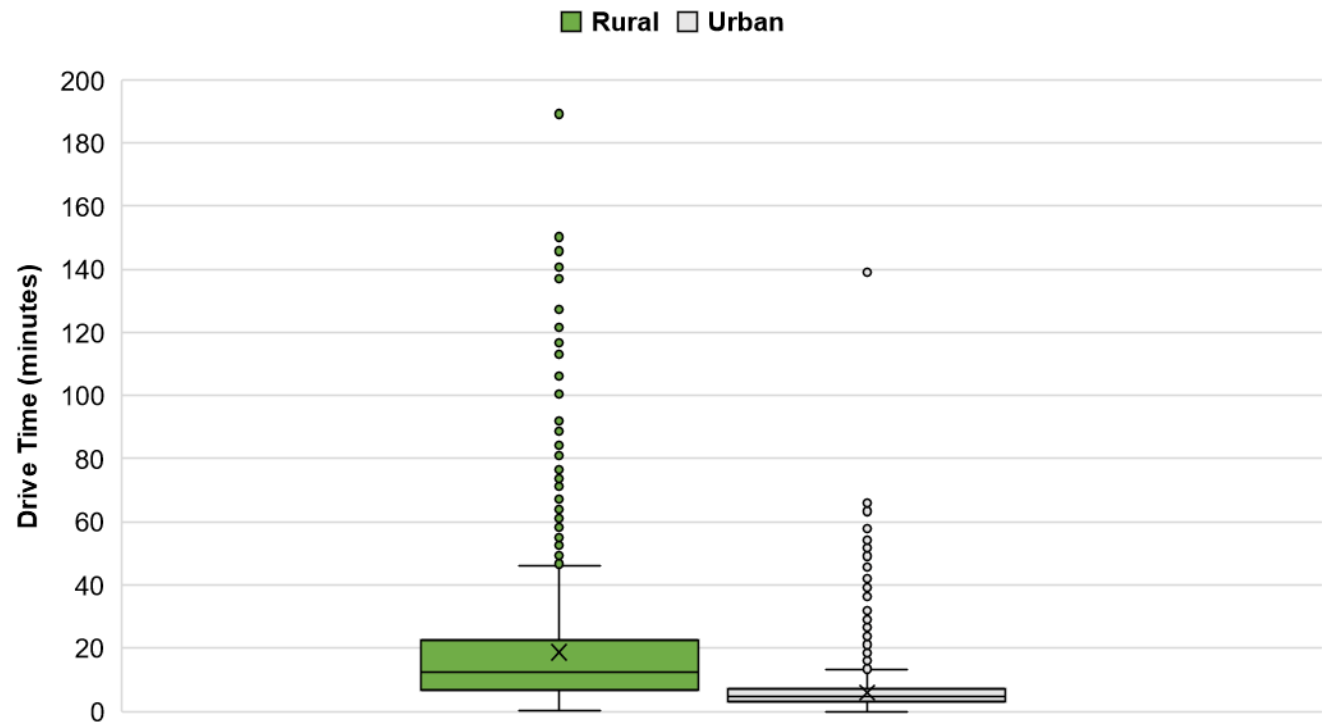
41 *Rural communities* are census tracts where at least 50 percent of the census tract land area is designated as rural by the U.S. Census Bureau. Staff calculated rural area using the U.S. Census Bureau's 2010 rural census block designations. At the time of analysis, these were the most recent data available. Urban communities are all other census tracts.

42 CEC staff referred to the most recent final disadvantaged community designations from the California Environmental Protection Agency (CalEPA) under CalEnviroScreen 3.0. At the time of this analysis, disadvantaged community designations by CalEPA under CalEnviroScreen 4.0 has not been finalized.

43 Drive time maps are available on the [SB 1000 webpage](https://www.energy.ca.gov/programs-and-topics/programs/clean-transportation-program/electric-vehicle-infrastructure) at <https://www.energy.ca.gov/programs-and-topics/programs/clean-transportation-program/electric-vehicle-infrastructure>.

underserved communities. Solutions to improve charging access will vary and depend on the intersecting characteristics of a community. Staff will continue to refine and update the analysis to identify charging network gaps in underserved communities and build out charging infrastructure that serves all Californians.

Figure 4: Drive Time to the Nearest DC Fast Charging Station by Urban and Rural Communities



Source: U.S. Census Bureau 2010 Urban and Rural Classifications, U.S. Department of Energy’s Alternative Fuels Data Center Charger Data as of February 2021, and California Air Resources Board California Hydrogen Infrastructure Tool Roadway Data.

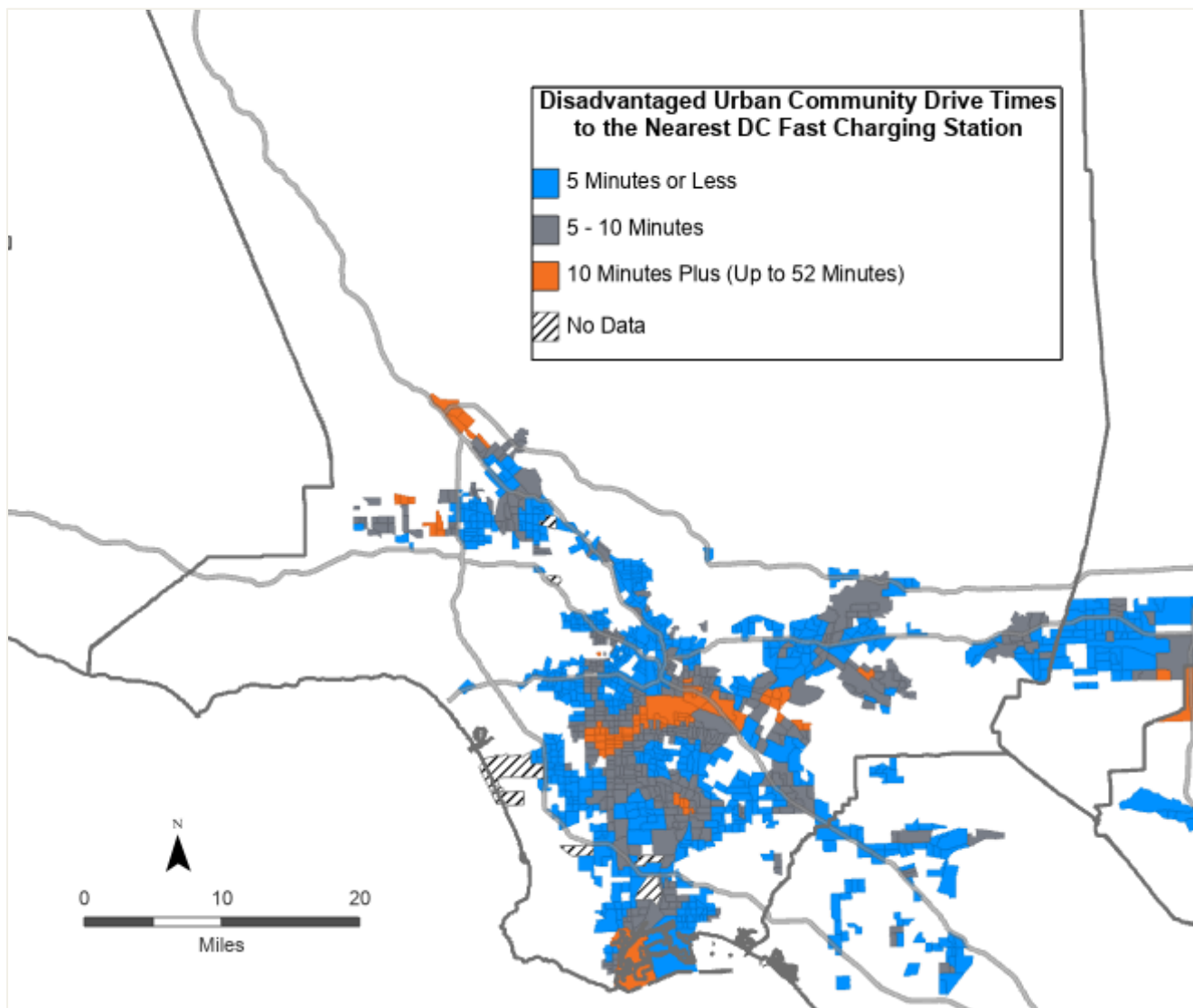
Table 7: Drive Time Ranges by Income Level and Urban or Rural Area

Income — Community Type	0 to 5 mins	6 to 9 mins	10 plus mins	N/A	Total
Low — Rural	16%	14%	69%	1%	100%
Low — Urban	61%	28%	11%	Less than 1%	100%
Middle — Rural	19%	22%	58%	1%	100%
Middle — Urban	62%	24%	14%	0%	100%
High — Rural	25%	29%	45%	1%	100%
High — Urban	54%	32%	14%	Less than 1%	100%

Source: California Energy Commission Analysis using data from the U.S. Census Bureau 2010 Urban and Rural Classifications, U.S. Census Bureau 2014–2018 American Community Survey Median Household Income and Average Household Size 5-Year Estimates, California Department of Housing and Community Development 2020

State Income Limits, U.S. Department of Energy Alternative Fuels Data Center as of February 2, 2021, and California Air Resources Board California Hydrogen Infrastructure Tool roadway data.

Figure 5: Map of Los Angeles Area Disadvantaged Community Drive Times to the Nearest DC Fast Charging Station



Source: California Energy Commission analysis using data from the U.S. Census Bureau 2010 Urban and Rural Classifications, California Environmental Protection Agency CalEnviroScreen 3.0, U.S. Department of Energy Alternative Fuels Data Center as of February 2, 2021, and California Air Resources Board California Hydrogen Infrastructure Tool roadway data.

Clean Transportation Program Funding

The CEC has supported the rollout of light-duty PEVs by awarding more than \$412 million in Clean Transportation Program funding for electric vehicle charging infrastructure. Partly because of these investments, California has the largest network of publicly accessible electric vehicle chargers in the nation.

Clean Transportation Program investments have funded electric vehicle charging stations at many types of locations, as detailed in Table 8. The “private access” chargers include home chargers that are generally dedicated to serving only one vehicle. The CEC has not funded single-family home charging in recent years. The “shared access” chargers include fleets, workplaces, and multifamily housing chargers that may serve multiple vehicles but are not necessarily public. The “public access” chargers include public Level 2 chargers, as well as corridor and urban metropolitan DC fast chargers. Finally, the “mixed access” chargers include shared-private and public access chargers.

Table 8: Chargers Funded by the Clean Transportation Program as of March 2023

	Private Access	Share-private Access	Shared-private Access	Shared-private Access	Public Access	Public Access	Mixed Access*	Total
Charger Type/ Setting	Level 2: Residential (Single & Multifamily)	Level 2: Fleet	Level 1 and Level 2: Workplace	Level 2: Residential (Multifamily)	Level 1 and Level 2: Public	Level 2 and DC fast: Corridor/Rur al/Urban Metro	Level 2 and DC fast: CALeVIP	-
Installed	3,936	155	419	341	3,108	532	3,303	11,794
Planned	0	0	0	1,728	206	126	9,939†	11,999
Total	3,936	155	419	2,069	3,314	658	13,242	23,793

Source: California Energy Commission. Does not include chargers that have yet to be approved at a CEC business meeting or connectors that have yet to be funded under CALeVIP.

