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2023–2024 Investment Plan Update for the Clean Transportation Program

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California Energy Commission

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ABSTRACT

The *2023–2024 Investment Plan Update for the Clean Transportation Program* guides the allocation of program funding for Fiscal Year 2023–2024. It also includes general fund and Greenhouse Gas Reduction Fund allocations under the Budget Acts of 2022 and 2023, which project funding through 2027. 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), has averaged about \$100 million per year. The California Energy Commission (CEC) reviews the proposed allocations annually and adjusts as needed.

This 2023–2024 investment plan is the fifteenth in the history of the program and reflects laws, executive orders, regulations, and other funding programs to reduce greenhouse gas emissions, petroleum dependence, and criteria pollution emissions for all Californians. Program priorities are determined with input from interested and affected groups, the Disadvantaged Communities Advisory Group, the Clean Transportation Program Advisory Committee, and CEC 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 *2023–2024 Investment Plan Update* establishes funding allocations based on identified needs and opportunities, including a focus on zero-emission vehicle infrastructure. The investment plan also prioritizes jobs, economic stimulus, and equity.

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

Keywords: California Energy Commission, Clean Transportation Program, AB 118, AB 8, AB 126, funding program, alternative transportation fuels, investment plan, equity, electric vehicles, hydrogen, biofuels, biomethane, biodiesel, renewable diesel, diesel substitutes, gasoline substitutes, tribal communities, disadvantaged communities, workforce, training, sustainability, fueling stations, fuel production, alternative fuel infrastructure, manufacturing

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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's) Clean Transportation Program is one of the first transportation-focused funding programs created by the California Legislature to help achieve the state's climate policies. The Clean Transportation Program has made significant progress through grant-focused investments designed to transition California to a clean transportation system. Now in its fifteenth year, the Clean Transportation Program has provided more than \$1.8 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.

California has experienced rapid growth in the sales of plug-in electric vehicles (or PEVs, including 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 second quarter of 2023, more than one-fourth (25.4 percent) of new light-duty vehicle sales in California were ZEVs or plug-in hybrids. The state reached 1 million passenger ZEVs and plug-in hybrids sold in the fourth quarter of 2021, with more than 1.6 million ZEVs and plug-in hybrids sold through the second quarter of 2023. While behind the passenger ZEV market, the number of medium- and heavy-duty ZEVs on the road reached more than 2,300 as of the end of 2022, with transit, school, and delivery vehicles at the forefront.

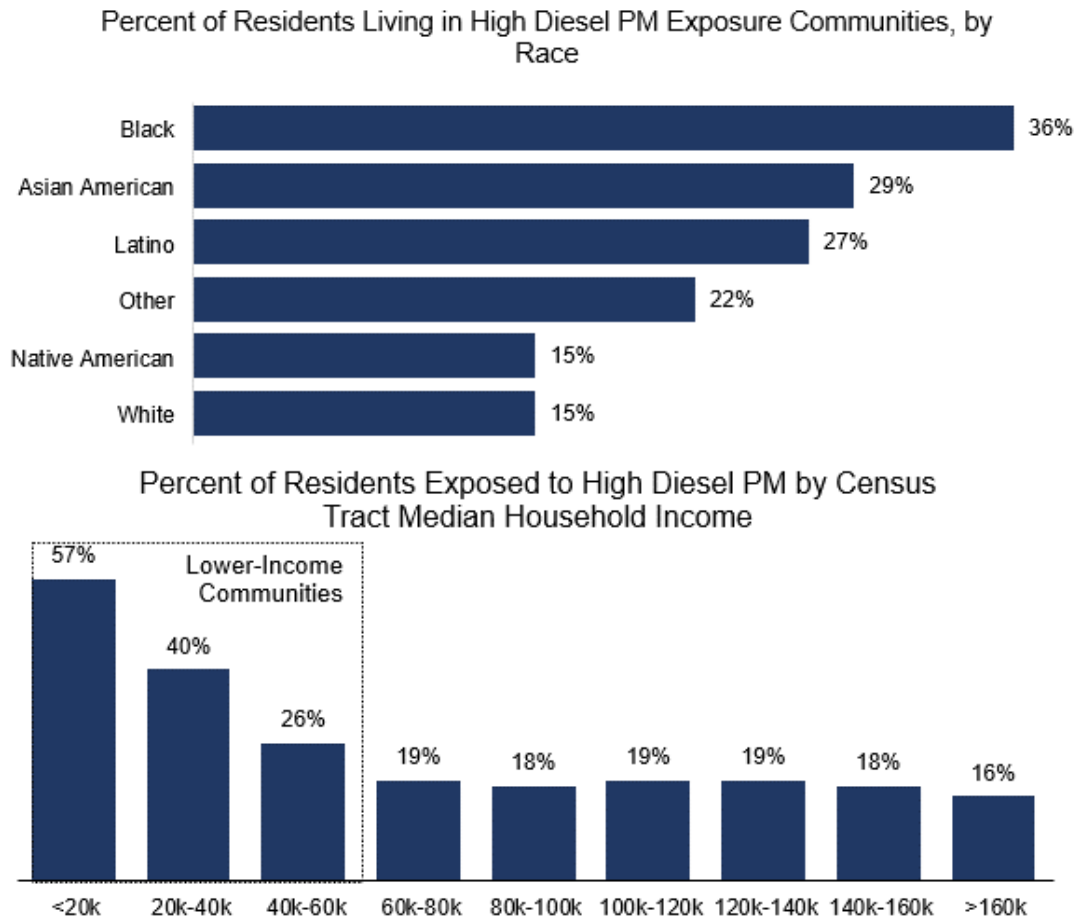
Purpose of the Clean Transportation Program

