DOCKETED	
Docket Number:	24-ALT-01
Project Title:	2024–2025 Investment Plan Update for the Clean Transportation Program
TN #:	261539
Document Title:	2024-2025 Investment Plan Update for Clean Transportation Program Commission Report
Description:	N/A
Filer:	Spencer Kelley
Organization:	California Energy Commission
Submitter Role:	Commission Staff
Submission Date:	2/4/2025 2:03:45 PM
Docketed Date:	2/4/2025

CALIFORNIA ENERGY COMMISSION

CALIFORNIA NATURAL RESOURCES AGENCY

California Energy Commission

COMMISSION REPORT

2024–2025 Investment Plan Update for the Clean Transportation Program

February 2025 | CEC-600-2024-047-CMF

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ACKNOWLEDGEMENTS

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The California Energy Commission also appreciates the help of other state agencies including the California Air Resources Board.

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ABSTRACT

The *2024–2025 Investment Plan Update for the Clean Transportation Program* guides the allocation of base program funding for Fiscal Year 2024–2025. Base program funding, originally established in 2008 through Assembly Bill 118 (Núñez, Chapter 750, Statutes of 2007) and most recently reauthorized in 2023 through Assembly Bill 126 (Reyes, Chapter 319, Statutes of 2023), totals $95.2 million in Fiscal Year 2024–2025. The *2024–2025 Investment Plan Update* also includes Greenhouse Gas Reduction Fund and General Fund allocations projected through Fiscal Year 2027–2028, which total $1.3 billion. In total, the plan discusses $1.4 billion of investments. The California Energy Commission (CEC) reviews the proposed allocations of base program funding annually and adjusts as needed.

This *2024–2025 Investment Plan Update* is the sixteenth plan 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 reports and analyses. These priorities are consistent with the 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 *2024–2025 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 Commission Report is the last step in developing the *2024–2025 Investment Plan Update,* which was adopted at an Energy Commission business meeting December 11, 2024.

Keywords: California Energy Commission, Clean Transportation Program, AB 118, AB 8, AB 126, funding program, alternative transportation fuels, investment plan, equity, zero-emission vehicles, electric vehicles, hydrogen, tribal communities, disadvantaged communities, workforce, training, sustainability, fueling stations, fuel production, alternative fuel infrastructure, manufacturing

Please use the following citation for this report:

Tuggy, Benjamin. 2025. *2024–2025 Investment Plan Update for the Clean Transportation Program.* California Energy Commission. Publication Number: CEC-600-2024-047-CMF

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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. Since 2008 the Clean Transportation Program has provided more than $2.3 billion in funding for a broad spectrum of zero-emission vehicles (ZEVs) and infrastructure, alternative fuels and technologies, and workforce development projects in communities that will accrue health, environmental, and economic benefits from these investments.

Given the advancements in zero-emission transportation, the Clean Transportation Program now focuses on zero-emission technologies wherever possible. This Investment Plan lays out a spending plan for $95.2 million in Fiscal Year 2024–2025 through base program funding. The plan also discusses projected funding of $1.3 billion through Fiscal Year 2027–2028 through future allocations of the Greenhouse Gas Reduction Fund and the General Fund. These future allocations are subject to change depending on the annual state budget process. In total, the plan discusses $1.4 billion of investments to build refueling infrastructure for zero-emission vehicles and prepare California's workforce for a zero-emission transportation future.

California has experienced rapid growth in the sales of plug-in electric vehicles (battery-electric and plug-in hybrid 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 the third quarter of 2024, more than one in four (26.4 percent of) new light-duty vehicle sales in California were ZEVs or plug-in hybrids. More than 2.1 million ZEVs and plug-in hybrids have been sold in the state through the third quarter of 2024. While behind the passenger ZEV market, the number of medium- and heavy-duty ZEVs on the road reached more than 3,700 as of the end of 2023, with transit, school, and delivery vehicles at the forefront.

Purpose of the Clean Transportation Program

Since 2006, the state has set pivotal goals to address the threat posed by global climate change and improve the public health of all Californians. Besides reducing GHG emissions, the state must reduce emissions of criteria pollutants to attain federal and state ambient air quality standards. Reducing air pollution is important to improving equitable outcomes, given that air quality burdens fall disproportionately on low-income residents.

State clean-air goals and regulations include the following:

- Reaching 100 percent ZEVs in new sales of passenger vehicles by 2035 (Executive Order N-79-20/Advanced Clean Cars II Regulations).
- Transitioning 100 percent of operating drayage trucks to zero emission by 2035 (Executive Order N-79-20/Advanced Clean Fleets Regulation).

- Transitioning 100 percent of operating medium- and heavy-duty trucks and buses to zero emission by 2045 everywhere feasible (Executive Order N-79-20/Advanced Clean Fleets Regulation).
- Requiring a carbon-neutral economy by 2045 (Assembly Bill 1279, Muratsuchi, Chapter 337, Statutes of 2022).

The transportation sector accounts for roughly 50 percent of state GHG emissions when considering "upstream emissions" from fuel production. Transportation is also a major source of criteria pollutants. To help address these problems and reach clean air goals, Assembly Bill 118 (Núñez, Chapter 750, Statutes of 2007) created the Clean Transportation Program to be administered by the CEC. Most recently, Assembly Bill 126 (Reyes, Chapter 319, Statutes of 2023) reauthorized the Clean Transportation Program to July 1, 2035.

Highlights of Investments

The Clean Transportation Program has been essential to making California a leader in zero-emission transportation. Since the first Clean Transportation Program Investment Plan was released in 2009, California has invested more than $2.3 billion in projects supporting zero-emission vehicle infrastructure, alternative fuels, and advanced vehicle technologies. This figure includes the base Clean Transportation Program funds and recent General Funds. Key highlights through July 2024 include:

- Installing or planning more than 34,700 chargers for plug-in electric vehicles, focused on public and shared-private Level 2 and Level 1 chargers and public and fleet direct current (DC) fast chargers along highway corridors and urban metropolitan areas.
- Creating block grants to provide streamlined incentives for light-duty electric vehicle charging infrastructure projects. One project, California Electric Vehicle Infrastructure Project (CALeVIP) 2.0, offers rebates for high-powered DC fast chargers. Another, Communities in Charge, offers incentives for Level 2 chargers with priority to disadvantaged and low-income communities.
- Releasing new solicitations targeting high-priority or underserved EV charging needs, including grid integration, multifamily housing, and rural communities.
- Allocating funding for 95 publicly available hydrogen fueling stations. As of July 2024, 44 light-duty hydrogen fueling stations were open for customers. An additional 18 stations were temporarily nonoperational (unavailable for more than 30 days), bringing the total number of open retail stations to 62.
- Funding six projects to produce 100 percent clean renewable hydrogen from in-state renewable resources.
- Awarding 250 projects providing more than $129 million in ZEV infrastructure incentives through the nation's first commercial vehicle fleet incentive project, titled Energy Infrastructure Incentives for Zero-Emission Commercial Vehicles (EnergIIZE Commercial Vehicles). 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 40 manufacturing projects to date that support in-state economic growth. Projects include ZEVs, ZEV components (including batteries), and ZEV infrastructure.
- 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.

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. Assembly Bill 126 requires that at least 50 percent of Clean Transportation Program funds go toward projects that benefit low-income and disadvantaged communities on or after January 1, 2025. As of July 2024, 63 percent of funds have gone to projects in disadvantaged or low-income communities or both. 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.

The Disadvantaged Communities Advisory Group, 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) on determining how programs can be more effective and beneficial for disadvantaged and other communities. The Disadvantaged Communities Advisory Group and other interested and affected groups have encouraged the CEC to prioritize investments that directly benefit low-income, disadvantaged, rural, and tribal communities and 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. In November 2024, the CEC released a solicitation to provide technical assistance to potential applicants and achieve a more equitable distribution of funding. Through these activities, the CEC aims to directly engage and listen to community members to better understand their barriers, needs, and priorities for ZEV infrastructure.

The Advisory Committee for the Clean Transportation Program has been refreshed for the 2024–2027 term, with 30 members. The committee reflects a broad array of interested and affected groups representing community-based organizations, social and environmental justice advocates, alternative vehicle technologies, and 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.

The CEC is continuously strengthening its support for tribes throughout the state. On March 2, 2023, all 10 commissioners of the CEC and CPUC met publicly with California Native American tribal leaders. Attendees discussed key energy challenges and opportunities faced by California tribes. At the meeting, the CEC approved Resolution 23-0302-09, which recognizes and commits the CEC to supporting California tribal energy sovereignty and independence. The CEC is working toward increasing access to funding, modernizing crucial infrastructure, and accelerating ZEV adoption among California Native American tribes.

Zero-Emission Vehicle Infrastructure Progress and Reliability

In February 2024, the CEC adopted the *Assembly Bill 2127 Second Electric Vehicle Charging Infrastructure Assessment — Analyzing Charging Needs to Support Zero-Emission Vehicles in 2030 and 2035.* For passenger vehicles, the report projects that California will need 1 million public and shared-private chargers by 2030 and 2.1 million chargers by 2035. The report also highlighted an alternative scenario for light-duty vehicles that assumed drivers would rely more heavily on fast charging. Under this alternative scenario, the total number of chargers would fall from 1 million to 660,000 chargers in 2030. For medium- and heavy-duty plug-in electric vehicles, the report finds that California will need 114,500 chargers by 2030 and 155,000 chargers by 2035.

The CEC estimates that California will have more than 359,000 light-duty vehicle chargers in the coming years, of which 25,000 are direct-current fast chargers (Table ES-1).

In January 2025, the CEC published the draft version of the *2024 Zero-Emission Vehicle Infrastructure Plan*. The report assesses the current state of ZEV infrastructure, including the number of operational and future planned charging and hydrogen fueling infrastructure and discusses a deployment strategy for Clean Transportation Program funding. The CEC encourages stakeholders to provide input through the Zero-Emission Vehicle Infrastructure Plan into whether the state goal for charger deployment should assume a greater reliance on fast charging.

Ensuring a reliable charging experience is critical to encouraging wider adoption of electric vehicles. Assembly Bill 2061 (Ting, Chapter 345, Statutes of 2022) and Assembly Bill 126 require the CEC to take certain steps to improve charger reliability. The CEC released a draft staff report, *Tracking California's Electric Vehicle Chargers: Regulations for Improved Inventory, Utilization, and Reliability Reporting*, in September 2023 and held a workshop on the related rulemaking in October 2023. Staff released a second draft of the staff report and held a workshop in April 2024 to receive further public feedback. The CEC has taken other steps, including reliability requirements in all funding opportunities since late 2021 and contracting a large field study to test publicly available chargers operating in California.

The CEC also analyzes hydrogen fuel cell electric vehicle (FCEV) infrastructure needs. Recent analyses include the *Joint Agency Staff Report on Assembly Bill 8: 2023 Annual Assessment of the Hydrogen Refueling Network in California* and the *2023 Staff Report on Senate Bill 643*. These reports assess the existing and planned refueling infrastructure for light-, medium-, and heavy-duty FCEVs in California. Analyses also assess clean hydrogen production, off-road uses for hydrogen, and global developments in the hydrogen sector. As of October 2024, between

public and private investments, staff anticipates that California will have 129 open retail hydrogen refueling stations. This number includes seven stations that will serve light-, medium-, and heavy-duty vehicles. The total number of open retail stations includes stations that are considered temporarily nonoperational. As of September 2024, nearly 30 percent of California's open retail stations had been nonoperational for over 30 days.

Similar to charging stations, ensuring a reliable hydrogen refueling station experience is critical. Low station reliability can be caused by equipment failures, supply chain constraints, and hydrogen supply disruptions. The CEC is considering ways to improve station reliability and ensure there is sufficient infrastructure to support fuel cell drivers today and into the future. For example, following a solicitation in November 2023, two projects were approved for awards at the CEC business meeting in May 2024 to support hydrogen refueling station operations and maintenance at 45 existing stations.

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)*	137,648	14,708	152,356	62
Number of Chargers/Fueling Stations for Which Funding Has Been Allocated (includes anticipated funding from Clean Transportation Program)†	196,354	10,416	206,770	67
Total	334,002	25,124	359,126	129**
2025 Goal (Executive Order B-48-18)	*240,000*	*10,000*	*250,000*	*200*
Gap From Near-Term Goal	0	0	0	81
AB 2127 Second Assessment 2030 Estimate of Charging Needs	*969,505*	*39,340*	*1,008,845*	-
Gap From 2030 Estimates	635,503	14,216	649,719	-

*** Existing charging ports estimated based on available data from U.S. Department of Energy's Alternative Fuels Data Center, PlugShare, grant recipient reporting, and surveys to electric vehicle network service providers, utilities, and public agencies in California.**

† Estimate of ports from other state programs derived from public presentations and statements by utilities, CPUC, CARB, other entities, and the CEC. Includes an estimate of Level 2 chargers resulting from CalGreen code. 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. Also includes federal NEVI funding. The estimated number of chargers and fueling stations could change as solicitations are released. Does not include charger estimates from the CPUC's transportation electrification program, which has already installed 18,193 Level 2 and 2,224 DC fast chargers as of September 2024.

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

Source: California Energy Commission

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 invests in a wide array of infrastructure categories, including electric vehicle charging infrastructure. The $5 billion National Electric Vehicle Infrastructure (NEVI) Formula Program will accelerate EV infrastructure deployment nationally. California's share of NEVI funding is expected to be $384 million, allocated over five years. In June 2024, the CEC announced proposed awards for the first competitive grant solicitation in California for distributing NEVI formula funds. Proposed awards total $37.7 million for 11 projects that will install nearly 500 DC fast charging ports at 70 new public stations.

The Infrastructure Investment and Jobs Act includes an additional $2.5 billion nationally to fund EV and hydrogen infrastructure on a competitive basis. In August 2024, the federal government announced that California, Oregon, and Washington would receive $102 million for their tri-state application to build a charging and hydrogen refueling corridor for medium- and heavy-duty ZEVs.

Recent State Budget Support for ZEV Infrastructure

The Budget Acts of 2021 and 2022 included a multiyear plan that added billions of General Fund dollars for zero-emission transportation and related activities, allocated to several agencies, including the CEC. The budget agreements planned additional funds for future fiscal years, subject to future Budget Act appropriations for each year. The Budget Act of 2023 adjusted the plan, including reassigning most allocations from the General Fund to the Greenhouse Gas Reduction Fund.

Fiscal Year 2024–2025 State Budget

To address an anticipated significant budget shortfall, the 2024 budget agreement did not include Greenhouse Gas Reduction Fund or General Fund allocations for the CEC's ZEV Climate Package in Fiscal Year 2024–2025. However, the 2024 budget agreement projected that ZEV Climate Package funding, which supplements the base Clean Transportation Program funding, will be available in Fiscal Years 2025–2026, 2026–2027, and 2027–2028, reflected in Table ES-3. Also, ZEV projects continue to be delivered using the $1.5 billion allocated in the Climate Package from 2021 through 2023.