* “Mixed Access” includes shared-private and public access chargers.

† For CALeVIP, “planned” chargers are those with rebate funding reserved.

California Electric Vehicle Infrastructure Project (CALeVIP) 1.0

In December 2017, the CEC introduced the California Electric Vehicle Infrastructure Project (CALeVIP) to provide streamlined Clean Transportation Program incentives for light-duty electric vehicle charging infrastructure. This program is now called “CALeVIP 1.0.” A successor program, CALeVIP 2.0, is described in the next section.

The incentives provided through CALeVIP simplify the funding process and accelerate charger deployment compared to the previously used grant solicitations. Each CALeVIP 1.0 project provides incentives for the purchase and installation of electric vehicle infrastructure in specific regions throughout the state, with funding targeted at regions that have low rates of infrastructure installation or lack adequate incentives from utilities and other sources. Dedicated funding amounts or higher incentive amounts or both are also available under CALeVIP 1.0 for project sites within disadvantaged communities and multifamily complexes.

Through 2022, the CEC allocated \$200 million (\$186 million for rebates and \$14 million for administrative fees) for charger rebates through CALeVIP 1.0; however, not all of these funds have been paid out to, or reserved by, incentive recipients.

CALeVIP 1.0 launched 13 regional incentive projects covering 36 counties. Table 9 shows the locations and types of CALeVIP 1.0 projects.

Table 9: CALeVIP 1.0 Investments

Incentive Project	Launch Date	Counties	CEC Rebate Funding (in millions)	Additional Rebate Funding From Partners (in millions)	Technologies
Fresno County	December 2017	Fresno	\$2.66	-	Level 2
Southern California	August 2018	Los Angeles, Orange, Riverside, San Bernardino	\$29	-	DC Fast Chargers
Sacramento County	April 2019	Sacramento	\$14	\$1.5	Level 2 and DC Fast Chargers
Northern California	May 2019	Shasta, Humboldt, Tehama	\$4	-	Level 2 and DC Fast Chargers
Central Coast	October 2019	Monterey, Santa Cruz, San Benito	\$6	\$1	Level 2 and DC Fast Chargers
San Joaquin Valley	December 2019	San Joaquin, Kern, Fresno	\$15.34	-	Level 2 and DC Fast Chargers
Sonoma Coast	July 2020	Mendocino, Sonoma	\$5.1	\$1.5 (over three years)	Level 2 and DC Fast Chargers
San Diego County	October 2020	San Diego	\$15.8	\$5.9 (over three years)	Level 2 and DC Fast Chargers
Peninsula-Silicon Valley	December 2020	San Mateo, Santa Clara	\$33	\$19.4 (over four years)	Level 2 and DC Fast Chargers
Inland Counties	May 2021	Butte, El Dorado, Imperial, Kings, Merced, Napa, Nevada, Placer, Solano, Stanislaus, Sutter, Tulare, Yolo	\$17.5	-	Level 2 and DC Fast Chargers
South Central Coast	July 2021	San Luis Obispo, Santa Barbara, Ventura	\$7.1	\$4.9 (over two years)	Level 2 and DC Fast Chargers
Alameda County	December 2021	Alameda	\$14.5	\$2.8	Level 2 and DC Fast Chargers
Southern California Level 2	April 2022	Los Angeles, Orange, Riverside, San Bernardino	\$22	\$1	Level 2

Source: California Energy Commission.

Second Block Grants for Light-Duty EV Charging Infrastructure

In December 2021, the CEC approved funding for two block grants of up to \$250 million each for light-duty EV charging infrastructure. The two implementers, CALSTART and the Center for

Sustainable Energy,⁴⁴ will each implement projects that complement one another and include strict readiness requirements as a means of minimizing charger installation times and attracting higher-quality applications. The application processes and project requirements vary between the two block grants as they are designed to best serve each project.

The Center for Sustainable Energy is implementing the CALeVIP 2.0 project, offering up to \$250 million in rebates for high-powered (150 kilowatt+) DC fast chargers. The first incentive project of \$30 million is open only to sites in disadvantaged or low-income communities. Applicants had a 45-day window to compile and submit applications that closed on March 10, 2023. In contrast to the first-come, first-served application process used in CALeVIP 1.0, applications will be sorted into readiness tiers, then randomized within each tier. The highest readiness tier will be funded first.

CALSTART is implementing the Communities in Charge project, offering up to \$250 million in rebates for level 2 EV chargers. The first incentive project of \$30 million opened its 45-day application window March 23, 2023. Applications will be sorted into readiness tiers like those in CALeVIP 2.0. These applications will be scored with priority given to disadvantaged and low-income communities, including tribal lands, which are now designated as a disadvantaged community. Additional scoring priority is given to installations on sites for multifamily housing, faith-based organizations, schools, health care facilities, community nonprofits, local governments, and workplaces. At least 50 percent of the funding will be reserved for installations on sites in disadvantaged or low-income communities.

Targeted Projects for Increasing Access and Innovation for Charging Infrastructure and ZEV Mobility

In addition to using block grants to distribute incentives efficiently for broader charging infrastructure deployment, the Clean Transportation Program also provides funding to solicitations and projects that target specific needs for charging infrastructure.

- On November 24, 2021, the CEC released the Reliable, Equitable, and Accessible Charging for multifamily Housing (REACH) solicitation. This solicitation will fund projects that demonstrate replicable and scalable models for large-scale deployment of EV charging infrastructure capable of maximizing access and EV travel for multifamily housing residents. Projects must include charger installations that will benefit and be used by multifamily housing residents within disadvantaged communities, low-income communities, or a combination of both and are encouraged to pursue installations for affordable housing. All projects will include community engagement and outreach to nearby residents on the benefits of electric vehicles and the convenience of the newly installed EV chargers. A NOPA was released May 11, 2022, recommending \$26.6 million in funding for 13 projects.

⁴⁴ CALSTART is a national nonprofit consortium that provides third-party analysis of clean vehicles, technologies, and fuels. The Center for Sustainable Energy is a national nonprofit focused on clean transportation and distributed energy, according to the organization's website.

- On December 14, 2021, the CEC released the Clean Transportation Program Rural Electric Vehicle (REV) Charging solicitation. This solicitation will 1) demonstrate replicable and scalable models that can dispatch EV charging stations to serve rural EV drivers, 2) support travel by EV drivers, especially those in low-income or disadvantaged communities, 3) provide EV charging access in rural areas that are not served or inadequately served by charging stations, 4) provide support and maintenance services to ensure reliable and readily accessible chargers, and 5) engage local rural communities and businesses in increasing charger awareness and promoting EV adoption. The CEC released a NOPA on June 24, 2022, recommending \$20.6 million in funding for 17 projects.
- The Charging Access for Reliable On-Demand Transportation Services (CARTS) was released August 31, 2021, targeting projects to support charging infrastructure for high-mileage on-demand transportation services, including services such as ride-hailing, taxis, and meal grocery delivery. On February 14, 2022, the CEC announced proposed awards of more than \$16 million for 10 projects.
- The CEC is partnering with CARB through an interagency agreement to expand program eligibility and funding under the Clean Mobility Options Program. Clean Mobility Options is a statewide program that offers vouchers for shared mobility projects in traditionally underserved communities, aiming to increase residents' access to clean transportation and zero-emission mobility solutions. The interagency agreement added \$8 million to the original CARB funding of \$37 million for additional vouchers, technical assistance, and outreach to communities not identified in the first round of funding. Projects are required to be operational for four years.

Projects to Support Innovation and Standardization in Charging

Through the Clean Transportation Program, the CEC has invested in funding opportunities to support innovative charging solutions, as well as the testing and standards that can support the principles of interoperability, competition and customer choice, cost control, and convenience.

- In August 2020, the CEC released the "BESTFIT Innovative Charging Solutions" solicitation, which offered funding to projects that demonstrate transformative technology solutions. They are meant to accelerate the successful commercial deployment of EV charging for light-duty and medium- and heavy-duty applications. There is no one-size-fits-all solution to charging needs, and there is instead a need to have a portfolio of charging solutions that complement one another.
- The Vehicle-Grid Innovation Lab (ViGIL) solicitation was released May 21, 2021. This solicitation will increase the capacity and throughput of electric vehicle supply equipment standards testing. The funding will support the expansion of testing for light-duty and medium- and heavy-duty electric vehicle charging equipment. On October 14, 2021, the CEC announced a proposed award of nearly \$2 million in grant funding.
- The Vehicle Interoperability Testing Symposium (VOLTS) solicitation was released September 24, 2021. This solicitation will support the interoperability of electric vehicle charging with a focus on convening interested and affected groups to conduct

interoperability tests, develop and finalize products and standards, and discuss requirements to overcome common technology barriers. On January 6, 2022, the CEC announced an award of nearly \$1 million to a proposed contractor.

Planning and Readiness

The CEC has provided funding to support regional alternative fuel readiness plans, with a new focus on zero-emission technologies. Since 2011, the CEC has conducted six grant solicitations for regional readiness planning, providing more than \$27 million for 86 agreements, with an increasing focus on ZEVs. Most regions in California have developed regional readiness plans as a result of this funding.

Most recently, in 2021, the CEC completed two solicitations for “Electric Vehicle Ready Communities Challenge,” Phase I and Phase II. Phase I provided funds to develop replicable blueprints that identify the actions needed to accelerate implementation of electrified transportation at the regional level. Phase II was open only to entities that completed Phase I blueprints within one year of their agreement start date, and resulted in seven implementation awards. Since the awarding of Phase II, the CEC has received positive feedback from local entities and their partners about the value of charging infrastructure planning grants.

Increasing Consumer Awareness of EV Charging Opportunities Through Expanded Installation of Signs

Despite strong growth in ZEV sales and PEV charger installations, many Californians have limited awareness of PEV charging opportunities or ZEV mobility. Informing larger numbers of California drivers about ZEVs will become increasingly important to meet California’s vehicle and climate goals. One strategy to build consumer awareness is to increase the number of signs indicating nearby public PEV charging stations. Further, signs will aid existing PEV drivers by helping them locate stations near their homes or commute routes.

There are just 50 indicator signs along California freeways. As a result, many EV drivers and potential EV drivers are likely unaware of charging opportunities. Lack of awareness contributes to range anxiety, the concern that a PEV cannot meet a driver’s needs for range and convenient refueling. In contrast, gas stations are highly visible to urban, suburban, rural, and freeway drivers due to the large, colorful display signs.

CEC staff is investigating strategies to increase the installation of physical indicator signs. One possible strategy is to use grant funding opportunities to provide funding to install signs along freeways and roadways.