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

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

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

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



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

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

- By 2025:
 - Reaching at least 1.5 million ZEVs (Executive Order B-16-12).
 - Installing 200 hydrogen-fueling stations and 250,000 battery-electric vehicle (BEV) chargers, including 10,000 direct current fast chargers (which was achieved two years early in 2023) (Executive Order B-48-18).
- By 2030:
 - Reaching at least 5 million ZEVs (Executive Order B-48-18).

- By 2035:
 - Achieving 100 percent of new sales of passenger vehicles and trucks to ZEVs (Executive Order N-79-20/Advanced Clean Cars II Regulations).
 - Transitioning 100 percent of operating drayage trucks to zero emission (Executive Order N-79-20).
 - Transitioning 100 percent of operating off-road vehicles and equipment to zero emission everywhere feasible (Executive Order N-79-20).
- By 2045:
 - Transitioning 100 percent of operating medium- and heavy-duty trucks and buses to zero emission by 2045 everywhere feasible (Executive Order N-79-20).

To help the state achieve its climate change policies, the California Legislature passed Assembly Bill 118 (Núñez, Chapter 750, Statutes of 2007) and created the Clean Transportation Program, to be administered by the CEC. With funds collected from vehicle and vessel registration, vehicle identification plates, and smog-abatement fees, the Clean Transportation Program funds projects that will “transform California’s fuel and vehicle types to help attain the state’s climate change policies.” Assembly Bill 8 (Perea, Chapter 401, Statutes of 2013) subsequently extended the collection of fees that support the Clean Transportation Program to January 1, 2024. Most recently, Assembly Bill 126 (Reyes, Chapter 319, Statutes of 2023) reauthorized the Clean Transportation Program to July 1, 2035.

Description of the Investment Plan

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

The CEC’s multiyear approach to Investment Plan allocations provides a consistent signal about the state’s planned clean transportation investments. These updates cover Clean Transportation Program investments for Fiscal Year 2023–2024, as well as general funds and Greenhouse Gas Reduction Funds approved through the annual state budget through 2027. The CEC engages in a rigorous public process to evaluate whether adjustments should be made to the allocations.

Highlights of Investments

The Clean Transportation Program has been an essential part of making California a leader in zero-emission transportation. Since the first Clean Transportation Program investment plan was released in 2009, the CEC has invested more than \$1.8 billion in projects supporting zero-emission vehicle infrastructure, alternative fuels, and advanced vehicle technologies. This figure includes both the base Clean Transportation Program funds and recent general funds. Key highlights through July 2023 include:

- Installing or planning nearly 24,500 chargers for plug-in electric vehicles, including nearly 6,000 at multi- and single-family homes; 155 for fleets; 420 at workplaces; 15,500 public and shared-private Level 2 and Level 1 chargers; and 2,300 public and fleet direct current (DC) fast chargers along highway corridors and urban metropolitan areas.
- Creating the California Electric Vehicle Infrastructure Project (CALeVIP) to provide streamlined Clean Transportation Program incentives for light-duty electric vehicle charging infrastructure.
- Funding two additional light-duty electric vehicle charging infrastructure block grant projects to implement up to \$250 million each in incentives. One project, called CALeVIP 2.0, offers rebates for high-powered (150 kilowatt+) DC fast chargers. The other, called Communities in Charge, offers incentives for Level 2 chargers with scoring priority given to disadvantaged and low-income communities.
- Funding 86 regional readiness planning grants, regional readiness implementation grants, and medium- and heavy-duty ZEV blueprint grants for communities and fleets that are ramping up for the adoption of ZEV technologies.
- Releasing new solicitations targeting high-priority or underserved EV charging needs, including multifamily housing, rural communities, and infrastructure for high-mileage on-demand transportation services.
- Allocating funding for 107 publicly available hydrogen fueling stations. As of October 2023, 66 hydrogen fueling stations had achieved open retail status in California. These open retail stations include 12 that are considered temporarily nonoperational (unavailable for more than 30 days) and are expected to become available for customer fueling again in the future.
- Funding six projects to produce 100 percent renewable hydrogen from in-state renewable resources.
- Awarding 120 projects providing more than \$97 million in infrastructure incentives through the nation's first commercial vehicle fleet incentive project titled Energy Infrastructure Incentives for Zero-Emission Commercial Vehicles (EnergIIZE Commercial Vehicles). This project will accelerate the deployment of electric and hydrogen infrastructure needed to fuel zero-emission trucks, buses, and equipment. The multiyear project includes a requirement that 60 percent of funds support low-income and disadvantaged communities.
- Releasing targeted grant funding solicitations to provide zero-emission charging and hydrogen refueling infrastructure for transit buses and drayage trucks, the latter in direct partnership with the California Air Resources Board (CARB) to provide vehicle funding incentives.
- Funding 40 manufacturing projects to date that support in-state economic growth. Projects include ZEVs, ZEV components (including batteries), and ZEV infrastructure. The CEC is developing funding agreements for two additional in-state ZEV manufacturing projects using one-time funding from the general fund. Furthermore, from this same one-time funding, a ZEV Battery Block Grant project was approved and

awarded to CALSTART to implement subawards for ZEV battery manufacturing within the state.

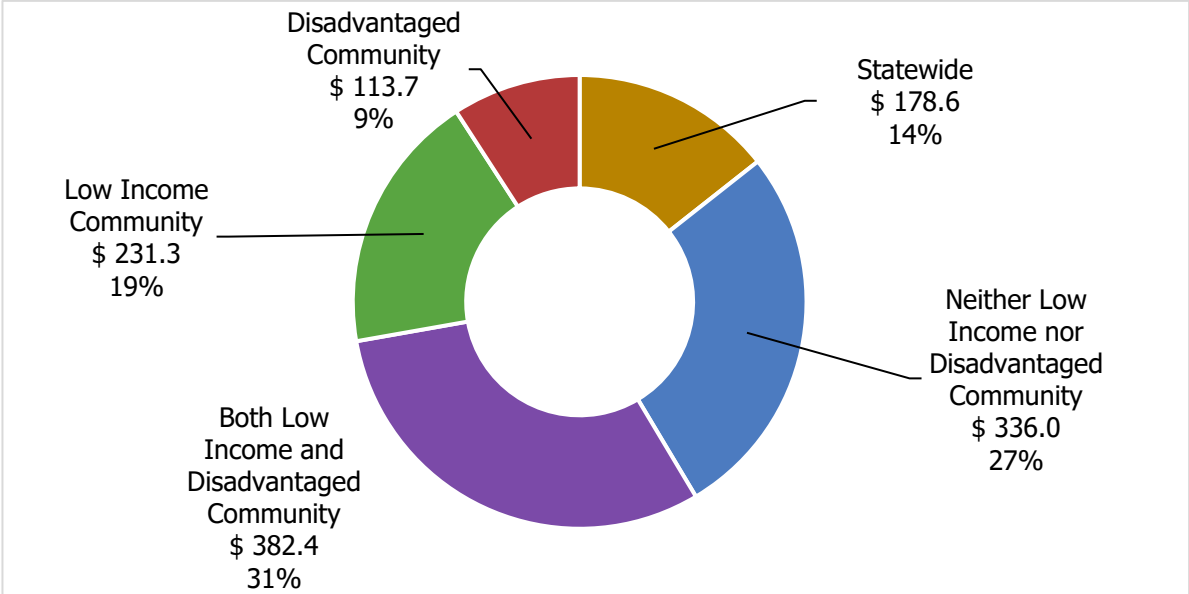
- Providing workforce training for more than 32,000 trainees and trainers, helping prepare workers for the clean transportation economy and the opportunity to earn sustainable wages and expand career employment pathways.
- Launching 74 projects to promote the production of sustainable, low-carbon alternative fuels within California. Most of the projects use waste-based feedstocks, which have some of the lowest carbon intensity pathways of alternative fuels within the state.