Funding Allocations for 2024–2025 and Beyond

The Investment Plan Update includes the base Clean Transportation Program funding and the additional ZEV Climate Package investments, which draw from the General Fund and Greenhouse Gas Reduction Fund. Table ES-2 explains the Clean Transportation Program base funding allocations by category. The CEC can only make category allocations with base Clean Transportation Program funding; funding categories in the Budget Act of 2024 are set in law and cannot be modified.

Funding allocations for the *2024–2025 Investment Plan Update* have changed significantly from the multiyear allocations in the *2023–2024 Investment Plan Update*. General Fund and

Greenhouse Gas Reduction Fund allocations are subject to change with development of future state budgets.

CEC staff worked to balance diverse public comments when refining the funding allocations. The Investment Plan is not the last step in determining how funds will be spent. The CEC gathers public feedback, such as through workshops, when developing individual solicitations. However, the CEC also received feedback from interested and affected groups about details within each funding category that will be considered during solicitation development, including:

- For the light-duty EV charging category, consider Level 1 charging; prioritize low-income and multifamily home charger access; provide equitable access for rural communities; and be attentive to prices for charging, especially for lower-income families.
- For medium- and heavy-duty infrastructure, focus on certain sectors such as transit.
- Mixed comments on the hydrogen category, especially about whether to build more hydrogen stations for light-duty vehicles.
- For workforce development, focus on registered apprenticeships; consider including the manufacturing sector; coordinate more with other agencies; and gather more data about workforce gaps.

Table ES-2 shows allocations including $40 million to support light-duty charging infrastructure, $38.2 million for medium- and heavy-duty infrastructure, and $15 million for hydrogen refueling infrastructure for Fiscal Year 2024–2025. Table ES-3 shows projected future allocations of Greenhouse Gas Reduction Fund and General Fund as of the 2024 budget agreement. Because of potential budget uncertainty around future ZEV Climate Package funds, the CEC is not currently proposing base Clean Transportation Program allocations for Fiscal Years 2025–2026, 2026–2027, or 2027–2028. Base fund allocations for those fiscal years will be proposed in future Investment Plan Updates when the budget context is clearer.

The Investment Plan allocates $38.2 million of base Clean Transportation Program funding for medium- and heavy-duty ZEV infrastructure for Fiscal Year 2024–2025. These funds will support the deployment of ZEV trucks, school buses, and other medium- and heavy-duty vehicles within the state. 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. In addition to grant funding, the CEC is working with partner agencies and exploring alternative funding mechanisms, such as loan financing.

At the same time, there must be continued infrastructure investments to support light-duty passenger vehicles, particularly for equitable outcomes. The Investment Plan allocates $40.0 million of base Clean Transportation Program funding for light-duty ZEV charging infrastructure for Fiscal Year 2024–2025. Combined with previous investments from the Clean Transportation Program, other public investments, and private match funding, the funding from this Investment Plan should be sufficient to meet the state's goal of having 250,000 chargers.

Assembly Bill 126 directs the CEC to allocate at least 15 percent of Clean Transportation Program base funds per year for hydrogen infrastructure and issue a solicitation at least annually and 90 days after the start of the fiscal year. If hydrogen grant funding solicitations are undersubscribed, the CEC is authorized to reallocate the funding. The CEC will work closely with CARB and the stakeholder community to tailor investments to support current and expected fuel cell drivers to access convenient and reliable hydrogen refueling.

The Investment Plan also allocates $2 million of Clean Transportation Program funding for Fiscal Year 2024–2025 to support ZEV workforce development, prioritizing members of disadvantaged and low-income communities.

Tables ES-2 and ES-3 do not include federal NEVI formula funds (about $163 million for the remaining two fiscal years of the program) for charging along highways and interstates.

Table ES-2: Clean Transportation Program Base Fund Allocations for Fiscal Year 2024–2025 (in Millions)

Category	Eligible Fuel Types	Funding Source	2024–2025
Light-Duty Charging Infrastructure	Electric	Clean Transportation Program (Base)	$40.0
Medium- and Heavy-Duty ZEV Infrastructure	Electric, Hydrogen	Base	$38.2
Hydrogen Refueling*	Hydrogen	Base	$15.0
Workforce Training and Development	Electric, Hydrogen	Base	$2.0
		Total Base	**$95.2**

*** Open to light-, medium-, and heavy-duty vehicle infrastructure projects, including mixed-use hydrogen stations. AB 126 requires the CEC to spend at least 15 percent of Clean Transportation Program base funds per year on hydrogen infrastructure through 2030.**

Source: California Energy Commission

Table ES-3: Estimated Investment Plan Allocations for Future Fiscal Years (in Millions)

Category	Eligible Fuel Types	Funding Source	2025–2026	2026–2027	2027–2028
Light-Duty Charging Infrastructure	Electric	Clean Transportation Program (Base)*	-	-	-
Light-Duty Charging Infrastructure	Electric	Greenhouse Gas Reduction Fund (GGRF)	$140	$80	$219
Equitable At-Home Charging	Electric	GGRF	$60	$40	$80
Medium- and Heavy-Duty ZEV Infrastructure	Electric, Hydrogen	Base*	-	-	-
Drayage Truck Infrastructure	Electric, Hydrogen	GGRF	$50	$49	$50
School Bus Infrastructure	Electric	General Fund	$125	-	-
Clean Truck, Bus, and Off-Road Equipment Infrastructure	Electric, Hydrogen	GGRF	$89	-	$137
Port ZEV Infrastructure	Electric, Hydrogen	GGRF	-	$130	-
Emerging Opportunities	Electric, Hydrogen	GGRF	$46	-	-
Hydrogen Refueling	Hydrogen	Base*	-	-	-
Workforce Training and Development	Electric, Hydrogen	Base*	-	-	-
		Total Base*	**-**	**-**	**-**
		Total GGRF, General Fund, and Reimbursements	**$510**	**$299**	**$486**

Available amounts may differ as future budgets are finalized. These figures do not include administrative costs for general funds in Fiscal Year 2025–2026. However, GGRF figures for Fiscal Years 2025–2026, 2026–2027, and 2027–2028 include administrative costs. Those GGRF allocations will be reduced for administrative costs following direction in future budget acts. The CEC may use unused administrative costs to fund additional projects within each funding allocation.

*** Because of budget uncertainty affecting other related funding, the CEC is not currently proposing allocations for Clean Transportation Program base funds for future fiscal years. However, the CEC expects $95.2 million in base funds to be available in each of Fiscal Years 2025–2026, 2026–2027, and 2027–2028.**

Source: California Energy Commission

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.[1] Senate Bill (SB) 32 established a goal of 40 percent below 1990 levels by 2030.[2] Assembly Bill (AB) 1279 established a goal to achieve carbon neutrality as soon as possible, no later than 2045, and achieve and maintain net-negative emissions thereafter.[3]

The state's efforts to address the climate crisis are showing progress, including in the transportation sector. GHG emissions from transportation decreased in recent years and more sharply in 2020, as Californians reduced travel because of the COVID-19 pandemic, before rebounding somewhat. 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 2021.[4]

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.[5] Figure 1 shows how diesel particulate matter disproportionately burdens low-income and minority residents. 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 2031 and 2037 will require significant reductions of nitrogen oxide emissions in parts of the state.[6]

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

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

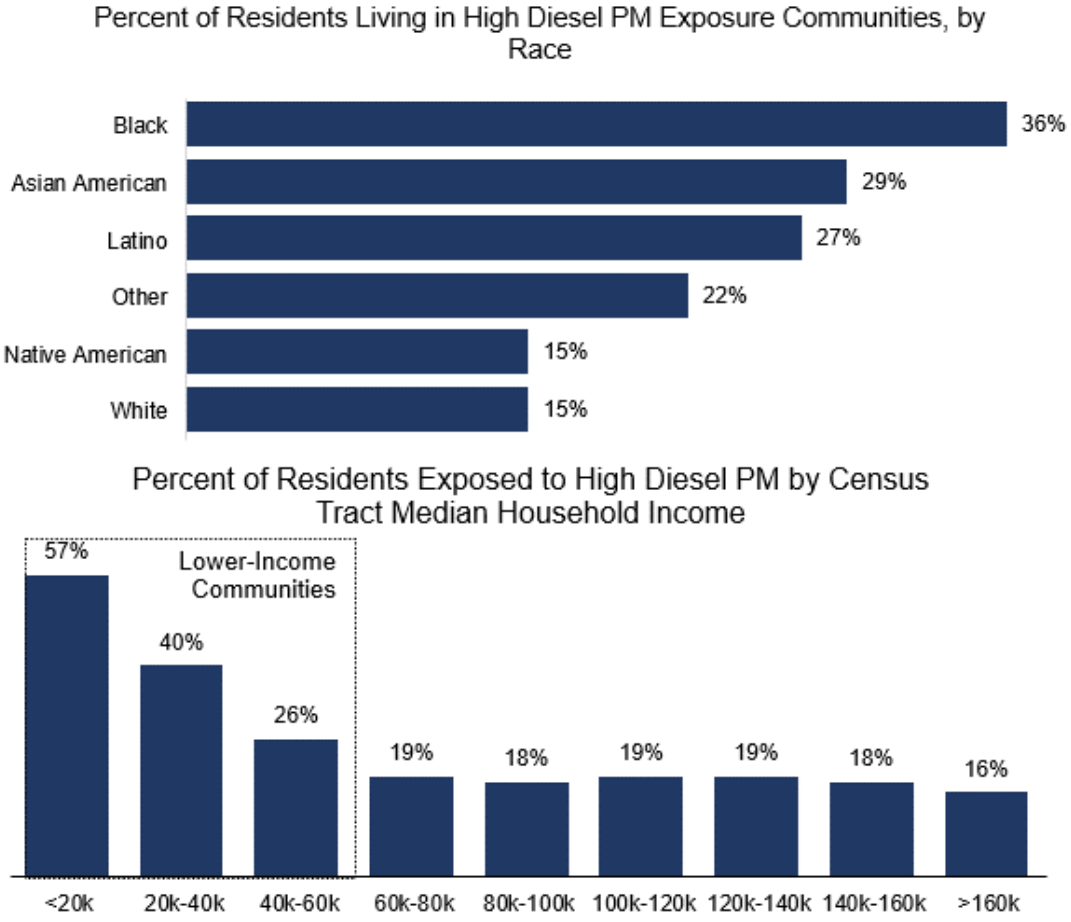
3 Assembly Bill 1279 (Muratsuchi, Chapter 337, Statutes of 2022). Accessed November 4, 2024. Available at https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=202120220AB1279.

4 California Air Resources Board. December 14, 2023. *California Greenhouse Gas Emissions for 2000 to 2021: Trends of Emissions and Other Indicators.* Accessed July 30, 2024. Available at https://ww2.arb.ca.gov/sites/default/files/classic/cc/inventory/2000-2020_ghg_inventory_trends.pdf.

5 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.

6 Ibid.

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



"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 of) diesel PM emissions come from vehicles.

Source: CEC analysis of census and CalEnviroScreen 2021 data

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 more than 2.1 million ZEVs or plug-in hybrids sold through the third quarter of 2024. More than one-quarter (26.4 percent) of new light-duty sales were ZEVs or plug-in hybrids in the third quarter of 2024.

The California Energy Commission (CEC) is the lead agency on ZEV infrastructure investment and analysis. 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, which the CEC administers. With funds collected from vehicle 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)

extended the collection of fees that support the Clean Transportation Program to January 1, 2024.

Assembly Bill 126 (Reyes, Chapter 319, Statutes of 2023) extended the program to July 1, 2035. The bill changed and added several requirements for the program, including:

- Focusing program investments into zero-emission technology projects, where feasible, and near-zero-emission projects elsewhere.
- Requiring awardees of funding for hydrogen fueling stations and electric vehicle (EV) charging stations to report fuel carbon intensity, operational, reliability, and uptime data to the CEC.
- Reserving at least 15 percent of Clean Transportation Program funds for light-, medium-, or heavy-duty hydrogen vehicle refueling.

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 *2024–2025 Investment Plan Update* covers Clean Transportation Program investments for Fiscal Year (FY) 2024–2025. It also includes projected Greenhouse Gas Reduction Fund and general funds through FY 2027–2028. 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. The CEC engages in a rigorous public process to evaluate whether the allocations should be adjusted.

This *2024–2025 Investment Plan Update* is the sixteenth Investment Plan in the history of the Clean Transportation Program and builds on the analyses and recommendations contained in prior documents. The commission report is the final version of the *2024–2025 Investment Plan Update* and was adopted at the December 11, 2024, business meeting. As part of developing the *2024–2025 Investment Plan Update,* the CEC consulted with the Disadvantaged Communities Advisory Group and held two public meetings with the Clean Transportation Program Advisory Committee. 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 Investment Plan drafts during these meetings and through the CEC's docket system.[7]

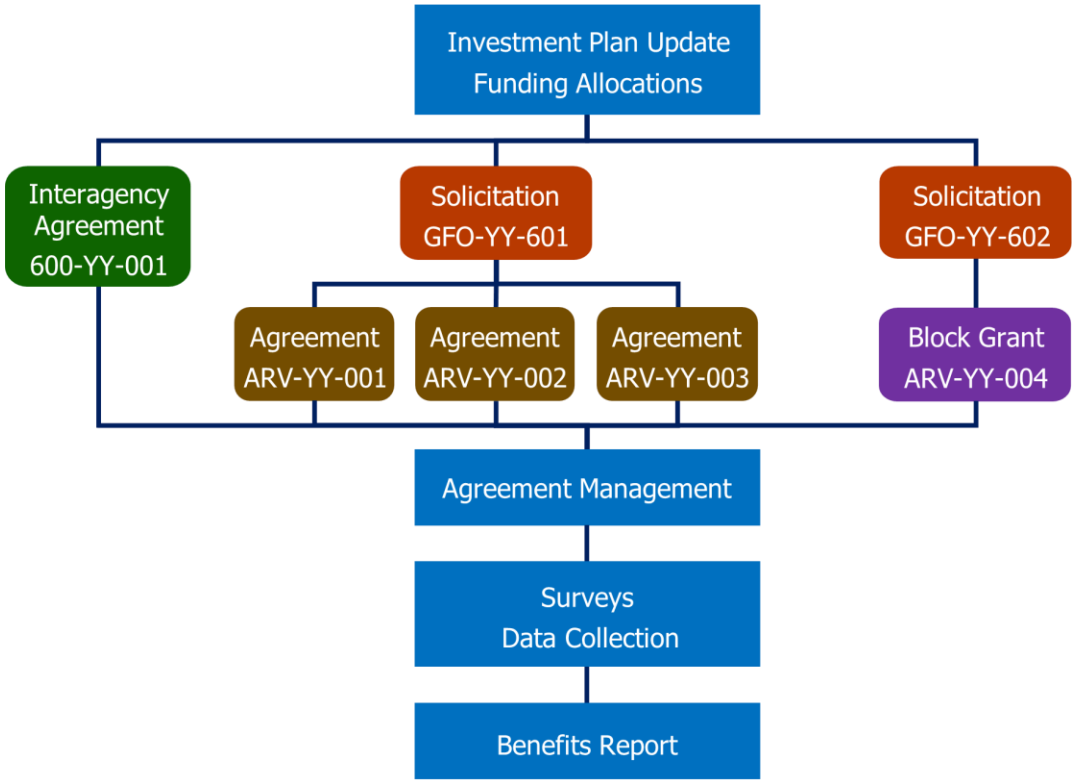
7 The Energy Commission's docket for the *2024–2025 Investment Plan Update for the Clean Transportation Program* (Docket #24-ALT-01) can be found at https://efiling.energy.ca.gov/Lists/DocketLog.aspx?docketnumber=24-ALT-01.