Proposed Funding Allocation

The CEC is required to allocate \$370 million in general funds for light-duty electric vehicle charging infrastructure for FY 2023–2024. CEC staff proposes adding \$13.8 million in Clean Transportation Program funds for FY 2023–2024. This combined funding will provide the buildout of EV infrastructure that can close the EV charging infrastructure gap for 2025.

Medium- and Heavy-Duty Zero-Emission Vehicles and Infrastructure

Freight and transit vehicles serve as a pillar to the California economy, providing indispensable functions for domestic goods movement, international trade, mass transportation, and other essential services. Clean Transportation Program funding in this sector has historically focused on medium- and heavy-duty vehicles, defined here as vehicles with a gross vehicle weight rating above 10,000 pounds. These vehicles represent a small share of California registered vehicle stock, accounting for about 1 million out of 31 million vehicles, or 2 percent. However, this small number of vehicles is responsible for about 23 percent of on-road GHG emissions in the state because of comparatively low fuel efficiency and high number of miles traveled per year.⁴⁵ Medium- and heavy-duty vehicles additionally account for one-third of statewide NO_x and 25 percent of PM_{2.5}⁴⁶ emissions from on-road transportation in California.⁴⁷ For these reasons, medium- and heavy-duty vehicles represent a significant opportunity to reduce GHG and criteria emissions while focusing on a small number of vehicles. Nonroad freight vehicles, such as forklifts and other cargo handlers, have similar or supporting purposes and potential for emission reductions.

Charging Infrastructure for Medium- and Heavy-Duty Vehicles

As part of the analyses conducted for the *AB 2127 Report*, the CEC evaluated infrastructure needs to support medium- and heavy-duty vehicles through the Medium- and Heavy-Duty Electric Vehicle Infrastructure Load, Operations, and Deployment (HEVI-LOAD) model in collaboration with Lawrence Berkeley National Laboratory. This model aims to characterize regional charging infrastructure needs for on-road medium- and heavy-duty electric vehicles. It will determine the number, locations, and types of charger deployments and examine suitable power levels ranging from overnight charging (<50 kilowatts) to public fast charging (multimegawatt) for the range of applications envisioned in California's transition to ZEVs. HEVI-LOAD leverages CARB's *Draft 2020 Mobile Source Strategy*, which projected that 180,000 medium- and heavy-duty electric vehicles will be needed in 2030 to achieve state climate and air quality goals and comply with Executive Order N-79-20. The model, which considered 50-kilowatt and 350-kilowatt charging power levels, estimated that to charge these vehicles, 157,000 DC fast chargers will be needed.

The second AB 2127 report will include updated modeling for medium- and heavy-duty vehicle charging needs based on the IEPR Additional Achievable Transportation Electrification 3 scenario. This scenario complies with CARB's Advanced Clean Trucks and Advanced Clean

45 Based on analysis from California Energy Commission Energy Assessments Division, with data from the California Department of Motor Vehicles. California Air Resources Board. June 22, 2018. ["California Greenhouse Gas Inventory for 2000-2018."](https://www.arb.ca.gov/cc/inventory/data/tables/ghg_inventory_scopingplan_sum_2000-18.pdf) Available at https://www.arb.ca.gov/cc/inventory/data/tables/ghg_inventory_scopingplan_sum_2000-18.pdf.

46 Particulate matter 2.5 micrometers in diameter or smaller. See Glossary.

47 California Air Resources Board. ["Almanac Emission Projection Data."](https://www.arb.ca.gov/app/emsmv/2017/emssumcat_query.php?F_YR=2020&F_DIV=3&F_SEASON=A&SP=SIP105ADJ&F_AREA=CA#7) Available at https://www.arb.ca.gov/app/emsmv/2017/emssumcat_query.php?F_YR=2020&F_DIV=3&F_SEASON=A&SP=SIP105ADJ&F_AREA=CA#7.

Fleets regulations. The HEVI-LOAD model has been updated to use a bottom-up approach, which aggregates, or groups, simulated vehicle trips to a total charging need.

Hydrogen Fueling Infrastructure for Medium- and Heavy-Duty Vehicles

Fuel cell electric vehicles using hydrogen offer another zero-emission transportation option for California's medium- and heavy-duty sectors and short-range and long-range applications. Hydrogen fuel cell and battery-electric technologies present different strengths and challenges. Moreover, the further development and deployment of medium- and heavy-duty fuel cell electric vehicles will help accelerate the growth of hydrogen production and reach economies of scale earlier than with light-duty vehicles alone.

The inaugural *SB 643 Report* provides an initial statewide assessment of the medium- and heavy-duty hydrogen FCEV infrastructure and fuel production needed to support the adoption of trucks, buses and off-road vehicles at levels necessary for the state to meet goals and requirements related to vehicular air pollution. The analyses conducted by the CEC will include a baseline of existing and planned infrastructure, commercially available medium- and heavy-duty FCEVs, and a review of scenarios of medium- and heavy-duty FCEV adoption rates

Clean Transportation Program Funding

In February 2022, CEC staff conducted a workshop to gather stakeholder feedback on potential medium- and heavy-duty zero-emission vehicles infrastructure projects. The workshop proposed solicitation concepts to increase the charging and refueling infrastructure needed to support the deployment of zero-emission medium- and heavy-duty vehicle technologies within the California freight system, transit bus fleets, school bus fleets, and other transportation sectors. The concepts evolved into solicitations that cover a wide range of support for medium- and heavy-duty zero-emission vehicle infrastructure. Similar to the light-duty investments, the CEC intends to use a complementary approach of block grants and in-house funding solicitations.

Energy Infrastructure Incentives for Zero-Emission Commercial Vehicles (EnergIIZE Commercial Vehicles)

Block grants are important tools to rapidly deploy funds to support infrastructure deployment. In March 2022 the CEC and CALSTART launched the EnergIIZE Commercial Vehicles block grant. This block grant for medium- and heavy-duty zero-emission vehicle infrastructure incentives is intended to be a cornerstone of the CEC's deployment strategy.

EnergIIZE has the funding authority for up to \$276 million, which was approved at the December 2021 CEC business meeting. The funding will be released to CALSTART in tranches.

EnergIIZE Commercial Vehicles launched four main funding lanes and one Public School Bus set-aside funding lane in 2022. Each of the four main funding lanes are planned to relaunch in 2023, along with two new set-aside funding lanes scheduled to launch in 2023 that will complement CARB's HVIP. All four main funding lanes for year one are fully subscribed.

- EV Fast Track: For year one of the project, the EV Fast Track funding lane launched March 23, 2022. Under this lane, a total of \$15.8 million was provided for incentives and was available on a first-come, first-served basis.

- Hydrogen: The Hydrogen funding lane was competitively scored and provided \$17 million in incentive funding. The lane launched June 30, 2022, and closed July 14, 2022.
- EV Jump Start: This equity-focused funding lane launched on September 1, 2022, and closed on October 7, 2022. This funding lane offered \$13.95 million for incentives and was competitively scored.
- EV Public Charging: This funding lane, also competitively scored, offered \$8.1 million in incentives and was open from October 14, 2022, to October 31, 2022. This funding lane incorporated a pilot for a Charging-as-a-Service (CaaS) business model.

In addition to the four main funding lanes launched in 2022, EnergiIZE launched the Public School Bus set-aside lane October 14, 2022, offering \$17.7 million for incentives. This lane was the first of the set-aside lanes made available that complemented CARB's HVIP program. Applicants that were awarded vehicle incentives through CARB's HVIP program and indicated a need for infrastructure funding were eligible to apply to the set-aside lane. The incentives offered in the set-aside lanes are offered on a rolling basis with applications processed in batches in response to demand.

For year two of the project, the EV Fast Track funding lane launched on February 17, 2023, and offered \$10.4 million for incentives. This was a first-come, first-served lane and was quickly subscribed. The year-two Hydrogen funding lane is expected to launch in April 2023 and the remaining two main funding lanes, EV Jump Start and EV Public Charging, are expected to launch in Q3 and Q4 2023.

EnergiIZE anticipates releasing two additional carve-out lanes beginning in May 2023 specifically targeting drayage trucks and transit buses as fleets continue to transition to zero-emission.

Targeted Projects for Medium- and Heavy-Duty ZEV Infrastructure

The EnergiIZE Commercial Vehicles block grant will complement the several in-house solicitations that the CEC has used over the years and is deploying. In-house competitive solicitations are valuable tools to target specific segments or needs. They can be issued either solely by the CEC or in partnership with other agencies, such as CARB. The following grant funding opportunities target use cases throughout the state.

- "Zero-Emission Transit Fleet Infrastructure Deployment." Released in July 2020, this grant solicitation announced the availability of up to \$20 million to fund the electric vehicle charging or hydrogen refueling infrastructure needed to support the large-scale conversion of transit bus fleets to ZEVs. In the "Small Fleet/Urban" category, \$5 million awards were proposed for one electrification project and one liquid hydrogen refueling project. In the "Large Fleet/Urban" category, a \$6 million electrification and microgrid project was proposed for funding, as was a \$4 million hydrogen refueling project, with \$2 million in general funds added. Subsequently, three additional transit fleet infrastructure projects were awarded, using \$14.2 million in general funds.
- "Zero-Emission Drayage Truck and Infrastructure Pilot Project." In a joint solicitation with CARB, the CEC allocated \$20.1 million from the Clean Transportation Program to fund the zero-emission drayage truck infrastructure and installation, as well as any

workforce training and development components. CARB allocated \$24 million from its FY 2019–20 Funding Plan for Clean Transportation Incentives to fund the purchase of on-road zero-emission Class 8 trucks. This solicitation sought to support large-scale deployments of on-road, zero-emission Class 8 drayage and regional haul trucks, as well as the infrastructure needed for service operation. On July 15, 2021, the CEC approved two projects, one with South Coast Air Quality Management District for a battery-electric infrastructure project and one with the Center for Transportation and the Environment for a hydrogen refueling infrastructure project. In August 2021, the CEC additionally proposed funding three additional drayage truck and infrastructure pilot projects, totaling \$23.5 million using general fund dollars.

- “BESTFIT Innovative Charging Solutions.” This solicitation, previously described in the Light-Duty Electric Vehicle Charging Infrastructure section, included eligibility for projects to demonstrate innovative electric vehicle charging solutions for light-duty and medium- and heavy-duty vehicles. On April 16, 2021, the CEC announced more than \$4.1 million in medium- and heavy-duty vehicle sector awards. Three additional medium- and heavy-duty projects were funded using general funds, totaling nearly \$4.3 million.
- “Blueprints for Medium- and Heavy-Duty Zero-Emission Vehicle Infrastructure.” Released in July 2020, this solicitation offered up to \$3 million to fund planning “blueprints” that will identify actions and milestones needed for implementing medium- and heavy-duty zero-emission vehicles and the related electric charging or hydrogen refueling infrastructure. The solicitation included a set-aside for public entities. On April 8, 2021, the CEC announced nearly \$4 million in proposed funding to support public agencies and nearly \$2 million in proposed funding to support private entities. On August 16, 2021, a revised NOPA was posted proposing an additional 12 blueprint projects for award, totaling about \$2.4 million using general funds.