Commitment to Inclusion, Diversity, Equity, and Access

The CEC is committed to inclusion, diversity, equity, and access, ensuring that all Californians have an opportunity to participate in and directly benefit from programs and services, and supporting in-state employment, in-state manufacturing, and state/local economic development. Furthermore, the CEC will seek to provide more than 50 percent of Clean Transportation Program funds from this investment plan toward projects that benefit low-income and disadvantaged communities. Assembly Bill 126 formally requires this goal to be met starting January 1, 2025. 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.

As depicted in Figure ES-2, to date, 58.6 percent of funds have gone to projects located in disadvantaged and/or low-income communities. This figure excludes about \$430 million in block-grant funds, and \$32 million in standard grant funds, that have either not yet been assigned to a specific site address or that are still in the process of being completed. This methodology has changed somewhat compared to past Investment Plan Updates, and is intended to be more accurate. Only after funding is assigned to specific sites can staff determine if those sites are in a low-income or disadvantaged community, both, or neither.

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



Totals may not match due to rounding. Includes investments from the beginning of the Clean Transportation Program through July 2023. "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 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) in 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 to conduct outreach and engagement in partnership with local community-based organizations.

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

The Advisory Committee for the Clean Transportation Program has 26 members and reflects a broad array of interested and affected groups representing community-based organizations, social and environmental justice advocates, alternative vehicle technologies, as well as workforce and labor interests. The perspectives and recommendations of the members and

other interested and affected groups help guide an inclusive approach for Clean Transportation Program investments.

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 agency to supporting California tribal energy sovereignty and independence. The CEC is working toward increasing access to funding, modernizing crucial infrastructure, and accelerating the state's clean transportation progress (specifically, ZEV adoption) among California Native American tribes.

In addition, Senate Bill 1000 (Lara, Chapter 368, Statutes of 2018) requires the CEC to assess whether chargers are disproportionately deployed by population density, geographical area, or population income level, including low-, middle-, and high-income levels. Staff published the first *Senate Bill 1000 Electric Vehicle Charging Infrastructure Deployment Assessment* on December 30, 2020. The report found that low-income communities, on average, have fewer public chargers per capita than middle- or high-income communities. The second report, published July 14, 2022, assessed drive times to public direct current fast charging stations. This second assessment found that rural communities have less public fast charging station coverage than urban communities, with low-income rural communities particularly lacking coverage.

Zero-Emission Vehicle Infrastructure Gap

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

In response, in 2021 the CEC issued the inaugural edition of the *Assembly Bill 2127 Electric Vehicle Charging Infrastructure Assessment — Analyzing Charging Needs to Support Zero-Emission Vehicles in 2030*. For passenger vehicle charging in 2030, the report projects that California will need nearly 1.2 million public and shared-private chargers to support the roughly 8 million ZEVs that CARB projects in its *Mobile Source Strategy*. An additional 157,000 chargers are needed to support 180,000 medium- and heavy-duty vehicles anticipated for 2030. The CEC is updating this charger needs analysis with plans to publish the second edition report by the end of 2023. CEC analysis finds that there is sufficient funding from the state, federal government, and utilities for California to have more than 250,000 light duty vehicle chargers, of which 18,000 are direct current fast chargers (Table ES-1). This is a minimum amount, not a maximum, since private sector investments are not included.

Ensuring a reliable charging experience will be 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. On January 25, 2023,

the CEC began a rulemaking proceeding to develop charger reliability regulations in accordance with Assembly Bill 2061 (Ting, Chapter 345, Statutes of 2022). 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.

The CEC also conducts extensive analysis on hydrogen fuel cell electric vehicle (FCEV) infrastructure. This analysis includes interagency collaborations such as the *Joint Agency Staff Report on Assembly Bill 8: Annual Assessment of Time and Cost Needed to Attain 100 Hydrogen Fueling Stations in California*, written by the CEC and CARB. In last year's joint agency report, staff anticipated 175 stations by 2027 and estimated that the gap to the 200-station goal would be closed using additional funding from the state's general fund. However, one grant recipient (Shell) requested to cancel their \$41 million agreement in June 2023, which was expected to develop 50 new stations. Also, the latest grant funding opportunity, GFO-22-607, which was intended to help California reach the 200-station goal, was undersubscribed. Now, between public and private investments, staff anticipates that California will have 130 stations.