CHAPTER 2:
Context of the *2024–2025 Investment Plan*

Implementing the Clean Transportation Program

The Investment Plan is a high-level document and typically does not determine specific funding solicitations or grant programs. After the Investment Plan is approved, the CEC issues funding opportunities following the allocations in the plan. Based on the results of these solicitations, CEC staff develops and oversees funding agreements according to the respective schedules, budgets, scopes of work, and terms and conditions. Finally, staff compiles data from the agreements and reports how projects have benefited the state.

Figure 2: Schematic of the Clean Transportation Program Implementation



Source: California Energy Commission

Description of Funding Mechanisms

The CEC has primarily used grants to distribute funding, selecting awardees through competitive solicitations. However, the CEC considers several funding mechanisms when developing the funding implementation strategy for each allocation. Funding mechanisms used for the Clean Transportation Program include the following:

- **Competitive solicitation for grants** — This is the most common funding mechanism in the Clean Transportation Program. 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, which are 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.
- **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 —** The CEC has recently partnered with CARB and the California Pollution Control Financing Authority on a loan program for ZEV infrastructure. The CEC has received feedback encouraging more loan programs, and staff will continue to explore loans and other financing options.

Recent feedback has also encouraged the CEC to release recurring funding solicitations on a more consistent schedule. The CEC is looking into implementing this request for certain recurring funding opportunities.

Program Outreach and Engagement

The CEC seeks to increase the participation of disadvantaged and underrepresented communities from diverse geographical regions and populations. The CEC also seeks to effectively engage communities disproportionately burdened by pollution and improve economic resiliency, including in rural and tribal communities. These efforts include:

- Refreshing the Clean Transportation Program Advisory Committee in 2020 and 2024 to better reflect California communities and increase representation of program beneficiaries, environmental justice communities, rural communities, tribes, and others.
- Consulting with the Disadvantaged Communities Advisory Group (DACAG)[8] for guidance and recommendations on program effectiveness as it relates to disadvantaged communities and other vulnerable and underrepresented groups. In 2024, staff met with DACAG subject matter experts to discuss charger reliability regulations, the ZEV Workforce Training and Development Strategy, the Clean Transportation Program Investment Plan, and community benefits. Staff also continued engaging with the DACAG on the Investment Plan, AB 2127 report, technical assistance solicitation, and NEVI funding by presenting at full DACAG meetings.
- Consulting with the CEC's Tribal Program and the Tribal Lead Commissioner for assistance with outreach and promotion of funding opportunities to tribes.

8 More information available on the Disadvantaged Communities Advisory Group Page, https://www.energy.ca.gov/about/campaigns/equity-and-diversity/disadvantaged-communities-advisory-group.

- Developing methods for measuring and tracking how CEC-funded projects benefit communities. CEC staff held two public workshops and four listening sessions to share and seek public feedback on a proposed framework for community benefits, including metrics for tracking the progress of those benefits. The CEC expects to track expenditures for programs and projects that directly benefit or serve low-income Californians or residents of disadvantaged- or low-income communities per Assembly Bill 126 requirements.
- Working to engage nonprofit organizations. Nonprofits are often eligible for program grants, including grants to fund installing charging infrastructure, and property owned by nonprofit organizations (such as faith-based organizations and community groups) can serve as sites for EV charging. Many Clean Transportation Program solicitations require or provide additional points when community-based organizations are supporting and engaged in a project. The CEC is exploring additional strategies to support nonprofit organizations in ZEV infrastructure deployment.
- Developing a solicitation to provide technical assistance for communities and applicants pursuing state and federal funding for ZEV infrastructure. The solicitation is intended to help applicants overcome challenges such as limited staff resources or limited experience identifying and seeking grant funding. Potential beneficiaries include California Native American tribes and low-income and disadvantaged communities. Following a public workshop in March 2024, the CEC released the technical assistance solicitation in November 2024.

Highlights of Investments

As of July 2024, the CEC has provided about $2.3 billion through the Clean Transportation Program. This figure includes the base Clean Transportation Program funds and recent Greenhouse Gas Reduction Funds and general funds. Many projects are in progress, with ongoing siting, installation, construction, and demonstrations. Table 1 summarizes program investments, including the following highlights:

- Installed or planned[9] more than 34,700 chargers for plug-in electric vehicles, focused on public and shared-private Level 2 and Level 1 chargers and public and fleet DC fast chargers along highway corridors and urban metropolitan areas.
- Approved up to $500 million for two light-duty EV charging infrastructure block grants.
- Released new solicitations targeting high-priority or underserved EV charging needs, including grid integration, multifamily housing, and rural communities.
- Released new solicitations to expand innovative and interoperable charging opportunities.
- Allocated funding for 96 publicly available hydrogen fueling stations (as of October 2024). Of these stations, eight will be capable of serving medium- and heavy-duty vehicles, as well as passenger vehicles. There are also 33 privately funded stations (16

9 For block grants, "planned" chargers are those with rebate funding reserved.

privately funded stations under CEC agreement and 17 outside any CEC agreement), some open and some under development. California is on track to meet the previous AB 8 requirement of 100 stations. As of July 2024, 44 light-duty hydrogen fueling stations were open for customers in California. An additional 18 stations were temporarily nonoperational (unavailable for more than 30 days), bringing the total number of open retail stations to 62.

- Funded six projects to produce 100 percent renewable hydrogen from in-state renewable resources. The hydrogen will be used for on-road fuel cell electric vehicles (FCEVs), both light-duty and medium-/heavy-duty.
- Awarded 250 projects providing more than $129 million[10] in infrastructure incentives through the nation's first commercial vehicle fleet incentive project, titled "EnergIIZE Commercial Vehicles," to accelerate deployment of electric and hydrogen infrastructure needed to fuel zero-emission trucks, buses, and equipment. The multiyear project, approved for up to $544 million, will help communities most impacted by transportation-related pollution by meeting essential infrastructure needs and requires 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 40 manufacturing projects to date that support in-state economic growth. The CEC is overseeing agreements for in-state ZEV manufacturing projects using prior funding from the General Fund. Furthermore, from this same one-time funding, the PowerForward block grant project with CALSTART[11] will solicit and develop subawards for battery manufacturing 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.

10 CALSTART. "EnergIIZE Monitoring Dashboard." Accessed March 13, 2024. Available at https://calstartorg.maps.arcgis.com/apps/dashboards/93ba3501edad4f51beb4d8d4dda46647.

11 A national nonprofit consortium that provides third-party analysis of clean vehicles, technologies, and fuels.

Table 1: Clean Transportation Program Investments as of July 2024

Funded Activity	Cumulative Awards to Date (in Millions)*	# of Projects or Units
Alternative Fuel Production		
Biomethane Production	$77.67	29 Projects
Gasoline Substitutes Production	$26.94	14 Projects
Diesel Substitutes Production	$64.12	25 Projects
Renewable Hydrogen Production	$21.93	6 Projects
Alternative Fuel Infrastructure		
Electric Vehicle Charging Infrastructure†	$588.91	34,756 chargers
Light-Duty Hydrogen Fueling Infrastructure (Including Operations and Maintenance)	$233.70	96 Public Fueling Stations
Medium- and Heavy-Duty ZEV Infrastructure	$643.58	390 Projects
E85 Fueling Infrastructure	$3.61	21 Fueling Stations
Upstream Biodiesel Infrastructure	$6.98	7 Infrastructure Sites
Natural Gas Fueling Infrastructure	$23.80	70 Fueling Stations
Alternative Fuel and Advanced Technology Vehicles		
Alternative fuel vehicle and ZEV demonstration and deployment	$245.31	14,516+ Natural Gas, Propane, Hybrid and ZEVs and 54 Demonstrations
Related Needs and Opportunities		
Manufacturing	$278.04	40 Manufacturing Projects
Workforce Training and Development	$44.21	32,000 Trainees
Fuel Standards and Equipment Certification	$4.95	2 Projects
Sustainability Studies	$2.04	2 Projects
Regional Alternative Fuel Readiness	$17.61	86 Regional Plans
Centers for Alternative Fuels	$5.41	5 Centers
Technical Assistance and Program Evaluation	$17.52	N/A
Total	**$2.31 Billion**	**-**

*** 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.**

† Some of these funds have been awarded to the block grants CALeVIP 1.0, CALeVIP 2.0, and Communities in Charge but have not yet been assigned to individual chargers. The number of chargers built with these awarded funds will continue to rise as the block grants dispense these funds.

Source: California Energy Commission

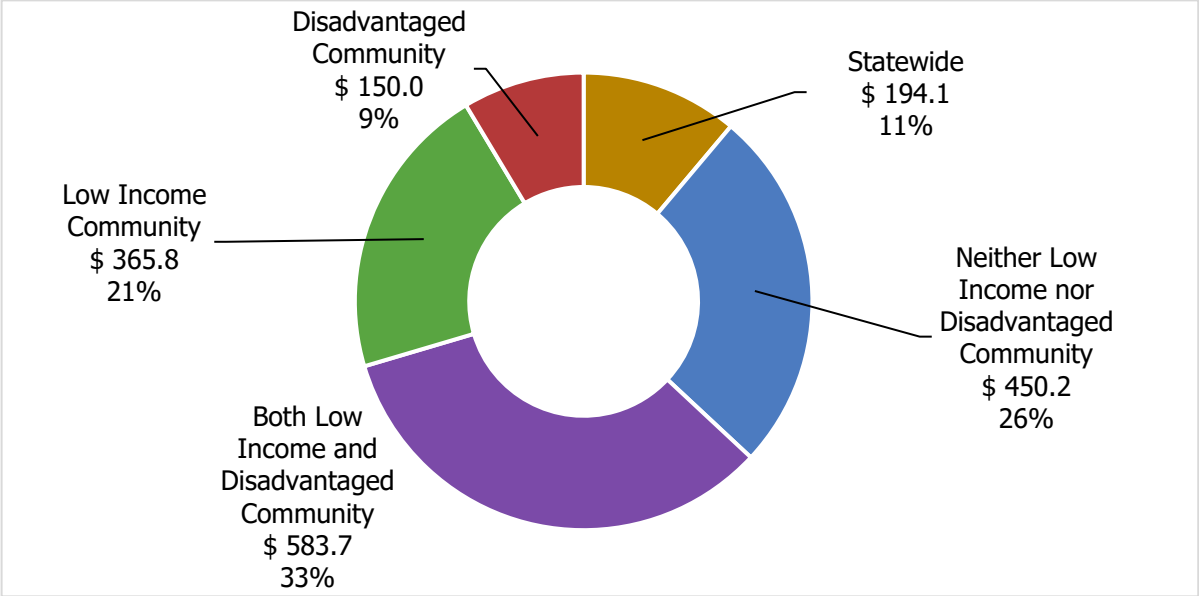
Using funds from the Clean Transportation Program, the CEC has also leveraged more than $1.25 billion in private and other public funds. This amount is only the minimal, contractually obligated amount of match funding provided toward Clean Transportation Program projects; the actual amount of investment prompted by 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 3, through July 2024, 63 percent of funds have gone to projects in disadvantaged or low-income communities or both.

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. For the Clean Transportation Program, the CEC seeks to invest more than 50 percent of funding to support projects benefiting low-income and disadvantaged communities. AB 126 formally requires this goal to be met starting January 1, 2025.

Figure 3: Clean Transportation Program Funding in Disadvantaged and Low-Income Communities (in Millions)



Totals may not match due to rounding. Includes investments from the beginning of the Clean Transportation Program through July 2024. "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. These designations require projects to be located in a specific area; "statewide" projects are not considered to be in disadvantaged or low-income communities.

Source: California Energy Commission

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.

Related Policies and Goals

The CEC's implementation of the Clean Transportation Program reflects numerous policies and goals. Table 2 highlights examples of the significant policy goals and milestones developed to reduce emissions and petroleum use in California while advancing equity. 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 and Milestones
Senate Bill 32	Reduce GHG emissions to 40 percent below 1990 levels by 2030
Assembly Bill 1279	Achieve carbon neutrality by 2045
Assembly Bill 1279	Reduce GHG emissions to 85 percent below 1990 levels and net-zero-GHG emissions by 2045
Low Carbon Fuel Standard Regulation (CARB)	Reduce carbon intensity of transportation fuels in California by 20 percent by 2030 Increase zero-emission vehicle infrastructure. The LCFS allows station owners and charger owners to generate credits based on dispensed fuel. Publicly accessible light-duty hydrogen fueling stations and DC fast chargers can generate more credits based on the unused capacity of the station or charger. ZEV forklifts, electric cargo-handling equipment, shore power to ocean-going vessels at berth, fixed guideway transit systems, and electric transportation refrigeration units can also generate credits.
Clean Air Act; California State Implementation Plans	80 percent reduction in NOx by 2031
Senate Bill 1275	Establishes the Charge Ahead California Initiative to increase the number of zero-emission and near zero-emission vehicles on California's roads and to increase access to these vehicles for lower-income Californians and priority populations.
Executive Order B-16-2012; Executive Order B-48-18; Executive Order N-79-20	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 (CARB)	100% of all new passenger cars sales in California will be zero-emission by Model Year 2035, including 35% by Model Year 2026 and 68% by 2030. The regulation includes plug-in hybrids in the zero-emission category. Includes minimum range requirements, durability and warranty provisions, charging standardization, and data transparency for ZEVs
Innovative Clean Transit Regulation (CARB)	100 percent of all new transit buses will be zero-emission by 2029, and all operating buses by 2040.
Advanced Clean Trucks Regulation (CARB)	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.

Policy Origin	Objectives and Milestones
Advanced Clean Fleets Regulation (CARB)	Requires state and local government fleets, drayage trucks, high-priority fleets, and federal fleets to phase in medium- and heavy-duty ZEVs over time Sets a clear end date for new internal combustion–powered medium- and heavy-duty vehicle sales in California by 2036

Source: California Energy Commission, California Air Resources Board

SB 350 and the Disadvantaged Communities Advisory Group

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

On November 17, 2023, the DACAG provided comments on the *2023–2024 Investment Plan Update.*[12] Recommendations from the DACAG 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 continue to have the opportunity to, and are encouraged to, provide recommendations for future Investment Plans.