On February 28, 2022, the CEC held another workshop focused on identifying funding opportunities for medium- and heavy-duty ZEV infrastructure projects.⁴⁸ Concepts presented by CEC staff for consideration included, but were not limited to, the following:

- Hydrogen Refueling: This concept seeks projects to build hydrogen refueling stations that would have a public fueling component for light-duty FCEVs and have a public or private component for fueling medium- and heavy-duty vehicles.
- School District Vehicle-Grid Integration: This concept seeks projects from electric vehicle service providers to partner with public school districts, county offices of education, or transportation joint power authorities in areas likely to experience power outages because of public safety power shutoffs or fire danger. This is meant to improve resiliency in emergencies. These electric vehicle service providers would install bidirectional charging stations at key sites throughout the school districts, resulting in a final turnkey solution for other school bus operators to adopt.

48 CEC. February 28, 2022. “[Staff Workshop on Funding Allocations for Future Medium- and Heavy-Duty Charging and Refueling Infrastructure Projects](https://www.energy.ca.gov/event/workshop/2022-02/staff-workshop-funding-allocations-future-medium-and-heavy-duty-charging-and).” Available at <https://www.energy.ca.gov/event/workshop/2022-02/staff-workshop-funding-allocations-future-medium-and-heavy-duty-charging-and>.

- **Truck Parking EV Charging and Hydrogen Refueling:** This concept seeks projects focused on the parking and charging or refueling needs of independent owner operators and long-haul and regional-haul drivers, including the potential to fund locations for overnight public charging.
- **Warehouse and Regional Trucking:** This concept seeks projects to support medium- and heavy-duty warehouse and regional trucking. Projects may support heavy-duty regional-haul fleets that stay within a 300-mile radius from a home base and medium-duty, last-mile delivery fleets that are in or near a metropolitan area servicing warehouse distribution and fulfillment centers.
- **Innovative EV Charging and Hydrogen Refueling Technologies:** This concept would replicate and improve upon the original "BESTFIT Innovative Charging Solutions" solicitation. This concept would target and fund innovative medium- and heavy-duty charging or hydrogen refueling solutions or both.
- **Mobility-as-a-Service Models:** This concept seeks projects that would provide EV charging or hydrogen refueling infrastructure to support medium- and heavy-duty mobility-as-a service applications, including charging as a service and infrastructure as a service.
- **Medium- and Heavy-Duty Blueprint Planning Documents:** This concept would be similar to the previously released grant funding opportunity titled "Blueprints for Medium- and Heavy-Duty Zero-Emission Vehicle Infrastructure." It would seek blueprint planning projects to accelerate the deployment of medium- and heavy-duty ZEVs and ZEV infrastructure with a holistic view of transportation planning.
- **Medium- and Heavy-Duty Loan Pilot:** This concept would complement the CEC's grant opportunities by making loans available for medium- and heavy-duty zero-emission infrastructure projects.

Because of limited funds, the CEC may not pursue all these funding opportunities or may provide grant funding for concepts not listed above. Decisions regarding funding implementation will be developed based on interested and affected group feedback, emerging needs or opportunities, alignment with key state policies, and other considerations.

Of the concepts proposed at the February 2022 workshop, staff have released two grant funding opportunities and have begun developing other opportunities that will be released throughout 2023.

"Light-Duty Vehicle and Multi-Use Hydrogen Refueling Infrastructure," GFO-22-607, was released in October 2022. This solicitation offered up to \$27 million to fund projects that will provide publicly available hydrogen refueling stations. The solicitation will enable continued growth of the California fuel cell electric vehicle market.

"Innovative Hydrogen Refueling Solutions for Heavy Transport" was released in October 2022. This solicitation offered up to \$16.5 million for the development and demonstration of innovative hydrogen refueling solutions to support the decarbonization of emerging medium- and heavy-duty on-road and off-road vehicle applications, reduce hydrogen delivery and refueling costs, improve reliability, enable higher fill rates, and minimize energy losses. This

solicitation was a collaboration between the CEC's Clean Transportation Program and the CEC's Gas Research and Development Program.

Additional concepts from the February 2022 workshop that are being developed include:

- School Bus Vehicle-Grid Integration.
- Innovative EV Charging Solutions for Medium- and Heavy-Duty Zero-Emission Vehicles.
- Medium- and Heavy-Duty Blueprint Technical Assistance and implementation of completed medium- and heavy-duty blueprints.
- Infrastructure Funding to Complement CARB Demonstration and Pilot Project Concepts.
- A Medium- and Heavy-Duty Loan Pilot project.

These opportunities are expected to be released throughout 2023.

Proposition 98 Funding

In the Budget Act of 2022, the Legislature provided \$1.5 billion in one-time Proposition 98 general funds to support grants to local educational agencies to replace internal combustion school buses with new zero-emission school buses over five fiscal years, beginning in FY 2023–2024. Assembly Bill 181 (Committee on Education, Chapter 52, Statutes of 2022), the education omnibus budget trailer bill, provided CARB with \$1.125 billion from Proposition 98 General Funds for the Hybrid and Zero-Emission Truck and Bus Voucher Incentive Project (HVIP). AB 181 also provided \$375 million to CEC to fund zero-emission school bus charging or fueling infrastructure. The Budget Act of 2021 also allocated \$15 million in general funds to CEC for supporting infrastructure in FY 2023-2024.

Proposed Funding Allocation

For FY 2023–2024, the CEC allocates \$13.8 million in Clean Transportation Program funding, in addition to \$680 million in general funds, to medium- and heavy-duty sectors to meet the growing needs of charging and hydrogen fueling infrastructure for medium- and heavy-duty ZEVs. A significant portion of this funding is directed by the state budget to specific sectors such as drayage trucks.

Public Hydrogen Fueling Infrastructure

Assembly Bill 8 (Perea, Chapter 401, Statutes of 2013) directs the CEC to allocate \$20 million annually, not to exceed 20 percent of the funds appropriated by the Legislature, from the Clean Transportation Program for building hydrogen-fueling stations until there are at least 100 publicly available stations in California.

Evaluating the Deployment of FCEVs and Hydrogen Fueling Stations

Assembly Bill 8 requires CARB to evaluate the need for publicly available hydrogen fueling stations annually. This evaluation includes the quantity of fuel needed for the actual and projected number of FCEVs (based on CARB's analysis of DMV registrations and auto manufacturer projections), geographic areas where fuel will be needed, and station coverage.

Based on this evaluation, CARB reports the information to the CEC. CARB estimates station and FCEV projections for up to six years in the future, based on mandatory survey information

provided by vehicle manufacturers for the next three model years and voluntary information for an additional three following model years.

In September 2022, CARB released the *2022 Annual Evaluation of Fuel Cell Electric Vehicle Deployment & Hydrogen Fuel Station Network Deployment* report (Annual Evaluation).⁴⁹ In this assessment, CARB noted that the growth potential put in place by the planned hydrogen station network will provide an opportunity for auto manufacturers to accelerate their FCEV deployment plans for California. CARB also reported that automakers project having 65,600 FCEVs on the road by 2028. However, past automaker projections have overestimated future sales. Actual vehicle sales have turned out to be lower than the projections.

In December 2022, the CEC and CARB released the *Joint Agency Staff Report on Assembly Bill 8: 2022 Annual Assessment of Time and Cost Needed to Attain 100 Hydrogen Fueling Stations in California*.⁵⁰ With the expended funds and committed allocation of funds, California is on track to meet the original AB 8 minimum requirement of 100 stations. Further, existing funding is expected to close the gap to the 200-station goal.

When all 200 stations are open, CEC staff estimates that the network of hydrogen stations will be capable of supporting about 274,000 light-duty FCEVs when operating at 100 percent availability, assuming the remaining stations yet to be funded have a capacity of 1,000 kilograms of hydrogen per day (kg/day) per station. This capacity is more than four times the projected demand for 2028.

Clean Transportation Program Funding to Date

Through the Clean Transportation Program, the CEC has provided nearly \$166 million of funding to support 78 publicly available hydrogen stations capable of light-duty vehicle fueling, including associated operations and maintenance. As of March 2023, 63 hydrogen fueling stations had achieved open retail status in California.

Furthermore, the three awardees under the CEC's funding solicitation GFO-19-602 can receive additional grant funds of up to \$85.9 million for subsequent batches of stations depending on performance, funding availability, and Clean Transportation Program Investment Plan Update funding allocations. Multi-use stations will address several markets and accelerate the development of commercial fuel cell electric trucks with the potential to reduce local air pollution from the goods movement sector.

The CEC funding Solicitation GFO-22-607 offered up to \$27 million to fund projects that will provide publicly available hydrogen refueling stations. A NOPA for this solicitation is expected in April 2023.

49 California Air Resources Board. September 2022. [2022 Annual Evaluation of Fuel Cell Electric Vehicle Deployment & Hydrogen Fuel Station Network Development](https://www2.arb.ca.gov/resources/documents/annual-hydrogen-evaluation). Available at <https://www2.arb.ca.gov/resources/documents/annual-hydrogen-evaluation>.

50 Berner, Jane, Miki Crowell, and Andrew Martinez. 2022. [Joint Agency Staff Report on Assembly Bill 8: 2022 Annual Assessment of Time and Cost Needed to Attain 100 Hydrogen Refueling Stations in California](https://www.energy.ca.gov/sites/default/files/2022-12/CEC-600-2022-064.pdf). California Energy Commission and California Air Resources Board. Publication Number: CEC-600-2022-064. Available at <https://www.energy.ca.gov/sites/default/files/2022-12/CEC-600-2022-064.pdf>.

Stations funded by the Clean Transportation Program before GFO-19-602 are required to dispense fuel with at least 33 percent renewable hydrogen content. Stations resulting from GFO-19-602 and GFO-22-607 are mandated to comply with the renewable hydrogen requirements specified in the CARB Low Carbon Fuel Standard (LCFS) regulation, which requires at least 40 percent of the hydrogen be from renewable sources. CARB's definition of renewable hydrogen per the LCFS includes hydrogen produced through fossil natural gas, which is combined with carbon capture from biomethane through "book and claim." CARB's 2022 Annual Evaluation stated that 65 percent renewable content for the first quarter of 2022 was reported to CARB's LCFS Hydrogen Refueling Infrastructure program. This reported renewable content most likely includes the purchase of biogas credits.

Other Sources of Project Support

The Hydrogen Refueling Infrastructure credit provision of the LCFS allows eligible hydrogen fueling station operators to earn credits based on the capacity of the hydrogen station for a limited period, rather than being limited to credit generation based on the amount of hydrogen fuel dispensed.⁵¹

One hydrogen fueling station funding recipient has received \$5 million from the Volkswagen Mitigation Trust fund to support development of five hydrogen refueling stations as part of GFO-19-602. The use of the \$5 million mitigation trust funds and cooperation among CARB, the Bay Area Air Quality Management District, and the CEC will reduce the time and funding required to reach the statutory goal of at least 100 publicly available hydrogen fueling stations operating in California. This approach will fund additional stations to set California on the path toward 200 stations.