The network of 130 stations will have a nameplate capacity to serve 188,000 light-duty FCEVs. When assuming operation at 80 percent of nameplate capacity, these stations will be capable of supporting nearly 150,000 FCEVs. However, 12 of these stations have been temporarily nonoperational for more than 30 days, and other stations have faced reliability challenges, due in part to 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.

As of the end of 2022 there were around 11,900 FCEVs in California. CARB reported, in the *2022 Annual Evaluation of Fuel Cell Electric Vehicle Deployment and Hydrogen Fuel Station Network Development*, that the FCEV population in California could grow to 65,600 FCEVs by 2028, based on the auto manufacturer survey responses in 2022. Medium- and heavy-duty FCEVs can play an important role in goods movement and transit, and additional infrastructure will be needed to support both electric and hydrogen fleets.

In September 2023, the CEC released the *2023 Staff Report on Senate Bill 643*. This report assesses the existing and planned refueling infrastructure for medium- and heavy-duty FCEVs in California. It also assesses clean hydrogen production, off-road uses for hydrogen, and global developments in the hydrogen sector.

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)*	82,135	9,808	91,943	66
Number of Chargers/Fueling Stations for Which Funding Has Been Allocated (includes anticipated funding from Clean Transportation Program)†	161,870	10,637	172,507	64
Total	244,005	20,445	264,450	130**
<i>2025 Goal</i> (Executive Order B-48-18)	240,000††	10,000††	250,000	200
Gap From Near-Term Goal	0	0	0	70
Inaugural Assembly Bill 2127 Report 2030 Estimate of Charging Needs	1,126,855	37,461	1,164,316	-
Gap From 2030 Estimates	882,850	17,016	899,866	-

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

† Estimate of ports from other state programs derived from public presentations and statements by utilities, CPUC, CARB, other entities, and CEC. Includes funding from the State Budget Act of 2021 and State Budget Act of 2022 intended to close the gaps for Level 2 and DC fast chargers and hydrogen fueling stations. 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 CPUC’s five-year, statewide \$1 billion transportation electrification program starting in 2025.

** These hydrogen fueling stations include privately funded stations.

†† This analysis is as of July 2023. CEC expects to reach 240,000 Level 2 chargers in 2026. The state reached 10,000 DC fast chargers ahead of schedule in September 2023.

Source: California Energy Commission.

The Zero-Emission Vehicle Infrastructure Plan (ZIP)

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

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

- DC fast charging for light-duty EVs.
- Emerging technologies.

The revised staff report was published in December 2022 and is a resource for public and private entities to better understand the status of short-term and long-term state actions to support ZEV infrastructure. CEC staff expects to release a draft version of the next ZEV Infrastructure Plan in the second half of 2024.

Federal Support for ZEV Infrastructure

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

On August 1, 2023, the CEC and Caltrans submitted to the U.S. Joint Office of Energy and Transportation an update to California's NEVI Deployment Plan. California's deployment plan update for 2023 received federal approval September 29, 2023. The deployment plan will be updated each year to reflect the progress of the previous year, identify new challenges and opportunities, highlight future deployment plans, and ensure alignment with California's EV charging infrastructure planning. The current plan is to build a network of modern, high-powered DC fast chargers along interstates and national highways throughout California. The CEC expects to deploy 28 high-powered DC fast charging locations with a total of 291 fast charging ports as a result of its initial NEVI Formula Program solicitation.

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

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

Budget Act of 2021

On July 12, 2021, Governor Gavin Newsom strengthened California's commitment to a zero-emission transportation future by approving the State Budget Act of 2021 (Senate Bill 129,

Skinner, Chapter 69), which included a three-year, \$3.9 billion budget for ZEV-related investments by CEC, CARB, and GO-Biz. Of that package amount, the CEC would administer \$1.165 billion over three years. While some projected funds have changed in more recent budgets, the Budget Act of 2021 set the stage for increased ZEV investments.

Budget Act of 2022

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

The funding will help increase ZEV charging for light-duty vehicles with an emphasis on broader access and equitable at-home charging for multiunit dwellings. The four-year budget also provided \$1.385 billion in infrastructure funding to power medium-duty and heavy-duty vehicles and equipment.