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

Recommendations	Actions Taken by CEC
Moving 100 percent of program funding toward zero-emission fuels.	Continued to support the emerging revolution in the transportation sector with significant investments in zero-emission vehicle infrastructure (both battery-electric and hydrogen fuel cell). For FY 2024–2025, 100% of base funding is allocated toward zero-emission categories.
Funding projects exclusively in and benefiting disadvantaged communities.	Committed to seeking to award at least 50 percent of funding to support projects benefiting low-income and disadvantaged communities for the remainder of the Clean Transportation program. The CEC recently released the EnergIIZE EV Jump Start funding lane and the CALeVIP 2.0 Golden State Priority Project, which are focused on supporting disadvantaged communities through equitable projects. As of July 2024, CALeVIP 2.0 has funded only projects in low-income or disadvantaged communities. Staff is working to better define, measure, track, and increase community benefits from the Clean Transportation Program.

12 SB 350 Disadvantaged Communities Advisory Group. "FY 2023-24 CTP Investment Plan DACAG Comment Letter," written on November 17, 2023, and submitted December 4, 2023, to Docket 23-ALT-01, TN# 253507. Available at https://efiling.energy.ca.gov/Lists/DocketLog.aspx?docketnumber=23-ALT-01.

Recommendations	Actions Taken by CEC
Expanding the definition of disadvantaged communities beyond the CalEnviroScreen definition.	Expanded solicitation eligibility and statutory change to Clean Transportation Program to explicitly include California Native American tribes. 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.
Increasing transparency and tracking expanded metrics to measure how projects "benefit" disadvantaged communities.	Continued to work with the CEC's Public Advisor's Office to inform and receive input from the 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. An internal data team has been established to develop standardized performance metrics across programs.
Prioritizing and investing in community outreach and engagement.	1) Explicitly included scoring criteria for various funding solicitations that emphasize location in disadvantaged and low-income communities and development of an equity outreach and engagement plan[13] 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. Staff has also hosted numerous community listening sessions to receive focused feedback on upcoming programs. These activities are in addition to continued engagement with the DACAG and its transportation experts.
Continuing investments in workforce training and development and evaluating job quality and access.	Dedicated Clean Transportation Program funding allocations to expanding workforce training and development, including community-based workforce training and development projects in and near ZEV deployments in priority communities. Staff has incorporated job quality and quantity assessments into solicitations. The CEC also developed a ZEV Workforce Training and Development Strategy to identify workforce program objectives.
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. The CEC refreshed the committee again in 2024, with multiple community-based, faith-based, and environmental justice organizations.

13 One example: "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.

Recommendations	Actions Taken by CEC
Prioritizing investments in the medium- and heavy-duty vehicle categories and target disadvantaged communities.	Increased funding allocations for these activities 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. Staff is also considering shifting NEVI formula funds to truck charging. This proposal was discussed at a public workshop May 10, 2024 and the May 2024 DACAG meeting.
Requiring the use of green hydrogen in all hydrogen projects and conducting equity, economic, and carbon life-cycle analysis on investments.	Developed a more intentional set of criteria for hydrogen funding. Projects producing hydrogen or using hydrogen directly from renewable sources will be given preference. Project proposals with book-and-claim-type sourcing will receive lower priority. Other criteria that may be evaluated and scored include providing high-quality job opportunities and high benefit-cost scores.
Aligning charger deployment plans with the findings of the AB 2127 report to ensure equitable infrastructure.	Offered funding opportunities to install chargers at community centers, rural areas, multifamily housing, and disadvantaged and low-income communities. Relevant grants include Communities in Charge, Reliable, Equitable, and Accessible Charging for Multifamily Housing (REACH), Rural Electric Vehicle (REV) Charging, CALeVIP: Golden State, and EnergIIZE: EV Jump Start.
Pushing forward zero-emission solutions in the offroad sector, especially for large facilities impacting disadvantaged communities, such as ports.	Developed the Advanced Technology Demonstration and Pilot Project solicitation with CARB. Eligible projects include zero-emission equipment and off-road vehicles. On July 16, 2024, staff held a public workshop to present concepts for solicitations on medium- and heavy-duty infrastructure. Proposed projects included ZEV charging and refueling infrastructure for agriculture, construction, and port equipment.

Source: California Energy Commission

Complementary Funding Programs

Federal Funding

National Electric Vehicle Infrastructure (NEVI) Formula Program

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 new investments in a wide array of infrastructure categories. Of particular interest to the Clean Transportation Program, electric vehicle charging infrastructure receives significant new funding, with $5 billion to accelerate EV infrastructure deployment nationally from a program titled the National Electric Vehicle Infrastructure (NEVI) Formula Program. California's share is expected to be $384 million, allocated over five years. The CEC is collaborating with the California Department of Transportation (Caltrans) to administer the funds.

The NEVI formula program is intended 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. A key goal 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 June 3, 2024, the CEC released the notice of proposed awards (NOPA) for the first competitive grant solicitation in California for distributing NEVI formula funds, GFO-23-601. Proposed awards total $37.7 million for 11 projects that will install nearly 500 DC fast charging ports at 70 new public stations. The projects have been presented starting at the September 2024 business meeting.

Subsequent NEVI deployment plans will reevaluate NEVI formula funding investments across segments and continue evaluating the funding in the context of the broader set of state and federal investments in light-, medium-, 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, hydrogen refueling, and other alternative-fuel infrastructure along corridors and in communities. This authorization is intended to complement the NEVI formula program, which focuses on long-distance travel between communities.

In June 2023, Caltrans, the CEC, Oregon Department of Transportation, and Washington State Department of Transportation jointly applied to the first round of the U.S. Department of Transportation's Charging and Fueling Infrastructure (CFI) Discretionary Grant Program. The application was to create a West Coast Truck Charging and Fueling Corridor Project, which would support charging and hydrogen fueling infrastructure for trucks from Mexico to Canada along Interstate 5 and corridors connecting to key port and freight centers along the West Coast. While the project was not selected for the first round of funding, the CEC and partner agencies submitted the application for reconsideration (with no changes permitted) when more funds were made available in 2024. In August 2024, the federal government announced that California, Oregon, and Washington had been awarded $102 million for their tri-state application. The CEC and partner agencies also plan to submit two new applications under Round 2.

Since the first round of the CFI program, the Joint Office of Energy and Transportation released the National Zero-Emission Freight Corridor Strategy in March 2024. The strategy outlines four phases for recommended zero-emission freight charging and fueling development between now and 2040 to achieve a complete network. The goal for Phase 1 is to establish infrastructure at key freight hubs. California's CFI applications for Round 2 are designed to align with this strategy.

Electric Vehicle Charger Reliability and Accessibility Accelerator Program

The Electric Vehicle Charger Reliability and Accessibility Accelerator (EVC RAA) is another program under the Infrastructure Investment and Jobs Act. The EVC RAA is an initiative to fix or replace nonfunctional EV charging stations and, in the process, bring some older stations into compliance with recent minimum standards established under the NEVI formula program. The EVC RAA aims to address the issue of existing, publicly available chargers that are

temporarily out of service, creating inconvenience and range anxiety for EV drivers.[14] By addressing reliability and accessibility challenges, the EVC RAA program is hoped to spur wider adoption of electric vehicles.

On January 18, 2024, the Federal Highway Administration approved California's EVC RAA program application, awarding Caltrans $63.7 million in federal funding to repair or replace and install an estimated 1,302 charging ports. The CEC is collaborating with Caltrans on charging infrastructure deployment and has entered into an interagency agreement with Caltrans to administer California's EVC RAA program.

The CEC and Caltrans plan to leverage the CEC's existing grant solicitation process to distribute California's EVC RAA funds. The CEC released the EVC RAA solicitation in October 2024, with almost $60 million available.

Climate Pollution Reduction Grants

The Inflation Reduction Act of 2022 (Public Law 117-169), the largest climate and clean-energy legislation ever adopted in the United States, includes a Climate Pollution Reduction Grants program administered by the U.S. EPA. In July 2024, the U.S. EPA awarded $500 million to the South Coast Air Quality Management District for clean freight projects in Southern California. The grant includes four categories of zero-emission technologies and is expected to fund more than 1,000 chargers for medium- and heavy-duty vehicles, in addition to deploying 800 medium- and heavy-duty EVs and 18 electric locomotives.[15]

Other State Funding

California Energy Commission School Bus Replacement Program

Based on Proposition 39 of 2012 and Senate Bill 110 (Committee on Budget and Fiscal Review, Chapter 55, Statutes of 2017), the CEC administered one-time funding of $75 million for the retrofit or replacement of school buses with battery-electric models. Priority was 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 was supplemented with more than $14 million in past Clean Transportation Program funds to provide the necessary charging infrastructure to operate the buses. As of July 2024, 62 school districts have received a total of 228 electric school buses. The CEC anticipates that all electric school buses and charging infrastructure awarded through the School Bus Replacement Program will be delivered and installed by March 2025.

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

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14 U.S. Department of Transportation. "Notice of Funding Opportunity Number 693JJ324NF00001: Electric Vehicle Charger Reliability and Accessibility Accelerator." Accessed March 27, 2024. Available at https://grants.gov/search-results-detail/350190.

15 U.S. EPA. "South Coast Air Quality Management District (California)." Accessed September 16, 2024. Available at https://www.epa.gov/inflation-reduction-act/south-coast-air-quality-management-district-california.

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 and collaboration between agencies are crucial 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)[16] and other vehicle purchase incentives.
- 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 Zero-Emission Truck Loan Pilot Project, which provides financing opportunities for heavy-duty zero-emission vehicles. (The CEC funds infrastructure.) This project replaces the original Truck Loan Assistance Program, which helped small-business fleet owners who were affected by CARB's In-Use Truck and Bus Regulation secure financing for upgrading their fleets to new trucks of any fuel type.
- The Innovative Small e-Fleets (ISEF) Program, a pilot program administered through HVIP that focuses on supporting small fleets by offering higher voucher amounts and supporting innovative solutions such as all-inclusive leasing, rentals, and "truck as a service" models.
- The Clean Off-Road Equipment Voucher Project (CORE). Similar to HVIP, CORE provides vouchers to offset the incremental cost of zero-emission off-road equipment such as transport refrigeration units, construction and agricultural equipment, and commercial harbor craft.
- The Zero-Emission School Buses and Infrastructure (ZESBI) incentive project, authorized by the state's FY 2023–2024 budget (Senate Bill 114, Committee on Budget and Fiscal Review, Chapter 48, Statutes of 2023), which is designed to help local educational agencies replace older internal combustion engine school buses with new zero-emission school buses and supporting infrastructure.
- 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. As reported in the FY 2023–24 Proposed Funding Plan, the Legislature has appropriated nearly $2.8 billion from the Greenhouse Gas Reduction Fund 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. Table 4 shows how CARB allocated funding for FY 2024–2025.

16 CVRP closed in fall 2023.

Table 4: FY 2024–2025 CARB Clean Transportation Incentives Allocations (in Millions)

Project Category	Air Quality Improvement Fund
Medium- & Heavy-Duty Zero-Emission	
Zero-Emission Truck Loan Pilot	$5.0
Innovative Small e-Fleet Pilot	$14.97
Clean Off-Road Equipment (CORE)	$14.97
Air Quality Improvement Program Total	**$34.95**

Source: California Air Resources Board

CARB released the *Proposed Fiscal Year 2024–25 Funding Plan for Clean Transportation Incentives* on October 11, 2024, and its board approved the allocations November 21, 2024.[17]

Investor-Owned Utility Investments

Investor-owned utilities (IOUs) and publicly owned utilities (POUs) have made important regional investments in EV infrastructure. Many of these investments pay for front-of-the-meter distribution system upgrades that are necessary to support charging stations. Ratepayers have also funded investments in charging infrastructure. The CPUC approves and oversees IOU investments. Much of the CPUC's current ZEV work is focused on distribution system upgrades to meet the needs of a high-transportation-electrification future. The CPUC is reassessing the ability of ratepayer funds to continue supporting behind-the-meter infrastructure development past 2026, with a decision due in 2025.[18]

Further, starting in 2022, after the passage of Assembly Bill 841 (Ting, Chapter 372, Statutes of 2020), the CPUC and IOUs developed special EV Infrastructure Rules for customers installing separately metered or submetered EV charging. Under these rules, a larger portion of the cost of electric distribution infrastructure associated with EV charging is paid for through ratepayer subsidies rather than by EV service providers.

Following passage of Senate Bill 410 (Becker, Chapter 394, Statutes of 2023), the CPUC issued a decision establishing broader energization timeline targets for all load types and covering a broader range of infrastructure upgrades.[19] This decision includes establishing the average

17 CARB. October 2024. *Proposed Fiscal Year 2024–25 Funding Plan for Clean Transportation Incentives*. Accessed October 14, 2024. Available at https://ww2.arb.ca.gov/our-work/programs/low-carbon-transportation-incentives-and-air-quality-improvement-program/funding.

18 California Public Utilities Commission. "Administrative Law Judges Ruling Initiating Track 1 and Inviting Party Comment." Accessed November 25, 2024. Available at https://docs.cpuc.ca.gov/SearchRes.aspx?DocFormat=ALL&DocID=532694036

19 California Public Utilities Commission. "Energization." Accessed September 16, 2024. Available at https://www.cpuc.ca.gov/industries-and-topics/electrical-energy/infrastructure/energization.

timeline of 230 calendar days and a maximum of 335 calendar days for projects taking service under the EV Infrastructure Rules.[20]

Volkswagen Diesel Emissions Settlement

California received about $423 million from the Volkswagen Environmental Mitigation Trust for projects to reduce the lifetime excess oxides of nitrogen (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.[21] 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 Commitment[22] will occur over a 10-year period via Volkswagen's subsidiary Electrify America, divided into four 30-month, $200 million ZEV investment plans. 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, car-share and ride-hail services).
- Two "Green City" initiatives that may include ZEV car-sharing services, transit applications, and freight transport projects.

On January 25, 2024, CARB approved Electrify America's fourth and final 30-month ZEV investment plan, which began July 1, 2024.

Zero-Emission Vehicle Infrastructure Plan

CEC staff, in coordination with various state agencies including the CPUC, CARB, California State Transportation Agency (CalSTA), California Department of Transportation (Caltrans), Governor's Office of Business and Economic Development (GO-Biz), and Department of General Services (DGS), developed the first Zero-Emission Vehicle Infrastructure Plan (ZIP) in

20 California Public Utilities Commission. "D.24-09-020." Accessed November 25, 2024. Available at https://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M540/K806/540806654.PDF.