Proposed Funding Allocation

California is on track to meet the 100-station goal set by AB 8 with the stations funded by the combined expended and committed funds. California is also committed to meeting the 200-station goal set forth by Executive Order B-48-18 with planned investments. The proposed funding allocations of this investment plan include \$10 million for hydrogen fueling infrastructure for the final half-year (FY 2023–2024) of the Clean Transportation Program. This is more than 20 percent of the expected funds for the Clean Transportation Program in 2023–2024. The investment plan includes an additional \$60 million to the expansion of hydrogen refueling infrastructure for the three fiscal years 2023–2024, 2024–2025, and 2025–2026.

51 California Air Resources Board [Resolution 18-34](https://www.arb.ca.gov/fuels/lcfs/rulemakingdocs.htm) information is available at <https://www.arb.ca.gov/fuels/lcfs/rulemakingdocs.htm>. This modification to the LCFS provides credits to hydrogen fueling station owners for 15 years, with the credits being calculated based on the nameplate capacity of the station not to exceed 1,200 kilograms of hydrogen per day and the availability (or uptime) of the station relative to the permitted hours of operation. The amount of dispensed hydrogen is subtracted from the calculation of HRI credits so that credits are not double-earned.

Emerging Opportunities

The Emerging Opportunities allocation will support fueling infrastructure for emerging vehicle segments and the development of vehicle-grid integration products and services. Funded activities may include:

- Zero-Emission Vehicle Infrastructure for Emerging Sectors: Funding to support zero-emission efforts in segments that are in earlier stages of transition to zero-emission, such as aviation, locomotive, and marine vehicles.
- Vehicle-grid integration: Funding to develop and scale charging products that optimize charging in response to customer and grid needs, enable load flexibility, and realize EVs as distributed energy resources.
- Bidirectional Charging: A subset of vehicle-grid integration, bidirectional charging products can enable EVs to discharge energy from onboard batteries to homes, buildings, the grid, or other loads.

Vehicle-grid integration will be particularly important as California continues decarbonizing. By shifting charging in response to customer and grid needs, the load flexibility enabled by vehicle-grid integration can help reduce renewable curtailment, decrease emissions, shave on-peak consumption, and provide additional generation to the grid. The CEC, CPUC, and utilities are working jointly to develop rates and other compensation mechanisms that promote vehicle-grid integration and offer incentives for customer charging flexibility. Concurrently, industry players are developing products and services that help customers manage their charging and take advantage of these compensation mechanisms.

In July 2022, the CEC held a workshop discussing the market status of vehicle-grid integration and potential funding concepts.⁵² Based on feedback from this workshop, the CEC developed and issued the Responsive, Easy Charging Products With Dynamic Signals (REDWDS) solicitation in March 2023.⁵³ This solicitation initially provides up to \$9 million in grant funds to accelerate the development and deployment of easy-to-use charging products, which will help customers manage electric vehicle charging and respond to dynamic grid signals. Additional grant funds may be available in the future to complete a second phase of work. This solicitation builds upon the Open Charging Point Protocol and International Standard for Organization 15118 technical requirements included in CEC's block grant projects, as well as recent revisions to the Load Management Standards.

52 CEC. July 28, 2022. "[Workshop on Vehicle-Grid Integration Market Status and Funding Concepts](https://www.energy.ca.gov/event/workshop/2022-07/workshop-vehicle-grid-integration-market-status-and-funding-concepts)." Available at <https://www.energy.ca.gov/event/workshop/2022-07/workshop-vehicle-grid-integration-market-status-and-funding-concepts>.

53 CEC. "[GFO-22-609 – Responsive, Easy Charging Products With Dynamic Signals \(REDWDS\)](https://www.energy.ca.gov/solicitations/2023-03/gfo-22-609-responsive-easy-charging-products-dynamic-signals-redwds)." Available at <https://www.energy.ca.gov/solicitations/2023-03/gfo-22-609-responsive-easy-charging-products-dynamic-signals-redwds>.

CHAPTER 5:

Alternative Fuel Production and Supply

Zero- and Near-Zero-Carbon Fuel Production and Supply

The California transportation sector relies largely on petroleum, which accounts for 89 percent of ground transportation fuel used in the state.⁵⁴ Low-carbon substitute fuels that can displace the roughly 14 billion gallons of petroleum-based gasoline and 3.3 billion gallons of petroleum-based diesel used per year in California could provide opportunities to reduce GHG emissions and criteria air pollution.⁵⁵ Biofuels — defined in this document as nonpetroleum diesel substitutes, gasoline substitutes, and biomethane — represent the largest existing stock of alternative fuel in the California transportation sector.⁵⁶ In addition, production of and demand for renewable hydrogen are expected to increase in the coming years as more hydrogen fuel cell electric vehicles are sold and applications in other sectors expand.

The carbon intensity of renewable fuels can vary significantly depending on the pathway, which accounts for the specific feedstock and production process of the fuel. CARB provides carbon intensity values for most transportation fuels as part of the LCFS. The carbon intensity value accounts for the life-cycle GHG emissions of the fuel, including production, transportation, and consumption, and is reported in grams of carbon dioxide equivalent greenhouse gases per megajoule (gCO₂e/MJ).⁵⁷ Maximizing renewable fuel production from the lowest carbon pathways represents a key opportunity to reduce near-term GHG emissions in combustion engines and fuel cell electric vehicles. Clean Transportation Program funding uniquely drives innovative biofuel production plants to California, providing an in-state source for fuel which may otherwise come from out of state.

Fuel Type Overview

Renewable Diesel and Biodiesel

In 2021, renewable diesel was the most common diesel substitute in California, with 1.049 billion diesel-gallon equivalents sold and nearly doubling in use compared to 2019 usage.⁵⁸ Renewable diesel that meets the fuel specification requirements of ASTM International

54 Based on analysis from the California Energy Commission Energy Assessments Division, with data from the California Department of Motor Vehicles.

55 Ibid.

56 The term “gasoline substitutes” refers to any liquid fuel that can directly displace gasoline in internal combustion engines, including ethanol and renewable drop-in gasoline substitutes. The term “diesel substitutes” refers to any liquid fuel that can significantly displace diesel fuel, including biodiesel and renewable diesel. These definitions differ from similar terms used by CARB under the LCFS, which are broader and include fuels such as electricity, natural gas, and hydrogen.

57 Consult the glossary for the definition of “megajoule.”

58 California Air Resources Board. April 29, 2022. “[CARB Data Dashboard](https://ww3.arb.ca.gov/fuels/lcfs/dashboard/dashboard.htm).” Available at <https://ww3.arb.ca.gov/fuels/lcfs/dashboard/dashboard.htm>.

Standard D975 is fungible, or interchangeable, with conventional diesel fuel and can be used in existing diesel engines and fuel infrastructure. Biodiesel is another diesel substitute; however, unlike renewable diesel, it is not fully fungible with conventional diesel fuel.

Renewable diesel and biodiesel have carbon intensities up to 92 percent lower than diesel fuel, depending on the pathway used.⁵⁹ Together, renewable diesel and biodiesel accounted for about 45 percent of LCFS credits in 2021.⁶⁰ Of the 3.6 billion gallons of diesel fuel consumed in California in 2020, about 855 million (or 24 percent) were from low-carbon biodiesel or renewable diesel.

Biomethane

Biomethane (or “renewable natural gas”) is a commercially mature biofuel that serves as a low- or negative-carbon substitute for conventional natural gas. Biomethane from anaerobic digestion of wastewater sludge can reduce GHG emissions by as much as 92 percent below diesel. Biomethane derived from high-solids anaerobic digestion of prelandfill food and green wastes has a carbon intensity around *negative* 23 gCO₂e/MJ (or roughly 125 percent below diesel), indicating that the pathway contributes a net GHG emission reduction. Biomethane derived from dairy biogas has the lowest carbon intensity approved under the LCFS — about negative 377 gCO₂e/MJ.⁶¹

The potential of low-carbon biomethane to replace natural gas in the transportation sector is based on the availability of waste-based feedstocks, and estimates vary on technical and economical availability. The University of California, Davis, Institute of Transportation Studies indicated an economically feasible potential of roughly 623 million diesel gallon equivalents. According to the U.S. Department of Energy’s *2016 Billion Ton Report*, slightly higher estimates indicate that waste residues from in-state dairies, landfills, food diversion, and wastewater treatment plants could be used to produce biomethane in volumes ranging from 750 million to 1.2 billion diesel gallon equivalents per year. This amount would displace 23 to 36 percent of the on-road diesel fuel consumption in California.⁶² However, based on other studies provided by NREL, the technical availability (under preferable market conditions) could be four times higher.⁶³ Regardless, given the limited availability, the carbon reduction benefits from

59 Compared to California diesel (102.01 gCO₂e/MJ), with biodiesel carbon intensity as low as 8.63 gCO₂e/MJ and renewable diesel carbon intensity as low as 19.51 gCO₂e/MJ. Based on data from the [LCFS Fuel Pathway Table](https://www.arb.ca.gov/fuels/lcfs/fuelpathways/current-pathways_all.xlsx) (August 25, 2022), available at https://www.arb.ca.gov/fuels/lcfs/fuelpathways/current-pathways_all.xlsx.

60 California Air Resources Board. October 31, 2021. [“LCFS Quarterly Data Spreadsheet.”](http://www.arb.ca.gov/fuels/lcfs/lrtqsummaries.htm) Available at <http://www.arb.ca.gov/fuels/lcfs/lrtqsummaries.htm>.

61 California Air Resources Board. August 25, 2022. [“LCFS Pathway Certified Carbon Intensities.”](https://www.arb.ca.gov/fuels/lcfs/fuelpathways/pathwaytable.htm) Available at <https://www.arb.ca.gov/fuels/lcfs/fuelpathways/pathwaytable.htm>.

62 U.S. Department of Energy. July 2016. [2016 Billion Ton Report: Advancing Domestic Resources for a Thriving Bioeconomy](https://www.energy.gov/sites/prod/files/2016/12/f34/2016_billion_ton_report_12.2.16_0.pdf). Available at https://www.energy.gov/sites/prod/files/2016/12/f34/2016_billion_ton_report_12.2.16_0.pdf.

63 California Energy Commission staff. 2017. [2017 Integrated Energy Policy Report](https://www.energy.ca.gov/data-reports/reports/integrated-energy-policy-report/2017-integrated-energy-policy-report). California Energy Commission. Publication Number: CEC-100-2017-001-CMF. Available at <https://www.energy.ca.gov/data-reports/reports/integrated-energy-policy-report/2017-integrated-energy-policy-report>.

biomethane need to be prioritized for specific transportation applications (as well as other purposes), where appropriate.