21 California Air Resources Board. June 2018. "California's Beneficiary Mitigation Plan for the Volkswagen Environmental Mitigation Trust." Accessed January 9, 2025. Available at https://ww2.arb.ca.gov/resources/documents/californias-beneficiary-mitigation-plan.

22 California Air Resources Board. "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.

2022. The document supports decision-making in the public and private sectors by documenting plans and strategies to deploy ZEV infrastructure for all Californians.

The 2022 ZIP divided ZEV infrastructure into five market segments to address the specific challenges and opportunities unique to each sector. Highlights include:

- Emphasizing charging and hydrogen fueling for medium- and heavy-duty vehicles to increase equity by rapidly transitioning the most polluting vehicles to zero emission.
- Continuing to collaborate with private actors to address challenges for public hydrogen fueling for light-duty vehicles, such as high prices at the pump, station reliability, fueling standards, and others.
- Maximizing access to home charging, including for multifamily housing residents and potential funding for incentives for charging at low-income, single-family homes.
- Improving the customer experience, focusing on charging speeds, reliability, and costs to drivers, and phasing out public support for chargers with CHAdeMO connectors to adapt to market trends.
- Monitoring demonstration of emerging technologies such as battery swapping, wireless charging, and mobile charging units.

The 2022 ZIP is a resource for public and private entities to better understand the status of short-term and long-term state actions to support ZEV infrastructure. In January 2025, the CEC published a draft version of the 2024 ZIP that will serve primarily as a deployment plan to complement the Clean Transportation Program to meet state goals. The 2024 ZIP assesses the current state of ZEV infrastructure assessments and strategies to deploy charging and fueling infrastructure through the Clean Transportation Program. The strategy will extend to General Fund and GGRF allocations but may have some constraints per legislative direction.

CHAPTER 3:
Funding Allocations for 2024–2025 and Beyond

The Investment Plan Update includes the base Clean Transportation Program funding and the additional ZEV Climate Package investments, which draw from the General Fund and Greenhouse Gas Reduction Fund. Table 5 outlines the Clean Transportation Program base funding allocations for FY 2024–2025, for which $95.2 million of base 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. Any additional ZEV Climate Package allocations are subject to change with the development of future state budgets.

The 2024 budget agreement no longer includes additional ZEV Climate Package funds for FY 2024–2025. As such, Table 5 includes Clean Transportation Program base fund allocations only. Funds will help close funding gaps in infrastructure deployment and accelerate charging and hydrogen fueling station deployment.

CEC staff worked to balance diverse public comments when refining the funding allocations. The Investment Plan is not the last step in determining how funds will be spent. The CEC gathers public feedback, such as through workshops, when developing solicitations. The CEC also received feedback from interested and affected groups about details within each funding category that will be considered during solicitation development, including:

- For the light-duty EV charging category, consider Level 1 charging; prioritize low-income and multifamily home charger access; provide equitable access for rural communities; and be attentive to prices for charging, especially for lower-income families.
- For medium- and heavy-duty infrastructure, focus on certain sectors such as transit.
- Mixed comments on the hydrogen category, especially about whether to build more hydrogen stations for light-duty vehicles.
- For workforce development, focus on registered apprenticeships; consider including the manufacturing sector; coordinate more with other agencies; and gather more data about workforce gaps.

Table 5 shows allocations including $40 million to support light-duty passenger vehicle infrastructure, $38.2 million for medium- and heavy-duty ZEV infrastructure (second row), and $15 million for hydrogen refueling infrastructure. Table 6 shows projected future allocations of Greenhouse Gas Reduction Funds and general funds as of the 2024 budget agreement. Because of budget uncertainty around future ZEV Climate Package funds, the CEC is not proposing base Clean Transportation Program allocations for FYs 2025–2026, 2026–2027, or 2027–2028. Base fund allocations for those fiscal years will be proposed in future Investment Plan Updates when the budget context is clearer.

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. Combined with previous investments from the Clean Transportation Program, other public investments, and private match funding, the funding from this Investment Plan should be sufficient to meet the state's goal of having 250,000 chargers.

Assembly Bill 126 directs the CEC to allocate at least 15 percent of Clean Transportation Program base funds per year for hydrogen infrastructure and to issue a solicitation at least annually and 90 days after the start of the fiscal year. If hydrogen grant funding solicitations are undersubscribed during the year, the CEC is authorized to reallocate the funding. Hydrogen projects may also be eligible under the general medium- and heavy-duty ZEV infrastructure category.

The table does not include federal NEVI formula funds (about $163 million for the remaining two fiscal years of the program) for charging along highways and interstates.

Table 5: Clean Transportation Program Base Fund Allocations for FY 2024–2025 (in Millions)

Category	Eligible Fuel Types	Funding Source	2024–2025
Light-Duty Charging Infrastructure	Electric	Clean Transportation Program (Base)	$40.0
Medium- and Heavy-Duty ZEV Infrastructure	Electric, Hydrogen	Base	$38.2
Hydrogen Refueling*	Hydrogen	Base	$15.0
Workforce Training and Development	Electric, Hydrogen	Base	$2.0
		Total Base	**$95.2**

*** Open to light-, medium-, and heavy-duty vehicle infrastructure projects, including mixed-use hydrogen stations. AB 126 requires the CEC to spend at least 15 percent of Clean Transportation Program base funds per year on hydrogen infrastructure through 2030.**

Source: California Energy Commission

Table 6: Estimated Investment Plan Allocations for Future Fiscal Years (in Millions)

Category	Eligible Fuel Types	Funding Source	2025–2026	2026–2027	2027–2028
Light-Duty Charging Infrastructure	Electric	Clean Transportation Program (Base)*	-	-	-
Light-Duty Charging Infrastructure	Electric	Greenhouse Gas Reduction Fund (GGRF)	$140	$80	$219
Equitable At-Home Charging	Electric	GGRF	$60	$40	$80
Medium- and Heavy-Duty ZEV Infrastructure	Electric, Hydrogen	Base*	-	-	-
Drayage Truck Infrastructure	Electric, Hydrogen	GGRF	$50	$49	$50
School Bus Infrastructure	Electric	General Fund	$125	-	-
Clean Truck, Bus, and Off-Road Equipment Infrastructure	Electric, Hydrogen	GGRF	$89	-	$137
Port ZEV Infrastructure	Electric, Hydrogen	GGRF	-	$130	-
Emerging Opportunities	Electric, Hydrogen	GGRF	$46	-	-
Hydrogen Refueling	Hydrogen	Base*	-	-	-
Workforce Training and Development	Electric, Hydrogen	Base*	-	-	-
		Total Base*	**-**	**-**	**-**
		Total GGRF, General Fund, and Reimbursements	**$510**	**$299**	**$486**

Available amounts may differ as future budgets are finalized. These figures do not include administrative costs for general funds in FY 2025–2026. However, GGRF figures for FYs 2025–2026, 2026–2027, and 2027–2028 include administrative costs. Those GGRF allocations will be reduced for administrative costs following direction in future budget acts. The CEC may use unused administrative costs to fund additional projects within each funding allocation.

*** Because of budget uncertainty affecting other related funding, the CEC is not proposing allocations for Clean Transportation Program base funds for future fiscal years. However, the CEC expects $95.2 million in base funds to be available in each of FYs 2025–2026, 2026–2027, and 2027–2028.**

Source: California Energy Commission

CHAPTER 4:
Light-Duty Electric Vehicle Charging Infrastructure

Recent Legislation Guiding CEC Actions on Electric Vehicle Charging Infrastructure

Charging Station Reliability and Uptime

Ensuring a reliable charging experience will be critical to encouraging wider adoption of electric vehicles. Assembly Bill 2061 (Ting, Chapter 345, Statutes of 2022) 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 assess the reliability of charging station infrastructure and update the assessment every two years, beginning January 1, 2025. AB 126 requires the CEC to adopt tools to increase charging station uptime, including requirements for uptime and operations and maintenance.

On January 25, 2023, the CEC began a rulemaking proceeding to develop charger reliability regulations in accordance with AB 2061. The CEC released a draft staff report on the topic, *Tracking California's Electric Vehicle Chargers: Regulations for Improved Inventory, Utilization, and Reliability Reporting*, in September 2023 and held a workshop on the rulemaking in October 2023.[23] Staff released a second draft of this report and held a workshop to receive public feedback in April 2024. Staff anticipates that regulations proposed in this report will be adopted in 2025.

The CEC has taken additional steps to improve the reliability of EV chargers. Beginning in late 2021, the CEC began including reliability requirements in all its grant funding opportunities. These requirements have evolved over time but generally include performance standards, as well as recordkeeping, reporting, and maintenance requirements. Solicitation requirements may be more stringent than those in the upcoming regulations.

Payment Options for Charging Stations

Senate Bill 123 (Committee on Budget and Fiscal Review, Chapter 52, Statutes of 2023) changes requirements for payment options that certain public EV charging stations must

23 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*. Accessed November 4, 2024. Available at https://efiling.energy.ca.gov/GetDocument.aspx?tn=248612&DocumentContentId=83100.

provide. CEC staff is preparing to open a rulemaking to revise EV charging payment regulations under SB 123 and held a prerulemaking workshop in May 2024.[24]

Quantifying Charging Infrastructure for Light-Duty Vehicles

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

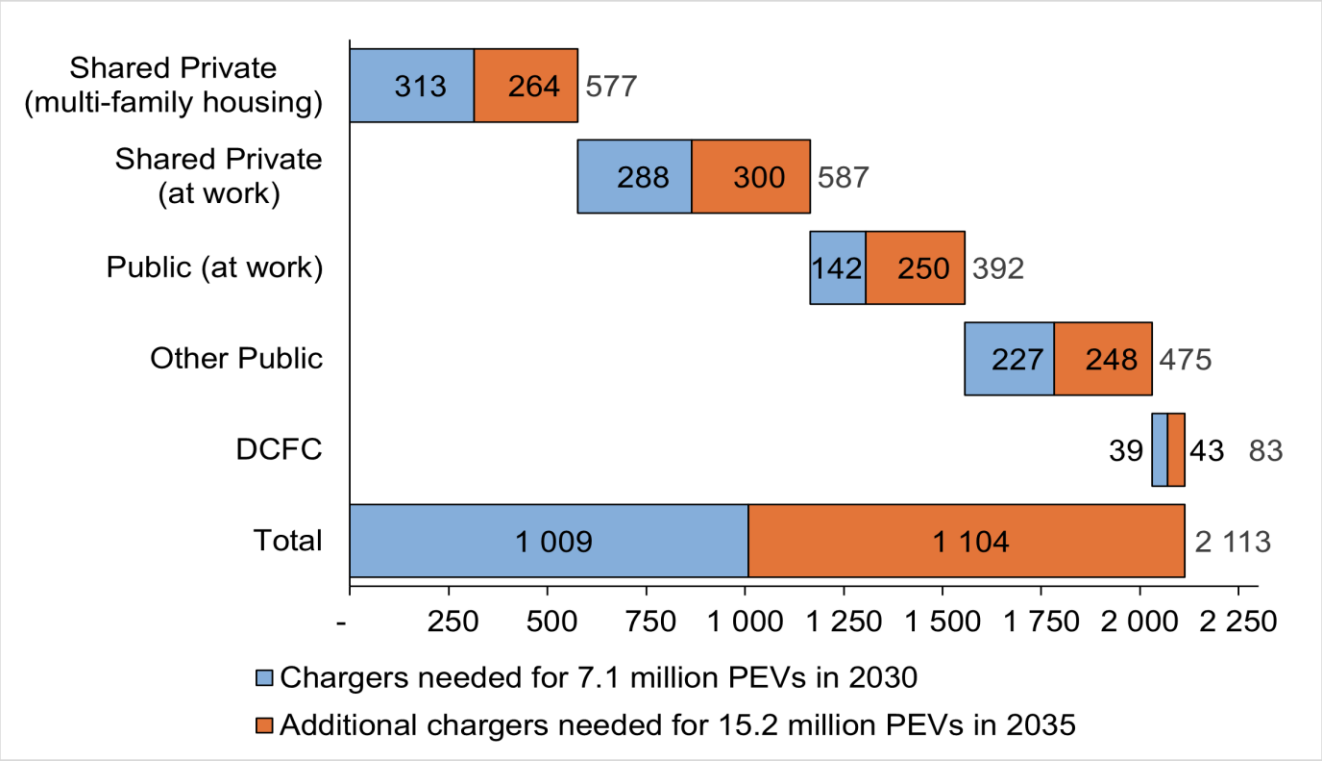
Assembly Bill 2127 (Ting, Chapter 365, Statutes of 2018) requires the CEC, working with CARB and the CPUC, to prepare and update biennially a statewide assessment of electric vehicle charging infrastructure. The assessment focuses on the number and types of charging infrastructure needed to support California's zero-emission vehicles in 2030 and 2035. The February 2024 *Assembly Bill 2127 Second Electric Vehicle Charging Infrastructure Assessment* includes updated ZEV adoption scenarios and improved charging infrastructure models for light-duty vehicles.[25] The report uses the Integrated Energy Policy Report (IEPR) scenario of 7.1 million plug-in electric vehicles (PEVs) in 2030 and 15.2 million PEVs in 2035 to align with CARB's Advanced Clean Cars II regulations.

The second report projects that California will need 1.01 million chargers (including 39,000 DC fast chargers) to support 7.1 million light-duty plug-in electric vehicles in 2030. By 2035, the state will need 2.11 million chargers (including 83,000 DC fast chargers) to support 15.2 million light-duty plug-in electric vehicles. Figure 4 provides a breakdown of projected charging needs for light-duty vehicles from this baseline scenario. The CEC also evaluated charging needs if EV drivers use more DC fast charging (sometimes called the "gas station" scenario). This scenario found that charger needs in 2030 would drop from 1 million to 660,000 in 2030. The CEC is continuing to refine analysis to incorporate consumer preferences and technological advances.

24 California Energy Commission. May 22, 2024. "Senate Bill 123 Pre-Rulemaking Workshop." Accessed August 14, 2024. Available at https://www.energy.ca.gov/event/workshop/2024-05/senate-bill-123-pre-rulemaking-workshop.

25 Davis, Adam, Tiffany Hoang, Thanh Lopez, Jeffrey Lu, Taylor Nguyen, Bob Nolty, Larry Rillera, Dustin Schell, and Micah Wofford. 2023. *Assembly Bill 2127 Second Electric Vehicle Charging Infrastructure Assessment: Assessing Charging Needs to Support Zero-Emission Vehicles in 2030 and 2035.* California Energy Commission. Publication Number: CEC-600-2024-003-CMR. Available at https://www.energy.ca.gov/publications/2024/assembly-bill-2127-second-electric-vehicle-charging-infrastructure-assessment.

Figure 4: Chargers Needed for Light-Duty Electric Vehicles in 2030 and 2035 Under Baseline Scenario



Models project that California will need more than 1 million public and shared private chargers in 2030 to support 7.1 million plug-in electric vehicles and 2.1 million chargers in 2035 to support 15.2 million plug-in electric vehicles. 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: California Energy Commission and National Renewable Energy Laboratory

Progress Toward Light-Duty Charging Infrastructure Goals

To track progress toward the state's 2025 and future goals, the CEC conducts quarterly surveys, which started in July 2020, to obtain combined counts of public- and shared-access chargers within California. Table 7 below provides estimates of the existing number of public or shared Level 2 and DC fast chargers within the state as of August 2024. The table also estimates the number of chargers to be installed from allocated 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 7: Progress Toward 250,000 Chargers and Beyond

Category	Level 2 Chargers	DC Fast Chargers	Total Chargers
Existing Chargers (Estimated)*	137,648	14,708	152,356
Anticipated Chargers for Which Funding Has Been Allocated (including anticipated funding from Clean Transportation Program)†	196,354	10,416	206,770
Total	334,002	25,124	359,126
2025 Goal (Executive Order B-48-18)	*240,000*	*10,000*	*250,000*
Gap From Near-Term Goal	0	0	0
AB 2127 Second Assessment 2030 Estimate of Charging Needs	*969,505*	*39,340*	*1,008,845*
Gap From 2030 Estimates	635,503	14,216	649,719

*** Existing charging ports estimated based on available data from U.S. Department of Energy's Alternative Fuels Data Center, PlugShare, grant recipient reporting, and surveys to electric vehicle network service providers, utilities, and public agencies in California.**

† Derived from public presentations and statements by utilities, California Public Utilities Commission, CARB, other entities, and the CEC. Includes an estimate of Level 2 chargers resulting from CalGreen code. Includes funding from State Budget Act of 2021 and State Budget Act of 2022, intended to close the gaps for Level 2 and DC fast chargers, and federal NEVI formula program funding. The estimated number of chargers could change as solicitations are released. Does not include charger estimates from CPUC's transportation electrification program, which has already installed 18,193 Level 2 and 2,224 DC fast chargers as of September 2024.

Source: California Energy Commission

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.[26] If the CEC finds that chargers have been disproportionately deployed, the CEC will use program funds and other mechanisms to deploy chargers 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 DC fast chargers by income level and population density. The report found that low-income communities,[27] on

26 More information about the SB 1000 reporting is available at https://www.energy.ca.gov/programs-and-topics/programs/clean-transportation-program/electric-vehicle-infrastructure.

27 *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.

average, have fewer public chargers per capita than middle- or high-income communities.[28] 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 communities.[29] 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.

Finally, many disadvantaged communities have long drives to public fast charging.[30] The CEC has created drive time maps showing rural, low-income, and disadvantaged communities with sparse public fast charging coverage.[31] These maps can be used to guide Clean Transportation Program DC fast charging investments within underserved communities. Solutions to improving charging access will vary and depend on the intersecting characteristics of a community.

The CEC 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. The next assessment will build upon the CEC's *Home Charging Access in California* report,[32] published January 7, 2022, and include analysis of Level 2 home charging potential and public

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28 *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 under 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 under Health and Safety Code Section 50093.

29 *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. CEC 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.

30 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.

31 Drive-time maps are available on the SB 1000 web page at https://www.energy.ca.gov/programs-and-topics/programs/clean-transportation-program/electric-vehicle-infrastructure.

32 Alexander, Matt. January 2022. *Home Charging Access in California*. California Energy Commission. Publication Number: CEC-600-2022-021. Accessed March 13, 2023. Available at https://www.energy.ca.gov/publications/2022/home-charging-access-california.

charging to provide alternatives to home charging by income level, population density, and geographical area.

Clean Transportation Program Funding to Date

The CEC has supported the rollout of light-duty PEVs by awarding more than $588 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 July 2024

Access Type	Private Access	Shared-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/ Rural/Urban Metro/Fleet	Level 2 and DC fast: Block Grants	-
Installed	3,936	155	419	341	3,108	532	4,450	**12,941**
Planned	1,142	0	0	1,744	1,909	640	16,380†	**21,815**
Total	**5,078**	**155**	**419**	**2,085**	**5,017**	**1,172**	**20,830**	**34,756**

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 or Communities in Charge.

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

† For block grants, "planned" chargers are those with rebate funding reserved.

Source: California Energy Commission

Block Grants for Light-Duty Vehicle Charging

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 was the first light-duty EV block grant funded by the CEC and led the way to future block grants for ZEV infrastructure.

In December 2021, the CEC approved funding for two new block grants of up to $250 million each for light-duty EV charging infrastructure. One is CALeVIP 2.0, implemented by The Center

for Sustainable Energy,[33] offering up to $250 million in rebates for high-powered (150 kilowatt+) DC fast chargers. The two funding opportunities to date from CALeVIP 2.0 have been available only to sites within a disadvantaged or low-income community. Applications were placed into tiers based on level of readiness, funding the applications that were most ready to install the chargers.

The other block grant approved in December 2021 is Communities in Charge, implemented by CALSTART, offering up to $250 million in rebates for Level 2 chargers. Applications were scored with priority given to disadvantaged and low-income communities, including tribal lands, which are now designated as disadvantaged communities. Additional scoring priority was given to installations on sites for multifamily housing, faith-based organizations, schools, health care facilities, community nonprofits, local governments, and workplaces.

Targeted Solicitations 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. Table 9 lists some recent examples of these targeted solicitations.

Table 9: Targeted Solicitations for Light-Duty Charging

Title	Goal	Status
Reliable, Equitable, and Accessible Charging for multifamily Housing (REACH) 2.0 and 3.0	Fund charger installation projects that will benefit and be used by multifamily housing residents within disadvantaged communities, low-income communities, and affordable housing	REACH 2.0 NOPA released December 2023 with $41 million for 11 projects; REACH 3.0 applications open through January 25, 2025 with up to $19 million available
Rural Electric Vehicle (REV) Charging	Increase charging access in rural areas that are not served or inadequately served by charging stations, especially in low-income and disadvantaged communities, with a focus on reliability	NOPA released June 2022 with $20.6 million for 17 projects
Fast and Available Charging for All Californians (FAST)	Fund charging projects that are open to the public but focused on on-demand transportation	NOPA released August 2023 with $10.5 million for 3 projects
Tribal Electric Vehicle Infrastructure, Planning and Workforce Training and Development	Acceleration of ZEV adoption among California Native American tribes by funding charging infrastructure, infrastructure planning, and workforce training and development	NOPA released November 2024 with $15 million for 9 projects

33 A national nonprofit focused on clean transportation and distributed energy, according to the Center for Sustainable Energy's website.

Source: California Energy Commission

Funding Allocation

The CEC allocates $40 million in Clean Transportation Program funds for FY 2024–2025 for light-duty charging infrastructure. The funding will provide the buildout of charging infrastructure that can help close the charger gap. The 2024 budget agreement proposes additional Greenhouse Gas Reduction Funds for light-duty EV charging in future fiscal years.

CHAPTER 5:
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[34] because of comparatively low fuel efficiency and high number of miles traveled per year.[35]

Medium- and heavy-duty vehicles also account for one-third of statewide NO_X and 25 percent of $PM_{2.5}$[36] emissions from on-road transportation in California.[37] 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 Electric Vehicles

The *AB 2127 Second Electric Vehicle Charging Infrastructure Assessment* evaluates infrastructure needed to support medium- and heavy-duty vehicles using an updated analysis model in collaboration with Lawrence Berkeley National Laboratory. This model determines the number, locations, and types of charger deployments needed at depots and public locations for charging en route. Depot chargers are chargers located at trip destinations and locations where vehicles are stored overnight, including depots owned by the vehicle operator and charging locations owned by a third party. Because vehicles spend longer periods at these locations, depot chargers can provide lower-powered charging. Some vehicles make trips

34 Using data from 2019 rather than 2020, to avoid COVID-19-related anomalies. California Air Resources Board. October 26, 2022. "California Greenhouse Gas Inventory for 2000–2020." Accessed April 10, 2024. Available at https://ww2.arb.ca.gov/sites/default/files/classic/cc/inventory/ghg_inventory_scopingplan_sum_2000-20.pdf.

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

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

37 California Air Resources Board. "Almanac Emission Projection Data." Archived version available at https://web.archive.org/web/20220125064641/https://www.arb.ca.gov/app/emsinv/2017/emssumcat_query.php?F_YR=2020&F_DIV=3&F_SEASON=A&SP=SIP105ADJ&F_AREA=CA#7.

beyond the range of the batteries and rely on en-route chargers to replenish range quickly. To support rapid charging, en-route chargers must provide higher-powered charging than depots.

The assessment leverages the IEPR Additional Achievable Transportation Electrification 3 scenario, which accounts for the projected impact of the Advanced Clean Trucks and Advanced Clean Fleets regulations. Based on this scenario, Table 10 shows the projected number of chargers needed for medium- and heavy-duty PEVs by 2030 and 2035.

Table 10: Chargers Needed for Medium- and Heavy-Duty PEVs

	By 2030	By 2035
Projected Number of Vehicles	*155,000*	*377,000*
Lower-Powered (20–150 kilowatt) Depot Chargers Needed	109,000	256,000
Higher-Powered (350–1,500 kilowatt) En-Route Chargers Needed	5,500	8,500
Total Needed	**114,500**	**264,500**

Source: California Energy Commission

Hydrogen Fueling Infrastructure for Medium- and Heavy-Duty Vehicles

FCEVs 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 FCEVs will help accelerate the growth of hydrogen production and reach economies of scale earlier than with light-duty vehicles alone.

See Chapter 6 for a broader discussion of hydrogen infrastructure. However, many of the CEC's funding solicitations for medium- and heavy-duty ZEV infrastructure have blended both charging and hydrogen refueling projects and are discussed below in Chapter 5.

Clean Transportation Program Funding to Date

The CEC has supported the rollout of medium- and heavy-duty ZEVs by awarding more than $643 million in Clean Transportation Program funding for ZEV infrastructure for these segments. In February 2022, the CEC 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.

In July 2024, CEC conducted another funding concept workshop[38] to solicit stakeholder feedback on potential medium- and heavy-duty ZEV infrastructure funding opportunities. The workshop proposed five presolicitation concepts intended 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, priority corridors, ports, and agriculture and construction sectors. The concepts proposed may evolve into solicitations that will provide funding for larger-scale deployments of medium- and heavy-duty zero-emission vehicle infrastructure projects.

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 $544 million, which was approved at the December 2021 and April 2024 CEC business meetings. The funding is released to CALSTART in tranches and is then distributed through multiple funding "lanes," starting in 2022.

For the second year of the project, EnergIIZE Commercial Vehicles launched all four main funding lanes in addition to three set-aside funding lanes for public school bus, transit, and drayage fleets. The set-aside lanes complemented CARB's HVIP program.

In 2024, the third year of the project:

- The EV Fast Track funding lane launched February 7, 2024, and offered $20 million for incentives. This was a first-come, first-served lane and was quickly subscribed.
- The Hydrogen funding lane launched April 17, 2024, and closed May 1, 2024. This funding lane was competitively scored and offered $16 million in incentive funding.
- The EV Jump Start funding lane launched July 16, 2024, and remained open through September 10, 2024. This funding lane was competitively scored and offered up to $10 million for those applicants and fleets users who meet certain equity eligibility criteria, such as project location in a disadvantaged or low-income community.
- The second offering for the public school bus set-aside funding lane launched in November 2023 and closed April 29, 2024. This funding lane was directly complementary to those recipients receiving vehicle vouchers for public school buses through CARB's HVIP program.
- The second offering for both the transit and drayage set-aside funding lanes launched April 30, 2024. Each set-aside funding lane will remain open for applications through the first quarter (January–March) of 2025. The transit set-aside funding lane is offering

38 CEC. July 16, 2024. "Staff Workshop for Medium- and Heavy-Duty Zero-Emission Vehicle Infrastructure Solicitation Concepts." Accessed July 25, 2024. Available at https://www.energy.ca.gov/event/workshop/2024-07/staff-workshop-medium-and-heavy-duty-zero-emission-vehicle-infrastructure.

up to $15 million for incentives and the drayage set-aside funding lane will offer $50 million for incentives.

The previously expected EV Public Charging funding lane is not currently planned on the same schedule as before as the CEC and CALSTART are refreshing the EnergIIZE program to provide more support for medium- and heavy-duty infrastructure deployment.

Targeted Solicitations for Medium- and Heavy-Duty ZEV Infrastructure

The EnergIIZE Commercial Vehicles block grant will complement the CEC's in-house competitive solicitations, which are valuable tools for targeting specific segments or needs. Competitive solicitations can be issued solely by the CEC or in partnership with other agencies, such as CARB.

From the concepts proposed at the February 2022 workshop, staff has released several grant funding opportunities, including the following recent activities.

- "Implementation of Medium- and Heavy-Duty Zero-Emission Vehicle Infrastructure Blueprints," GFO-23-603, was released in September 2023. This solicitation followed GFO-20-601, "Blueprints for Medium- and Heavy-Duty Zero-Emission Vehicle and Infrastructure." GFO-23-603 offered funding to prior Medium- and Heavy-Duty Blueprint Planning grant recipients to implement zero-emission vehicle charging or hydrogen refueling infrastructure projects or both that were developed and identified in the final submitted blueprint planning documents resulting from GFO-20-601. The CEC released a NOPA on February 12, 2024, recommending $25.0 million in funding for five projects.
- "Charging and Refueling Infrastructure for Transport in CALifornia Provided Along Targeted Highway Segments (CRITICAL PATHS)," GFO-23-602, was released in September 2023. This solicitation offered $30 million to fund projects that would support medium- and heavy-duty zero-emission vehicle refueling or charging infrastructure or both along designated corridors. The CEC released a NOPA on February 16, 2024, recommending $34.2 million in funding for three projects.

From the July 2024 workshop, five solicitation concepts were proposed for projects to increase deployment of charging and hydrogen refueling infrastructure to support deploying zero-emission medium- and heavy-duty vehicles within the California freight and port systems, and other emerging opportunity sectors, including agriculture and construction. The CEC is gathering public comment and intends to develop and release solicitations throughout the rest of 2024. The five concepts proposed include those listed below. The descriptions and details are subject to change based on stakeholder feedback to the July 2024 workshop. Further, grant funding opportunities may include the following or other funding concepts based on stakeholder feedback at the workshop and subsequent comments.

- "Charging and Refueling Infrastructure for Transport in CALifornia Provided Along Targeted Highway Segments (CRITICAL PATHS) 2.0." This concept would be a sequel to the CRITICAL PATHS solicitation (GFO-23-602) released in September 2023. Up to

$30 million is proposed to support medium- and heavy-duty charging and hydrogen refueling projects along designated freight corridors. Of that total, $6 million is specifically for hydrogen refueling projects, with the rest available for either fueling technology. This concept would continue supporting a coordinated strategy with other state agencies for the statewide buildout of medium- and heavy-duty zero-emission vehicle infrastructure. This solicitation was released October 16, 2024, with an application closing date of January 15, 2025.