Renewable Hydrogen

Senate Bill 1505 (Lowenthal, Chapter 877, Statutes of 2006) requires that at least 33.3 percent of hydrogen used for transportation come from renewable sources. As part of the Low Carbon Fuel Standard credits for ZEV infrastructure that took effect in January 2019, qualifying stations must have a renewable content of 40 percent or higher. According to the AB 8 2022 *Annual Assessment* mentioned above, most renewable hydrogen at California refueling stations can be called “indirect,” since it involves applying “renewable energy attributes from other facilities.”

Renewable hydrogen is typically produced through steam reformation of biomethane or through electrolysis using water and renewable electricity. Other renewable hydrogen production pathways are also being explored through research and development efforts globally.

According to the California Independent System Operator, increasing amounts of renewable power generation may result in electricity oversupply as California renewable power requirements grow from 33 to 50 percent.⁶⁴ Renewable hydrogen production is being investigated as a viable technology for beneficial use of this surplus renewable energy. While the capital costs of electrolyzers have decreased, the overall cost of renewable hydrogen remains high. However, according to the International Council on Clean Transportation, the cost of hydrogen production from renewable sources could be reduced by almost half with the Inflation Reduction Act tax credits.⁶⁵ The use of renewable electricity could also contribute to reductions in capital costs for renewable hydrogen production. Additional cost-reduction methods include improvements in how hydrogen is treated, stored, and delivered, as well as economies of scale afforded by expanding applications of hydrogen fuel.

Clean Transportation Program Funding to Date

To date, the CEC has awarded approximately \$216 million to low-carbon fuel production projects. These awards are summarized by fuel type in Table 10.

64 California Independent System Operator. “[Managing Oversupply](http://www.caiso.com/informed/Pages/ManagingOversupply.aspx).” <http://www.caiso.com/informed/Pages/ManagingOversupply.aspx>.

65 The International Council on Clean Transportation. January 3, 2023. “[Can the Inflation Reduction Act Unlock a Green Hydrogen Economy?](https://theicct.org/ira-unlock-green-hydrogen-jan23/#:~:text=On%20average%2C%20the%20IRA%20tax,until%20they%20expire%20in%202032)” Available at <https://theicct.org/ira-unlock-green-hydrogen-jan23/#:~:text=On%20average%2C%20the%20IRA%20tax,until%20they%20expire%20in%202032>.

Table 10: Summary of Clean Transportation Program Low-Carbon Fuel Production Awards as of January 25, 2023

Fuel Type	Qualifying Proposals* Submitted	Funds Requested by Qualifying Proposals* (in Millions)	Awards Made	Funds Awarded (in Millions)
Gasoline Substitutes	28	\$71.8	14	\$31.8
Diesel Substitutes	62	\$187.1	26	\$75.1
Biomethane	71	\$221.4	32	\$91.5
Renewable Hydrogen	13	\$38.7	5	\$16.9
Total	174	\$519	77	\$215.3

Source: California Energy Commission. It includes results from GFO-19-601, which was funded through a separate source of funding called the California Climate Investment Fund.

* The term “qualifying proposals” refers to proposals that received at least a passing score.

The Clean Transportation Program investments into low-carbon fuel production are typically focused on either smaller precommercial projects or large community- or commercial-scale projects. The smaller, precommercial projects have typically focused on transformative technology solutions that have the potential to increase yields, productivity, or cost-effectiveness of low-carbon fuel production. The CEC funds these pilot and demonstration projects with the expectation that, after successful operations at this scale, the technology will be suitable for commercial use. These precommercial projects are focused on advanced new technologies and approaches that can subsequently be expanded into wider markets.

In April 2021, the CEC released GFO-20-608, titled “Ultra-Low Carbon Fuel Production: Commercial-Scale Production Facilities & Blending Infrastructure.” This solicitation was an offer to fund ultra-low-carbon transportation fuel production at new and existing advanced fuel production plants and fuel blending infrastructure projects. The solicitation provided \$9 million from the Clean Transportation Program, and in November 2021, the CEC issued a NOPA of five grants to fully use the funding.

Also in April 2021, the CEC released GFO-20-609, titled “Renewable Hydrogen Transportation Fuel Production.” This solicitation was an offer to fund the construction or expansion (or both) of hydrogen production facilities that produce renewable hydrogen transportation fuel using in-state renewable resources. The solicitation provided \$9 million from the Clean Transportation Program, and in February 2022, the CEC issued a NOPA for three grants to fully use the funding.

In February 2023, the CEC released GFO-22-608, titled “Ultra-Low-Carbon Fuel: Demonstration- and Commercial-Scale Production Facilities Using Forest Biomass.” This solicitation is an offer to fund ultra-low-carbon transportation fuel production at new or existing facilities using forest biomass at two development stages: demonstration- and commercial-scale. The solicitation provides up to \$9 million from the Clean Transportation Program with the NOPA expected to be released in June 2023.

Other Sources of Funding

Other state and federal programs provide support and incentives to low-carbon fuel producers. For instance, from 2015 to 2021, the California Department of Food and Agriculture (CDFA) awarded a total of \$195 million for anaerobic digesters at dairies through the Dairy Digester Research and Development Program (DDRDP). In the most recent 2022 DDRDP funding opportunity, CDFA received 27 applications totaling more than \$35.3 million in requested funding.

In September 2022, the CDFA awarded \$18.7 million in grant funding from the DDRDP to 14 methane reduction projects across the state. These projects will reduce GHG emissions from manure on California dairy and livestock farms.

Continuing in September 2022, the CDFA awarded \$18.9 million in grant funding from the Alternative Manure Management Program to 27 methane emission reduction projects in the state. This program funds projects other than dairy digesters that reduce manure methane emissions.⁶⁶ As of December 2022, the DDRDP has successfully completed 66 percent of the 131 projects already funded, and the Alternative Manure Management Program has completed 71 percent of its 140 awarded projects.

On the federal level, in January 2023, the U.S. Department of Energy awarded \$118 million in grant funding to 17 projects that will accelerate the use of domestic feedstock and production of biofuels from pre-pilot to demonstration scale.⁶⁷ Of the total 17 projects that were awarded, 6 projects were California based, supporting biofuel production technologies at pre-pilot and pilot scale-up development stages.

USDA's Higher Blends Infrastructure Incentive Program has provided incentives to increase the availability of higher blends of biofuels such as ethanol and biodiesel through transportation fueling and fuel distribution facilities. This program supports efforts in California to increase access to fuels with a lower carbon intensity than conventional fuels. Since the debut of the program in August 2020, USDA has invested more than \$77.8 million in projects expected to increase biofuels sales by 1.2 billion gallons annually.⁶⁸ The USDA announced in August 2022 the availability of \$100 million for the Higher Blends Infrastructure Incentive Program.⁶⁹

In addition, the LCFS and the Renewable Fuel Standard (the federal program that requires transportation fuel sold in the United States to contain a minimum volume of renewable fuels) can support low-carbon fuel producers by creating markets for carbon credits and renewable

66 California Department of Food and Agriculture. "[Alternative Manure Management Program \(AMMP\)](https://www.cdfa.ca.gov/oefi/AMMP/)." Accessed March 13, 2023. Available at <https://www.cdfa.ca.gov/oefi/AMMP/>.

67 U.S. Department of Energy. January 2023. "[U.S. Department of Energy Awards \\$118 Million to Accelerate Domestic Biofuel Production](https://www.energy.gov/articles/us-department-energy-awards-118-million-accelerate-domestic-biofuel-production)." Available at <https://www.energy.gov/articles/us-department-energy-awards-118-million-accelerate-domestic-biofuel-production>.

68 USDA. August 2022. "[Higher Blends Infrastructure Incentive Program](https://www.rd.usda.gov/sites/default/files/fact-sheet/508_rd_factsheet_hbiip.pdf)." Available at https://www.rd.usda.gov/sites/default/files/fact-sheet/508_rd_factsheet_hbiip.pdf.

69 USDA. August 2022. "[USDA Begins Accepting Applications for \\$100 Million in Biofuel Infrastructure Grants](https://www.usda.gov/media/press-releases/2022/08/23/usda-begins-accepting-applications-100-million-biofuel)." Available at <https://www.usda.gov/media/press-releases/2022/08/23/usda-begins-accepting-applications-100-million-biofuel>.

fuels. The incentives earned through the LCFS provide steady financial support to low-carbon fuel producers, distributors, and blenders in California. In 2021, about 77.2 percent of LCFS credits were granted for biofuels including biomethane, ethanol, biodiesel, and renewable diesel.⁷⁰ These credits equate to an incentive of more than \$2.89 billion for biofuel producers and retailers if sold at the average credit price of \$187 for 2021.⁷¹ It is expected that the LCFS will serve as the state's primary source of financial support for low-carbon fuel production and distribution.

Proposed Funding Allocation

The CEC will continue to examine the best use of funds in these categories through outreach to interested and affected groups, backed up with data and analysis. Several factors will be considered, including the near-term petroleum and GHG emission reduction potential of low-carbon, drop-in gasoline or petroleum replacement, the need to decarbonize hydrogen production, and market conditions. There may also be opportunities to expand or otherwise improve the limited distribution of liquid biofuels (whether for drop-in substitutes or blending).

Some fuel types and pathways have shown minimal improvement in carbon intensity or cost-effectiveness in recent funding solicitations, which may indicate that the technology or process has fully matured. The CEC may evaluate renewable fuel types and production pathways to determine when state incentives are no longer necessary and explore opportunities to use feedstocks that have not previously been considered because of technology and economic constraints.

For FY 2023–2024, the CEC allocates \$5 million in Clean Transportation Program funding for zero- and near-zero-carbon fuel production and supply. Funding priorities for this allocation may include increasing the in-state production of low-carbon fuels from waste-based feedstocks such as woody biomass from forest or agricultural sources and improving the state's supply of renewable hydrogen.

70 California Air Resources Board. March 26, 2021. "[LCFS Quarterly Data Spreadsheet.](https://ww2.arb.ca.gov/sites/default/files/2022-04/fig2.xlsx)" Available at <https://ww2.arb.ca.gov/sites/default/files/2022-04/fig2.xlsx>.

71 California Air Resources Board. January 11, 2022. "[December 2021 LCFS Credit Transfer Activity Report](https://ww2.arb.ca.gov/resources/documents/monthly-lcfs-credit-transfer-activity-reports)." Available at <https://ww2.arb.ca.gov/resources/documents/monthly-lcfs-credit-transfer-activity-reports>.

CHAPTER 6:

Related Opportunities

Manufacturing

Electric vehicles were the number one California export in 2020.⁷² California is also home to more than 360 companies with 70,000 employees that work on zero-emission transportation, including vehicles, components, infrastructure, and research.⁷³ California has 55 ZEV-related manufacturers⁷⁴ and leads the nation in ZEV manufacturing jobs.

Some of the Clean Transportation Program-funded companies are completely vertically integrated, such as GILLIG and Zero Motorcycles. Other companies manufacture parts and components, such as:

- Electric vehicle chargers (as represented by ChargePoint).
- Electric powertrains (Motiv Power Systems).
- Battery control systems (Freewire Technologies).
- Hydrogen refueling station parts (First Element Fuel).