- "Implementation of MDHD ZEV Infrastructure Blueprints 2.0." This concept would follow the Implementation of MDHD ZEV Infrastructure Blueprints solicitation (GFO-20-603) released in September 2023. Up to $20 million was proposed to support medium- and heavy-duty charging and hydrogen refueling projects identified as part of a zero-emission planning blueprint (CEC-funded or not) that meets the criteria established in GFO-20-601, "Blueprints for Medium and Heavy Duty Zero-Emission Vehicle and Technology Infrastructure." A solicitation may be released in early 2025.
- "ZEV Port Infrastructure." Up to $40 million was proposed to fund the deployment of medium- and heavy-duty zero-emission vehicle charging or hydrogen refueling infrastructure for California ports, focused on building grid capacity and onsite energy generation to power ZEV infrastructure in the time frame aligned with California port zero-emission goals. Proposed projects must install a minimum number of chargers, hydrogen dispensers, or both, depending on award amounts. This concept may be released as a solicitation in early 2025.

Two of the concepts from the July 2024 workshop are covered in later chapters:

- "Light-Duty Vehicle Hydrogen Refueling Infrastructure," which would include light-duty or mixed-use stations, as well as operations and maintenance (see Chapter 6)
- "Agriculture and Construction Infrastructure" (see Chapter 7)

Support From General Fund for School Bus Infrastructure

The Budget Act of 2023 allocated $375 million in Proposition 98 general funds to CARB and $125 million to the CEC for FY 2023–2024 (SB 114). Additional funding for electric school buses and charging infrastructure had been projected in FY 2024–2025 but is no longer included in the 2024 budget agreement. However, an additional $500 million ($125 million of which is for the CEC) for zero-emission school buses and infrastructure is projected for FY 2025–2026.

With the $500 million for FY 2023–2024, CARB and the CEC developed the Zero Emission School Bus and Infrastructure (ZESBI) Project. The ZESBI Project offers incentives to help local education agencies transition to a zero-emission school bus fleet. Grant awards cover up to the full purchase cost of the zero-emission school bus and related charging or fueling infrastructure. A portion of the incentive funds can also go toward workforce development and training, as well as the local education agency's school transportation program. The ZESBI

Project opened May 14, 2024, with CALSTART as the block grant implementor. Applications for the project closed November 22, 2024.

Funding Allocation

For FY 2024–2025, the CEC allocates $38.2 million in Clean Transportation Program funding to medium- and heavy-duty sector ZEV infrastructure, in addition to $15 million specifically for hydrogen infrastructure that can include light-, medium-, and heavy-duty projects. The 2024 budget agreement proposes additional general funds and Greenhouse Gas Reduction Funds for medium- and heavy-duty ZEV infrastructure in future fiscal years. This funding is intended to meet the growing needs of charging and hydrogen fueling infrastructure for medium- and heavy-duty ZEVs.

CHAPTER 6:
Hydrogen Infrastructure and Supply

The Clean Transportation Program has invested in producing renewable hydrogen and building the infrastructure needed to refuel fuel cell electric vehicles. AB 126 directs the CEC to allocate 15 percent of the funds appropriated by the Legislature from the Clean Transportation Program to deploy hydrogen fueling stations until there is a sufficient network to support hydrogen vehicles. AB 126 allows funding stations for all three vehicle segments: light-, medium-, and heavy-duty. This chapter discusses these hydrogen activities, starting with evaluating the refueling network.

Evaluating Hydrogen Fueling Infrastructure Progress and Reliability

The CEC and CARB continually assess the status of California's hydrogen refueling infrastructure across all vehicle segments (light-, medium-, and heavy-duty).

The CEC's inaugural *2023 Final Staff Report on Senate Bill 643* provides an initial statewide assessment of the medium- and heavy-duty hydrogen FCEV infrastructure and clean hydrogen fuel production needed to support the adoption of trucks, buses, and off-road applications to meet state clean-air goals.[39]

The analyses conducted by the CEC include a baseline of existing and planned infrastructure, commercially available medium- and heavy-duty FCEVs, and four possible scenarios of medium- and heavy-duty FCEV refueling station requirements through 2035. The scenarios produced a wide range of results, estimating anywhere from 1 to 601 stations needed by 2030. By 2035, the range varied from 11 to more than 2,000 stations. The variance indicates the current level of uncertainty for what will be needed in the future. Future SB 643 assessments will use the infrastructure results from the Lawrence Berkeley National Laboratory model used for AB 2127, which is being updated to include hydrogen scenarios.

State law requires CARB to evaluate the need for hydrogen fueling stations annually. This evaluation includes the quantity of fuel needed for the actual and projected number of FCEVs, geographic areas where fuel will be needed, and station coverage. The evaluation focuses on fueling stations for light-duty vehicles.

39 Villareal, Kristi. 2024. *2023 Final Staff Report on Senate Bill 643: Clean Hydrogen Fuel Production and Refueling Infrastructure to Support Medium- and Heavy-Duty Fuel Cell Electric Vehicles and Off-Road Applications*. California Energy Commission. Publication Number: CEC-600-2023-053-SF. Accessed April 9, 2024. Available at https://efiling.energy.ca.gov/GetDocument.aspx?tn=254100.

In December 2023, CARB released the *2023 Annual Evaluation of Fuel Cell Electric Vehicle Deployment & Hydrogen Fuel Station Network Deployment* report.[40] In this assessment, CARB reported that automakers project having 62,600 FCEVs on the road by 2029. However, past automaker projections have overestimated future sales, and automakers have begun to roll back those projections. As of the end of 2023, there were around 14,000 FCEVs in California. Almost 300 new FCEVs were sold in the state in the second quarter (April–June) of 2024.

Also in December 2023, the CEC and CARB released the *Joint Agency Staff Report on Assembly Bill 8: 2023 Annual Assessment of the Hydrogen Refueling Network in California.*[41] California is set to meet the former 100-station goal under AB 8. In this report, staff anticipated 130 stations by 2027; however, one applicant (Phillips 66 Company) that was proposed for an award to build four stations under solicitation GFO-22-607 declined. Also, one grant recipient (Equilon Enterprises LLC, doing business as Shell Oil Products US) announced the permanent closure of seven stations in February 2024.

Between public and private investments, as of October 2024, CEC staff anticipates that California will have 129 open retail stations. At least eight stations are expected to be capable of fueling medium- or heavy-duty vehicles in addition to light-duty vehicles. It's important to note that as of September 2024, about 30 percent of California's 62 open retail stations were nonoperational for 30 days or more. CEC staff will continue exploring ways to expand the network capacity of stations to provide sufficient, convenient, and reliable refueling options.

When all 129 stations are open, CEC staff estimates that the network of hydrogen stations will have a nameplate capacity to support about 182,000 light-duty FCEVs. When assuming operation at 80 percent of nameplate capacity, these stations will be able to support nearly 146,000 FCEVs. However, the current open-retail station network is experiencing reliability issues due to equipment failures, hydrogen supply issues, and supply-chain issues. The *2023 Annual Evaluation of Fuel Cell Electric Vehicle Deployment & Hydrogen Fuel Station Network Deployment* found that the network of open retail stations (not including stations that were reported as unavailable for longer than 30 days) has operated at around 60 percent of capacity on average from the third quarter of 2022 to the second quarter of 2023. If stations are down due to broken equipment or because they have run out of hydrogen fuel, the station network cannot support the number of FCEVs that they should on paper.

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40 California Air Resources Board. December 2023. *2023 Annual Evaluation of Fuel Cell Electric Vehicle Deployment & Hydrogen Fuel Station Network Development*. Accessed April 9, 2024. Available at https://ww2.arb.ca.gov/resources/documents/annual-hydrogen-evaluation.

41 Crowell, Miki and Andrew Martinez. 2023. *Joint Agency Staff Report on Assembly Bill 8: 2023 Annual Assessment of the Hydrogen Refueling Network in California*. California Energy Commission and California Air Resources Board. Publication Number: CEC-600-2023-069. Accessed April 9, 2024. Available at https://www.energy.ca.gov/sites/default/files/2023-12/CEC-600-2023-069.pdf.

Renewable Hydrogen Production

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.

According to the California Independent System Operator, increasing amounts of renewable power generation may result in electricity oversupply.[42] 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.[43] 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.

Senate Bill 1505 (Lowenthal, Chapter 877, Statutes of 2006) requires that at least 33.3 percent of hydrogen used for transportation in California come from renewable sources. Therefore, stations funded by the Clean Transportation Program before GFO-19-602 are required to dispense fuel with at least 33 percent renewable hydrogen content.

Subsequently, as part of CARB's Low Carbon Fuel Standard (LCFS) program that took effect in January 2019, qualifying hydrogen stations must have a renewable content of 40 percent or higher. Stations resulting from GFO-19-602 and GFO-22-607 are therefore mandated to comply with the renewable hydrogen requirements specified in the LCFS regulation. CARB's definition of renewable hydrogen per the LCFS includes hydrogen production pathways that use "book and claim" processes for biomethane injected into the fossil gas pipeline system. According to the AB 8 *2023 Annual Assessment*, much of the renewable hydrogen reported at California refueling stations is likely "indirect" since it involves purchasing renewable energy attributes from elsewhere rather than directly generating the hydrogen renewably. Using data available through the LCFS program for all reporting hydrogen refueling stations, an estimated 53 percent of the hydrogen sold in 2023 was generated with renewable attributes.[44]

AB 126 requires the CEC to provide scoring preferences to projects that dispense "clean and renewable" hydrogen when awarding grants for hydrogen fueling stations.

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42 California Independent System Operator. "Managing Oversupply." Accessed March 13, 2024. Available at https://www.caiso.com/informed/Pages/ManagingOversupply.aspx.

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

44 Villareal, Kristi. 2024. *2023 Final Staff Report on Senate Bill 643: Clean Hydrogen Fuel Production and Refueling Infrastructure to Support Medium- and Heavy-Duty Fuel Cell Electric Vehicles and Off-Road Applications*. California Energy Commission. Publication Number: CEC-600-2023-053-SF. Accessed July 25, 2024. Available at https://efiling.energy.ca.gov/GetDocument.aspx?tn=254100.

In addition to grant requirements, recent programs have launched to support renewable hydrogen production. To help with the demonstration or scale-up of the production, processing, delivery, storage, or end use of clean hydrogen, the Clean Hydrogen Program was established by Assembly Bill 209 (Committee on Budget, Chapter 251, Statutes of 2022) in 2022.[45] The CEC administers the program, and the Clean Transportation Program has added funds to it. The authorizing legislation originally set the program at $100 million, but the most recent state budget reduced the Clean Hydrogen Program budget to $40 million with most of the funds slated for Fiscal Year 2025–2026.

In October 2023, the U.S. Department of Energy (DOE) awarded up to $1.2 billion to ARCHES, LLC for a regional clean hydrogen hub in California.[46] In July 2024, the U.S. DOE and ARCHES announced the official signing of a $12.6 billion agreement to establish a network of renewable hydrogen production sites intended to help decarbonize public transportation, heavy-duty trucking, and port operations.[47]

Clean Transportation Program Funding to Date

Through the Clean Transportation Program, the CEC has allocated more than $230 million to support 96 publicly available hydrogen stations focused on light-duty vehicle fueling, including associated operations and maintenance. As of July 2024, 62 hydrogen fueling stations had achieved open retail status in California. This number includes 18 stations that are considered temporarily nonoperational. The CEC recently issued a new solicitation to support improved reliability for the existing network with funding for operations and maintenance. Moreover, the CEC will continue exploring strategies to support existing stations, improve the customer refueling experience, and expand the network to meet customer needs.

Based on an idea presented at the staff concepts workshop in July 2024, the CEC released a new hydrogen refueling infrastructure solicitation in September 2024 to develop light-duty or mixed-use hydrogen refueling stations in San Francisco and Sacramento County. The solicitation will also support construction, operations and maintenance, or both for planned and operational stations where progress has stalled because of cost constraints. The solicitation includes up to $15 million in funding and closed January 29, 2025.

Chapter 5 details some recent medium- and heavy-duty ZEV infrastructure solicitations that include hydrogen projects.

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45 CEC. "Clean Hydrogen Program." Accessed April 10, 2024. Available at https://www.energy.ca.gov/programs-and-topics/programs/clean-hydrogen-program.

46 U.S. DOE. October 13, 2023. "Biden-Harris Administration Announces $7 Billion For America's First Clean Hydrogen Hubs, Driving Clean Manufacturing and Delivering New Economic Opportunities Nationwide." https://www.energy.gov/articles/biden-harris-administration-announces-7-billion-americas-first-clean-hydrogen-hubs-driving.

47 Governor Gavin Newsom. July 17, 2024. News release. "California Launches World-Leading Hydrogen Hub." Accessed September 17, 2024. Available at https://www.gov.ca.gov/2024/07/17/california-launches-world-leading-hydrogen-hub/.

For renewable hydrogen production, the CEC has awarded $21.93 million in funding under the Clean Transportation Program to support six projects.

Funding Allocation

California is on track to meet the 100-station goal previously set by AB 8. The CEC has historically focused efforts in this category on light-duty vehicle fueling stations. This Investment Plan for FY 2024–2025 allocates $15 million for light-, medium-, or heavy-duty hydrogen infrastructure, which can include multiuse stations that serve all three segments.

As noted above, light-duty stations are being developed through older and more recently released grant funding opportunities. In addition, the CEC has funded a solicitation to improve the reliability of existing stations. The CEC is committed to advancing a convenient and reliable hydrogen refueling network that meets the needs of current and future fuel cell vehicle owners. Market forces, including inflation, high hydrogen prices at the pump, and falling fuel cell vehicle sales, have slowed down the buildout of the stations. Further, the hydrogen station funding solicitation GFO-22-607 was undersubscribed, and the most recent solicitation, GFO-24-601, accepted applications through January 29, 2025. The CEC will continue to examine ways to support the hydrogen industry and fuel cell vehicle drivers. Funding allocations will be determined through stakeholder engagement to identify where the greatest needs are for zero-emission vehicle infrastructure to meet state decarbonization goals.

CHAPTER 7:
Emerging Opportunities

The Emerging Opportunities allocation provided $50 million from FY 2021–2022 to support charging and fueling infrastructure for emerging vehicle segments and the development of vehicle-grid integration products and services. Based on future funding allocations, an additional $46 million is expected to be available in FY 2025–2026.

ZEV Infrastructure for Emerging Sectors

Some sectors are early in the transition to zero-emission, such as aviation, locomotive, and marine vehicles. On July 14, 2023, CARB released a competitive grant solicitation and application package titled "Advanced Technology Demonstration and Pilot Projects" (ATDPP), which included funding from the CEC to install supporting infrastructure. This grant solicitation funded projects that support a wide array of emerging opportunities, such as zero-emission rail, marine, aviation, off-road, and "green zone" projects.[48]

The solicitation announced the availability of up to $225 million for awarded projects. CARB included $175 million in this solicitation for zero-emission off-road, marine vessel, and green-zone vehicle funding, with $60 million carved out for commercial harbor craft regulatory compliance vessels. The CEC contributed $46 million for infrastructure in support of the resulting zero-emission off-road, marine vessel, and green-zone vehicle projects. Of the 12 projects proposed for awards on March 29, 2024, 6 are proposed to receive CEC funding.