Support for California's ZEV supply chain companies can be seen by the incentives offered through the California Alternative Energy and Advanced Transportation Financing Authority, California Competes, and the CEC's Clean Transportation Program.

Since the inception of the Clean Transportation Program, seven solicitations have been issued under the manufacturing category totaling \$279.8 million for 41 projects. Clean Transportation Program grants have been invaluable in attracting companies to California, leveraging the state's policy objectives and regulations, scaling growth in-state and abroad, and creating jobs.

Some California ZEV manufacturers have established formal worker relationships with organized labor. GILLIG, a battery-electric bus manufacturer in Livermore (Alameda County), has partnered with Teamsters Local 853 since 1976 and Auto, Marine & Specialty Painters Local Union 1176 since the 1960s. BYD Coach and Bus in Lancaster (Los Angeles County) has established an apprenticeship program with Sheet Metal Workers Local 105 and Antelope Valley College. Manufacturing jobs are critical to disadvantaged communities, low-income communities, and small businesses. An estimated 3,789 manufacturing-related jobs have been supported, created, or retained under the Clean Transportation Program manufacturing portfolio or a combination.

72 U.S. Census Bureau. "[State Exports From California](https://web.archive.org/web/20211105091310/https://www.census.gov/foreign-trade/statistics/state/data/ca.html)." Archived page available at <https://web.archive.org/web/20211105091310/https://www.census.gov/foreign-trade/statistics/state/data/ca.html>.

73 CALSTART. January 2021. "[CALSTART's California ZEV Jobs Study](https://calstart.org/wp-content/uploads/2021/02/CA-ZEV-Jobs-Study-Final-0203.pdf)." Available at <https://calstart.org/wp-content/uploads/2021/02/CA-ZEV-Jobs-Study-Final-0203.pdf>.

74 CEC. "[California Zero-Emission Vehicle-Related Manufacturing web map](https://experience.arcgis.com/experience/b2f1969d31274eb3a56418336bb23561/?draft=true)." Available at <https://experience.arcgis.com/experience/b2f1969d31274eb3a56418336bb23561/?draft=true>.

The Budget Acts of 2021 and 2022^{75,76} allocated a total of \$250 million to the CEC toward supporting ZEV manufacturing grants that increase in-state manufacturing of ZEVs, ZEV components, and ZEV charging or refueling equipment.

The CEC released a competitive grant solicitation March 30, 2022, GFO-21-605 — Zero-Emission Transportation Manufacturing, with this funding.⁷⁷ This solicitation funded projects that increase in-state manufacturing of ZEVs, ZEV components and batteries, and ZEV charging/refueling equipment. The CEC initially announced the availability of \$60 million to fund resulting agreements. The solicitation was oversubscribed, however, and CEC increased this amount to support the additional passing proposals and funding requested. The March 15, 2023, NOPA announced plans for awards totaling \$197.9 million among 13 projects as indicated in Table 11.

Table 11: Summary of Proposed Awards for GFO-21-605, Zero-Emission Transportation Manufacturing

Project Category	Applications Received	Funding Requested (in millions)	Proposed Awards	Proposed Funding (in millions)	Proposed Match (in millions)
Complete ZEVs	15	\$183	6	\$112	\$134
ZEV Infrastructure	2	\$18	1	\$15	\$15
ZEVs and ZEV Infrastructure Components	2	\$16	1	\$8	\$14
ZEV and ZEV Infrastructure Batteries	7	\$94	5	\$64	\$117
TOTAL	26	\$311	13	\$198	\$281

Source: CEC. Funding awards are subject to approval at a CEC business meeting.

The 13 Zero-Emission Transportation Manufacturing projects recommended for funding, summarized in Table 12, are spread across 19 project sites, 14 cities and 9 counties in California. The projects recommended for funding will promote a diversity of manufactured products in the ZEV supply chain. In total, the proposed projects are expected to create 2,989 direct jobs and other cobenefits, many of which are within or adjacent to disadvantaged and low-income communities.

75 California Budget Act. Chapter 21, Statutes of 2021 (AB 128), as amended by Chapter 69, Statutes of 2021 (SB 129) and Chapter 240, Statutes of 2021 (SB 170).

76 CA Budget Act. Chapter 43, Statutes of 2022 (SB 154), as amended by Chapter 45, Statutes of 2022 (AB 178).

77 CEC. "[GFO-21-605 - Zero-Emission Transportation Manufacturing](https://www.energy.ca.gov/solicitations/2022-03/gfo-21-605-zero-emission-transportation-manufacturing)." Available at <https://www.energy.ca.gov/solicitations/2022-03/gfo-21-605-zero-emission-transportation-manufacturing>.

Table 12: GFO-21-605 Zero-Emission Transportation Manufacturing Awardees

Awardee Name	Project Location(s)	Manufactured Product	Proposed CEC Award (in millions)	Proposed Match Share (in millions)	In a Low-Income or Disadvantaged Community
American Lithium Energy Corporation	Carlsbad	Battery cells	\$10.2	\$10.2	No
Ample, Inc.	Brisbane	Battery modules	\$14.7	\$15.0	Yes
Aptera Motors Corp.	Carlsbad, Vista	Battery electric passenger vehicle	\$21.9	\$26.4	Within 2 miles
BYD COACH & BUS LLC	Lancaster	Battery electric school bus	\$30.0	\$39.8	Yes
ChargePoint, Inc.	Campbell, Milpitas	Electric vehicle chargers	\$14.6	\$14.6	Within 2 miles
Cuberg Inc.	San Leandro	Battery cells	\$11.2	\$51.7	Yes
FirstElement Fuel, Inc.	Livermore, Santa Ana	Hydrogen refueling station modules and pumps	\$7.7	\$14.4	Yes
GILLIG LLC	Livermore	Battery electric bus	\$29.7	\$35.3	Within 2 miles
Moxion Power Co.	Richmond	Battery modules	\$15.0	\$26.7	Yes
Sparkz, Inc.	East Palo Alto	Battery cells	\$12.5	\$13.8	Yes
Symbio North America Corp.	Temecula, Poway	Hydrogen fuel cell power system and vehicle	\$9.1	\$11.0	Yes
Wiggins Lift Co., Inc.	Oxnard	Battery electric forklift	\$8.1	\$8.5	Yes
Zimeno Inc. DBA Monarch Tractor	Livermore	Battery electric tractor	\$13.1	\$13.2	Within 2 miles
TOTAL			\$197.9	\$280.7	8 (plus 4 within 2 miles)

Source: CEC. Fundings awards shown are subject to approval at a CEC business meeting.

The second solicitation, GFO-21-606 — ZEV Battery Manufacturing Block Grant, released in August 2022, offered \$25 million in grant funds for projects that will increase in-state manufacturing of ZEV batteries.⁷⁸ CALSTART was selected through this competitive solicitation to award these funds to battery manufacturers through a process in collaboration with the CEC. Further details on available funding to ZEV battery manufacturers are under development.

The CEC is committed to California's goal of zero-emission transportation while growing high-quality manufacturing jobs in the state. Maintaining a steady and consistent flow of public capital will encourage manufacturers through incentives to establish and scale up operations in California. Thanks to the ambitious goals of the state to electrify and decarbonize transportation, California will continue to be a leader in manufacturing the technologies that will lead the state to a 100 percent clean energy future for all.

Proposed Funding Allocation

The CEC anticipates about \$16 million in manufacturing funding still available for supporting future manufacturing solicitations or projects. The CEC will explore ways for allocating these remaining funds to continue supporting in-state manufacturing of ZEV technologies and in-state jobs.

Workforce Training and Development

Investments in workforce training and development are critical to the advancement of ZEV markets. More than \$42 million has been invested in workforce projects for more than 32,000 trainees, faculty, and trainers. Workforce investments are driven by state policies and priorities, needs of the ZEV and ZEV infrastructure market, job placement, and economic sustainability in priority communities, which include:

- Directing workforce investments and accruing benefits to disadvantaged and low-income communities.
- Pairing workforce projects in ZEV deployment areas.
- Requiring ZEV workforce plans for solicitations and incentives.
- Building new partnerships for co-investments, job growth, and community workforce priorities.
- Supporting high-road⁷⁹ principles, job quality, and job quantity.

78 CEC. "[GFO-21-606 - Zero-Emission Vehicle Battery Manufacturing Block Grant](https://www.energy.ca.gov/solicitations/2022-08/gfo-21-606-zero-emission-vehicle-battery-manufacturing-block-grant)." Available at <https://www.energy.ca.gov/solicitations/2022-08/gfo-21-606-zero-emission-vehicle-battery-manufacturing-block-grant>.

79 California Workforce Development Board. "[High Road Training Partnerships](https://cwdb.ca.gov/initiatives/high-road-training-partnerships/)." Accessed March 10, 2023. Available at <https://cwdb.ca.gov/initiatives/high-road-training-partnerships/>.

See also [Section 14005 of the California Unemployment Insurance Code](#). Available at

- Addressing workforce, market trends, and growth in all ZEV and ZEV infrastructure industries.

The Clean Transportation Program’s IDEAL (Inclusive, Diverse, Equitable, Accessible, and Local) ZEV Workforce Pilot solicitation provided more than \$6.5 million in funding for community-based workforce training and development projects that support ZEVs and ZEV infrastructure in California. Fourteen projects were approved that will provide skills development, support ZEV career pathways, and provide access to good paying, high-road jobs especially in rural and priority communities.

In 2021, Senate Bill 589 (Hueso, Chapter 732, Statutes of 2021) was signed by Governor Newsom. SB 589 requires, as part of the AB 2127 statewide charging infrastructure assessment, that the CEC “identify workforce development and training resources needed to meet these goals,” which will be addressed in the CEC’s second AB 2127 assessment.

On February 10, 2023, the CEC hosted a workshop to discuss workforce training and development topics, potential funding concepts, and proposed program activities for the Clean Transportation Program. The workshop sought the public’s feedback to these areas, provided discussion on the status of the ZEV and ZEV infrastructure industry, looked at how to best use the remaining Clean Transportation Program investments, and discussed how to leverage partnerships to support this workforce. It is imperative that the transition to ZEVs supports good-paying jobs and creates career opportunities for Californians.

Proposed Funding Allocation

The CEC allocates \$5 million for workforce training and development in FY 2023–2024. The CEC will continue to explore new public-private partnerships and leverage limited resources to determine how Clean Transportation Program funding can best be invested to maximize the benefits of this funding. Workforce training and development investments will continue to support priority communities, meet ZEV industry needs, create workforce partnerships, and advance job quality and quantity across the entire ZEV workforce ecosystem.

GLOSSARY

Term	Definition
Air pollutant	Foreign or natural substances occurring in the atmosphere that may result in adverse effects to humans, animals, vegetation, or materials or any combination thereof.
Air Quality Improvement Program (AQIP)	A program administered by the California Air Resources Board to reduce emissions from transportation. It complements and was introduced at the same time as the California Energy Commission's Clean Transportation Program.
Anaerobic digestion	A biological process in which biodegradable organic matter is broken down by bacteria into biogas, which consists of methane (CH ₄), carbon dioxide (CO ₂), and trace amounts of other gases. The biogas can be further processed into a transportation fuel or combusted to generate heat or electricity.
Assembly Bill (AB)	A law or proposed law that originated in the California State Assembly.
Battery-electric vehicle (BEV)	A type of electric vehicle that derives power solely from the chemical energy stored in rechargeable batteries.
Biodiesel	A transportation fuel for use in diesel engines that is produced through the transesterification of organically derived oils or fats. Transesterification is a chemical reaction between oil and alcohol that forms esters (in this case, biodiesel) and glycerol.
Biomethane	A pipeline-quality gas that is fully interchangeable with conventional natural gas and can be used as a transportation fuel to power natural gas engines. Biomethane is most commonly produced through anaerobic digestion or gasification using various biomass sources. Also known as "renewable natural gas (RNG)."
British thermal unit (Btu)	A unit of heat energy. One Btu is equal to the amount of energy required to raise the temperature of 1 pound of water by 1 degree Fahrenheit at sea level. One Btu is equivalent to 252 calories, 778 foot-pounds, 1,055 joules, or 0.293 watt-hours.
CalEnviroScreen	A screening method that can be used to help identify California communities that are disproportionately burdened by several sources of pollution. The CalEnviroScreen tool combines different types of census tract-specific information into a score to determine which communities are the most burdened or "disadvantaged."

Term	Definition
California Electric Vehicle Infrastructure Project (CALeVIP)	A California Energy Commission–funded program that provides incentives for light-duty electric vehicle charging infrastructure.
Carbon dioxide equivalent (CO ₂ e)	A measure used to compare emissions from various greenhouse gases based upon the related global warming potential. The carbon dioxide equivalent for a gas is derived by multiplying the mass of the gas by the associated global warming potential.
Carbon intensity	A measure of greenhouse gas emissions by weight per unit of energy. A common measure of carbon intensity is grams of carbon dioxide equivalent greenhouse gases per megajoule of energy (gCO ₂ e/MJ).
Clean Vehicle Rebate Project	A California Air Resources Board program that provides financial assistance for purchasing or leasing battery-electric, fuel cell, and plug-in hybrid vehicles.
Combined Charging System (CCS)	A commonly used standard plug for direct-current fast charging of electric vehicles.
Criteria air pollutant	An air pollutant for which acceptable levels of exposure can be determined and for which the U.S. Environmental Protection Agency has set an ambient air quality standard. Examples include ozone (O ₃), carbon monoxide (CO), nitrogen oxides (NO _x), sulfur oxides (SO _x), and particulate matter (PM ₁₀ and PM _{2.5}).
Dairy Digester Research and Development Program (DDRDP)	A California Department of Food and Agriculture program that provides financial incentives for anaerobic digesters to reduce methane emissions at dairy farms.
Direct current (DC) fast charger	Equipment that provides charging through a direct-current plug, typically at a rate of 50 kilowatts or higher.
Disadvantaged Communities Advisory Group (DACAG)	A group established under Senate Bill 350 (the Clean Energy and Pollution Reduction Act of 2015) that advises the California Energy Commission and California Public Utilities Commission on various programs.
Disadvantaged communities	Areas throughout the state that most suffer from a combination of economic, health, and environmental burdens. These burdens include poverty, high unemployment, air and water pollution, presence of hazardous wastes, as well as high incidence of asthma and heart disease.
Electric vehicle (EV)	A vehicle that uses an electric propulsion system. Examples include battery-electric vehicles, hybrid electric vehicles, and fuel cell electric vehicles.

Term	Definition
Electric Vehicle Infrastructure Projections (EVI-Pro)	A tool used to plan the chargers needed for light-duty electric vehicles in California.
Electric Vehicle Infrastructure Training Program (EVITP)	A certification program for electricians who wish to work on electric vehicle charging infrastructure. State law requires EVITP certification in some cases.
Electrolysis	A process by which a chemical compound is broken down into associated elements by passing a direct current through it. Electrolysis of water, for example, produces hydrogen and oxygen.
Equity	The fair treatment, meaningful involvement, and investment of resources through clean transportation programs, incentives, and processes for all Californians so that race, color, national origin, or income level are not barriers to increased opportunities, benefits, and sustainability.
Ethanol	A liquid that is produced chemically from ethylene or biologically from the fermentation of various sugars from carbohydrates found in agricultural crops and cellulosic residues. Used in the United States as a gasoline octane enhancer and oxygenate, or in higher concentration (E85) in flex-fuel vehicles.
Feedstock	Any material used directly as a fuel or converted into fuel. Biofuel feedstocks are the original sources of biomass. Examples of biofuel feedstocks include corn, crop residue, and waste food oils.
Fiscal year (FY)	Each California state fiscal year begins on July 1 and ends on June 30 of the following calendar year.
Flex-fuel vehicle	A vehicle that uses an internal combustion engine that can operate on alcohol fuels (methanol or ethanol), regular unleaded gasoline, or any combination of the two from the same fuel tank.
Fuel cell	A device capable of generating an electrical current by converting the chemical energy of a fuel (for example, hydrogen) directly into electrical energy.
Fuel cell electric vehicle (FCEV)	A type of electric vehicle that derives power from an onboard fuel cell.
gCO ₂ e/MJ	See the entry for "Carbon intensity."
Grant funding opportunity (GFO)	Where the California Energy Commission offers applicants an opportunity to receive grant funding for projects meeting certain requirements.

Term	Definition
Greenhouse gas (GHG)	Any gas that absorbs infrared radiation in the atmosphere. Common examples of greenhouse gases include water vapor, carbon dioxide (CO ₂), methane (CH ₄), nitrous oxide (N ₂ O), halogenated fluorocarbons (HCFCs), ozone (O ₃), perfluorinated carbons (PFCs), and hydrofluorocarbons (HFCs).
High road	A set of economic and workforce development strategies to achieve economic growth, economic equity, shared prosperity, and a clean environment. Strategies include, but are not limited to, interventions that (1) improve job quality and job access, including for women and people from underserved and underrepresented populations, (2) meet the skill and profitability needs of employers, and (3) meet the economic, social, and environmental needs of the community.
High-solids anaerobic digestion	An anaerobic digestion process where the percentage of total solids of the feedstock is greater than 15 percent and little or no water is added to the digester.
Hybrid and Zero-Emission Truck and Bus Voucher Project (HVIP)	A program that provides incentives for purchasing clean commercial vehicles such as trucks and buses. Also known as the "Clean Truck and Bus Voucher Incentive Project."
Hybrid vehicle	A vehicle that uses two or more types of power, most commonly using a combustion engine together with an electric propulsion system. Hybrid technologies typically expand the usable range of electric vehicles beyond what an electric vehicle can achieve with batteries alone and increase fuel efficiency beyond what an internal combustion engine can achieve alone.
Investor-owned utility (IOU)	A private company that provides a utility, such as water, natural gas, or electricity, to a specific service area. The California Public Utilities Commission regulates investor-owned utilities that operate in California.
Landfill gas	Gas generated by the natural degradation and decomposition of municipal solid waste by anaerobic microorganisms in sanitary landfills. The gases produced, carbon dioxide and methane, can be collected by a series of low-level pressure wells and processed into a medium-Btu gas that can be further processed into a transportation fuel or combusted to generate heat or electricity.
Level 1 charger	Equipment that provides charging through a 120-volt alternating-current plug.
Level 2 charger	Equipment that provides charging through a 240-volt (typical in residential applications) or 208-volt (typical in commercial

Term	Definition
	applications) alternating-current plug. This equipment generally requires a dedicated 40-amp circuit.
Low Carbon Fuel Standard (LCFS)	A set of standards designed to encourage the use of cleaner low-carbon fuels in California, encourage the production of those fuels, and therefore reduce greenhouse gas (GHG) emissions.
Low-income communities/ households	Census tracts or households that are either at or below 80 percent of the statewide median income, or at or below the threshold designated as low-income by the California Department of Housing and Community Developments 2018 Income Limits.
Megajoule	One million joules. A joule is a unit of work or energy equal to the amount of work done when the point of application of force of 1 newton is displaced 1 meter in the direction of the force. One British thermal unit is equal to 1,055 joules.
Methane	A light hydrocarbon that is the main component of natural gas. It is the product of the anaerobic decomposition of organic matter or enteric fermentation in animals and is a greenhouse gas. The chemical formula is CH ₄ .
Metric ton	A unit of weight equal to 1,000 kilograms (2,205 pounds).
Micrometer	One millionth of a meter, equal to roughly 0.00004 inches.
National Ambient Air Quality Standards (NAAQS)	A set of standards established by the U.S. EPA for six criteria air pollutants, measured by the amount of each pollutant for a specified period.
National Electric Vehicle Infrastructure (NEVI) Formula Program	A federal program for expanding the United States' electric vehicle charging infrastructure, created by the Infrastructure Investment and Jobs Act of 2021.
National Renewable Energy Laboratory (NREL)	The United States' primary laboratory for renewable energy and energy efficiency research and development.
Natural gas	A hydrocarbon gas found in the earth composed of methane, ethane, butane, propane, and other gases.
Nitrogen oxides (NO _x)	A chief component of air pollution that is commonly produced by the burning of fossil fuels.
Notice of proposed award (NOPA)	A document identifying projects that are proposed to receive funding under a California Energy Commission funding opportunity, such as a "grant funding opportunity" (GFO).

Term	Definition
Overgeneration	When total electricity supply exceeds total electricity demand. This condition may negatively affect the reliable operation of the regional, state, or interstate electrical grid.
Particulate matter	Any material, except pure water, that exists in a solid or liquid state in the atmosphere. The size of particulate matter can vary from coarse, wind-blown dust particles to fine-particle combustion products.
Pathway	A descriptive combination of three components including feedstock, production process, and fuel type.
Plug-in electric vehicle (PEV)	A type of vehicle that is equipped with a battery that can be recharged from an external source of electricity. This includes battery-electric vehicles and plug-in hybrids.
Plug-in hybrid electric vehicle (PHEV)	A type of hybrid vehicle that is equipped with a larger, more advanced battery that can be recharged from an external source of electricity. This larger battery allows the vehicle to be driven on battery power alone, gasoline fuel alone, or a combination of electricity and gasoline.
PM _{2.5}	Particulate matter with particles 2.5 micrometers in diameter or smaller. Also called "fine particulate matter."
Senate Bill (SB)	A law or proposed law that originated in the California State Senate.
Vehicle-grid integration	Policies, technologies, and strategies that help coordinate vehicle charging with both customer mobility needs and grid needs. Examples of vehicle-grid integration include managed one-way charging, bidirectional charging, and automated load management systems.
Zero-emission vehicle (ZEV)	A vehicle that produces no pollutant emissions from the onboard source of power. This term includes battery-electric and fuel cell electric vehicles, and sometimes includes plug-in hybrids.