At the July 2024 funding concepts workshop (Chapter 5), an "Agriculture and Construction Infrastructure" solicitation was proposed with up to $20 million for deploying zero-emission vehicle charging or refueling infrastructure for California agriculture and construction sites. This concept would focus on building infrastructure reliability by potentially including on-site energy generation. Projects would install and deploy new charging dispensers, hydrogen refueling equipment, or both for use by commercially available agriculture and construction vehicles. This concept may be developed into a broader medium- and heavy-duty infrastructure solicitation, which may be released in early 2025.

Vehicle-Grid Integration

Vehicle-grid integration will be particularly important as California continues decarbonizing, or switching energy sources from fossil-based to electric. 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, and shave on-peak consumption while reducing customer charging costs. Bidirectional charging, a subset of vehicle-grid integration, can enable EVs to discharge energy from onboard batteries to homes, buildings, the grid, or

48 "Green zones" are focused on a city or group of cities and is a broad category that can include zero-emission construction, waste collection, and landscaping equipment for schools and parks.

other loads. This ability can further support grid reliability and maximize other benefits of flexible EV charging.

In July 2022, the CEC held a workshop discussing the market status of vehicle-grid integration and potential funding concepts.[49] Based on feedback from this workshop, the CEC developed and issued the Responsive, Easy Charging Products With Dynamic Signals (REDWDS) solicitation in March 2023.[50] In September 2023, the CEC released a NOPA proposing $20.3 million in grant funds, and these awards were approved at business meetings through the first half of 2024. Projects funded by the solicitation will 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 for REDWDS projects meeting predefined performance metrics.

In May 2023, the CEC held a workshop discussing the Charging Interoperability and Collaboration Yard concept, or "Charge Yard," which could provide a permanent space for testing charging interoperability and exploring next-generation features such as bidirectional charging. Based on positive stakeholder feedback, CEC staff intends to develop the concept into a full solicitation.

Another recent Clean Transportation Program funding opportunity addressing managed and bidirectional charging is the Electric School Bus Bi-Directional Infrastructure solicitation, GFO-22-612. This solicitation funded managed charging and bidirectional power flow projects for electric school buses and associated infrastructure. A NOPA was released in September 2023, with the possibility of a second phase of awards via a subsequent solicitation.

For chargers funded through many CEC projects, the CEC includes minimum technical requirements, including some meant to enable grid-integrated charging. For example, requirements for Open Charge Point Protocol and International Organization for Standardization 15118 enable grid-integrated charging capabilities as well as other charging management functions. These best practices ensure that preparations for vehicle-grid integration are included across a large swath of the CEC's charger funding portfolio. The CEC will continue exploring opportunities to support vehicle-grid integration through the Clean Transportation Program, including potentially in collaboration with other CEC funding sources.[51]

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49 CEC. July 28, 2022. "Workshop on 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.

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

51 The CEC published the *Clean Energy Reliability Investment Plan* (CERIP) in March 2023, which noted that CERIP funding "could be used to support rapid scale up of VGI and V2B [vehicle-to-building], particularly in collaboration with electric vehicle infrastructure buildout funded through separate programs." Accessed August 21, 2023. Available at https://efiling.energy.ca.gov/GetDocument.aspx?tn=249029.

CHAPTER 8: Manufacturing

Transportation equipment manufacturing was the fourth-largest export in California by trade dollar value in 2022.[52] 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.[53] California has 60 ZEV-related manufacturers and leads the nation in ZEV manufacturing jobs.[54] Manufacturing jobs are critical to disadvantaged communities, low-income communities, and small businesses.

Job quality is also key, and 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.

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. 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. Since the beginning of the Clean Transportation Program, $278 million in funding has been provided under the manufacturing category to support 40 projects.

On March 30, 2022, the CEC released the competitive grant solicitation GFO-21-605, Zero-Emission Transportation Manufacturing, with this funding.[55] This solicitation funded projects that increase in-state manufacturing of ZEVs, ZEV components and batteries, and ZEV charging/refueling equipment. The revised March 15, 2023, NOPA announced plans for awards totaling $197.9 million among 13 projects. Some of the projects awarded focus on completely vertically integrated entities, such as GILLIG and Zero Motorcycles. Other companies and awards will manufacture parts and components, such as Motiv Power Systems (electric

52 U.S. Census Bureau. "California Top 6 Exports." Accessed August 21, 2023. Available at https://www.bls.gov/mxp/publications/regional-publications/charts/california-top-6-exports.htm.

53 CALSTART. January 2021. "CALSTART's California ZEV Jobs Study." Accessed July 31, 2024. Available at https://calstart.org/wp-content/uploads/2021/02/CA-ZEV-Jobs-Study-Final-0203.pdf.

54 California Energy Commission. 2024. "California Zero-Emission Vehicle-Related Manufacturing Web Application." Accessed July 18, 2024. Data last updated February 2024. Available at https://experience.arcgis.com/experience/95583f19bded4bf0bdd0fbdd4dd77c85/?draft=true.

55 CEC. "GFO-21-605 - Zero-Emission Transportation Manufacturing." Accessed July 31, 2024. Available at https://www.energy.ca.gov/solicitations/2022-03/gfo-21-605-zero-emission-transportation-manufacturing.

powertrains), Freewire Technologies (battery-integrated DC fast chargers), and FirstElement Fuel (hydrogen refueling station parts).

On August 9, 2022, the ZEV Battery Manufacturing Block Grant solicitation (GFO-21-606) was released for a third-party implementor to award grant funds for projects that will increase in-state manufacturing of ZEV batteries.[56] CALSTART was selected as the block grant implementor. CALSTART held a public workshop August 30, 2023, to introduce and seek public feedback on the PowerForward ZEV Battery Manufacturing Grant project. The PowerForward battery manufacturing funding opportunity was released in April 2024, and the NOPA was posted on September 9, 2024, proposing $43.6 million in funding for three projects.[57]The CEC is not adding new Clean Transportation Program funding to manufacturing for FY 2024–2025. However, staff continues overseeing the manufacturing grants resulting from GFO-21-605 and working with CALSTART to implement the PowerForward block grant.

56 CEC. "GFO-21-606 — Zero-Emission Vehicle Battery Manufacturing Block Grant." Archived version available at https://web.archive.org/web/20230923084200/https://www.energy.ca.gov/solicitations/2022-08/gfo-21-606-zero-emission-vehicle-battery-manufacturing-block-grant.

57 PowerForward. 2024. "PowerForward: ZEV Battery Manufacturing Grant Program." Accessed July 31, 2024. Available at https://powerforwardgrant.org/index.html. See also "Notice of Proposed Awards: PowerForward Grant Solicitation Zero-Emission Vehicle Battery Manufacturing." Accessed September 9, 2024. Available at https://powerforwardgrant.org/documents/PowerForward%20NOPA.pdf.

CHAPTER 9:
Workforce Training and Development

Investments in workforce training and development are critical to advancing ZEV and ZEV infrastructure markets. To date, the CEC has invested more than $44 million in workforce skills and capacity building through various institutions and partnerships 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. Incorporating high-road policies into program investments is equally important to meeting economic goals for California's workers.[58] Clean Transportation Program workforce training and development funds prioritize:

- Directing investments and accruing benefits to disadvantaged and low-income communities.
- Addressing workforce and market needs in all ZEV and ZEV infrastructure industries.
- Building new partnerships to support workforce development pipelines and career pathways.

Interagency Collaboration

Collaborating with other agencies is key to ZEV workforce development. In January 2024, the CEC approved a partnership agreement with the California Workforce Development Board to:

- Provide technical assistance, analysis, and education for workforce development in clean energy.
- Support high-quality jobs, careers, and workforce education and training.
- Increase access to quality employment and workforce development in the energy sector for disadvantaged and low-income communities in California.

Another example of interagency collaboration relates to AB 841. Under AB 841, EV charging equipment that is funded by the CEC or CARB and meets certain requirements must be installed by at least one electrician that holds an Electric Vehicle Infrastructure Training Program (EVITP) certification. At the March 2024 business meeting, the CEC approved a $3 million interagency agreement with the California Employment Training Panel to train and certify additional licensed electricians through the EVITP. This agreement is intended to help

58 California Workforce Development Board. "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 https://leginfo.legislature.ca.gov/faces/codes_displayText.xhtml?lawCode=UIC&division=7.&title=&part=&chapter=2.&article=.

ensure that broad access to EVITP is available throughout all parts of California, including rural communities that may have a harder time finding appropriately certified electricians.

Recent Clean Transportation Program Activities

In 2022, the IDEAL (Inclusive, Diverse, Equitable, Accessible, and Local) ZEV Workforce Pilot solicitation awarded more than $6.3 million in Clean Transportation Program funding for 13 community-based workforce training and development projects to support the growing demand for skilled workers in the sector. These projects will develop curricula and provide tuition and job placement assistance for ZEV training related to public transit, fleet operations, freight, and hydrogen refueling infrastructure. Training programs will engage students from diverse demographics: high school students, college students, apprenticeship programs, veterans, and low-income and disadvantaged communities. Most IDEAL ZEV Workforce Pilot projects are expected to be completed in 2025.

In January 2024, the CEC released the Tribal Electric Vehicle Infrastructure, Planning, and Workforce Training and Development solicitation. This solicitation, targeted at tribes, tribal organizations, and tribally owned businesses, included Clean Transportation Program funding for activities that support careers in EVs, EV infrastructure, and EV-related technologies. On November 20, 2024, the CEC released a Notice of Proposed Award that included nearly $1 million toward workforce training and development activities among the proposed recipients.

Strategy and Future Activities

In June 2024, the CEC released the first draft of the ZEV Workforce Training and Development Strategy.[59] The strategy clarifies the CEC's role in ZEV workforce development, recognizes existing opportunities, and serves as a roadmap to building the career pathways necessary to support ZEVs and ZEV infrastructure. The draft identifies eight workforce program objectives and funding priorities to support workforce training and development activities for ZEVs and electric vehicle charging infrastructure:

- Publish the Draft ZEV Workforce Training and Development Strategy.
- Conduct a public workshop to introduce the strategy and priority objectives and solicit public feedback.
- Increase the number of EVITP-certified electricians.
- Develop an incentive program to support charger maintenance and repair training.
- Develop a charging infrastructure workforce assessment.
- Update the CEC’s workforce webpage.
- Conduct a public EVITP workshop.
- Develop workforce requirements for solicitations.

59 McKinny, Jana. June 2024. *Zero-Emission Vehicle Workforce Training and Development Strategy: A Roadmap for Clean Transportation Program Funding*. California Energy Commission. Publication Number: CEC-600-2024-049-SD. Available at https://efiling.energy.ca.gov/GetDocument.aspx?tn=257368.

On June 25, 2024, staff conducted a workshop to introduce the draft strategy and priority objectives and solicit public feedback.[60] The workshop included presentations and panels featuring state agencies, industry, and other organizations, and a discussion of training opportunities and skill gaps for charger maintenance and repair. Feedback from other state agencies and public comments will be incorporated into the next version of the strategy, expected in late 2024 or 2025.

Workforce Gaps

Identifying available workforce and training resources for manufacturing, installation, operations, and maintenance of EV charging infrastructure and hydrogen refueling stations is the first step toward identifying skills gaps and tailoring training programs to meet the evolving needs of the industry. In collaboration with industry, researchers, and other state agencies, staff will therefore analyze the workforce needed to install and maintain ZEV infrastructure. The assessment will help provide a baseline to measure program results and assess the impact of workforce development programs.

Funding Allocation

Given limited funding for this fiscal year, the CEC allocates $2 million for workforce training and development in FY 2024–2025. The CEC will continue to explore new labor, workforce, and employer partnerships and leverage limited resources to determine how to maximize the benefits of Clean Transportation Program investments. Workforce training and development investments will continue to support priority communities, meet ZEV and ZEV infrastructure industry needs, create workforce partnerships, and advance job quality and quantity across the entire ZEV workforce ecosystem.

60 More information is available at the ZEV Workforce Training and Development Workshop event page: https://www.energy.ca.gov/event/workshop/2024-06/clean-transportation-program-zev-workforce-training-and-development-workshop.

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)."
Book and claim	An accounting method where emissions savings from one environmentally friendly facility are considered to "offset" the emissions of another.
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

Term	Definition
	determine which communities are the most burdened or "disadvantaged."
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_2e)	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_2e/MJ).
Carbon neutrality	A balanced state where the amount of greenhouse gases being put into the atmosphere equals the amount being taken out.
CHAdeMO	One of three standards for direct-current fast charging of light-duty electric vehicles in the U.S. CHAdeMO is no longer as common as the other two standards, the Combined Charging System (CCS) and the North American Charging System (NACS).
Clean Vehicle Rebate Project (CVRP)	A California Air Resources Board program that provides financial assistance for purchasing or leasing battery-electric, fuel cell, and plug-in hybrid vehicles.
Contractors State License Board (CSLB)	A California state agency that licenses and regulates workers in multiple construction trades.
Criteria air pollutant	An air pollutant for which acceptable levels of exposure can be determined and for which the U.S. Environmental Protection Agency (U.S. EPA) 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 $PM_{2.5}$).
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.

Term	Definition
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.
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.
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.
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.
gCO2e/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.
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_2O), halogenated fluorocarbons (HCFCs), ozone (O_3), perfluorinated carbons (PFCs), and hydrofluorocarbons (HFCs).

Term	Definition
Greenhouse Gas Reduction Fund (GGRF)	Cap-and-trade auction proceeds used to fund projects that reduce greenhouse gas emissions, strengthen the economy, improve public health and the environment, and provide meaningful benefits to the most disadvantaged communities and low-income communities and households. California Air Resources Board's California Climate Investments provides guidance on the use of these funds.
High road	A set of economic and workforce development strategies to achieve economic growth, economic equity, shared prosperity, and a clean environment. Strategies include 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.
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.
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 applications) alternating-current plug. This equipment generally requires a dedicated 40-amp circuit.
Low Carbon Fuel Standard (LCFS)	A set of standards designed to decrease the carbon intensity of California's transportation fuel pool and provide an increasing range of low-carbon and renewable alternatives, which reduce petroleum dependency and achieve air quality benefits.

Term	Definition
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 Development 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.
Nameplate capacity	The maximum fuel capacity that a hydrogen refueling station is designed to dispense.
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).
Open retail station	A station that meets stringent standards and is open to the public for the retail sale of hydrogen for use in fuel cell electric vehicles.
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

Term	Definition
	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.