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

Budget Act of 2023

Governor Newsom's 2023–2024 budget framework preserves 88 percent of the CEC's funding for zero-emission transportation through Fiscal Year 2025–2026, originally allocated from the general fund, under the Budget Acts of 2021 and 2022. When including the newly added funding projected for Fiscal Year 2026–2027, the total ZEV Package funding has increased. However, this budget framework significantly changes clean-transportation allocations compared to the Budget Acts of 2021 and 2022, including:

- Redistributing much of the previously projected Fiscal Year 2023–2024 allocations to later fiscal years. ZEV Package funding specific to Fiscal Year 2023–2024 is \$438.5 million, rather than the previously projected \$1.070 billion.
- Replacing the Transit Bus ZEV Infrastructure funds with a new Zero-Emission Transit Capital Program at the California State Transportation Agency. Since the CEC will not administer these funds, they are not included in Table ES-2.
- Eliminating the Hydrogen Refueling Infrastructure category. However, hydrogen projects are still eligible under categories such as Drayage Truck ZEV Infrastructure.
- Reassigning the other ZEV Package General Fund allocations, except for School Bus ZEV Infrastructure, to a different funding source: the Greenhouse Gas Reduction Fund.

Clean Transportation Program Reauthorization Through 2035

On October 7, 2023, Governor Newsom signed Assembly Bill 126, which extends the Clean Transportation Program through July 1, 2035, rather than the previous end date in 2023. The bill changes and adds several requirements for the program, including:

- Focusing program investments into zero-emission technology projects, where feasible, and near-zero-emission projects elsewhere.
- Requiring that the CEC spend at least 50 percent of Clean Transportation Program funds in ways that directly benefit low-income Californians and members of low-income and disadvantaged communities.
- Requiring awardees of funding for hydrogen fueling stations and EV charging stations to report fuel carbon intensity, operational, reliability and uptime data to the CEC.
- Requiring the CEC to provide scoring preferences to projects that dispense “clean and renewable” hydrogen when awarding grants for hydrogen fueling stations.

Assembly Bill 126 also changed the specified annual allocation for hydrogen refueling stations under the Clean Transportation Program. Assembly Bill 8 previously directed the CEC to allocate \$20 million annually, not to exceed 20 percent of the funds appropriated by the Legislature, from the Clean Transportation Program to deploy hydrogen fueling stations until there are at least 100 publicly available stations in operation. Assembly Bill 126 modifies the required hydrogen funding to at least 15 percent of Clean Transportation Program funds for light-, medium-, or heavy-duty vehicle refueling.

Proposed Clean Transportation Program Funding Allocations for 2023–2024

The Investment Plan Update includes the base Clean Transportation Program funding and the additional ZEV Package investments, which draw from the general fund and Greenhouse Gas Reduction Fund. Table ES-2 shows the proposed base funding allocation for Fiscal Year 2023–2024, as well as the recent ZEV Package allocations under the Budget Acts of 2022 and 2023. The CEC can make adjustments only in base Clean Transportation Program funding; funding categories in the Budget Acts of 2022 and 2023 are set in law and cannot be modified.

Funding allocations for this revised staff draft of the *2023–2024 Investment Plan Update* have changed significantly from the multiyear allocations in last year’s *2022–2023 Investment Plan Update*. These changes reflect how the Clean Transportation Program has been reauthorized past 2023. They also reflect how the Budget Act of 2023 has reallocated previously planned ZEV Package funding.

Table ES-2 shows combined allocations of more than \$600 million to support light-duty passenger vehicle infrastructure (first three rows) and more than \$1.1 billion to support medium- and heavy-duty ZEV infrastructure (next five rows). Investments in medium- and heavy-duty ZEV infrastructure reflect the need to swiftly transition the most polluting vehicles toward zero-emission technologies in the most sensitive regions of the state. At the same time, there must be continued infrastructure investments to support light-duty passenger vehicles.

Combined with previous investments from the Clean Transportation Program, 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. The Greenhouse Gas Reduction Fund will provide \$340 million over Fiscal Years 2024–2025, 2025–2026, and 2026–2027 to build a broad network of grid-integrated, high-powered fast chargers to support travel across the state and supplement federal NEVI funding for corridor fast charging. The Greenhouse Gas Reduction Fund also provides \$275 million for equitable at-home charging for multifamily residents and priority community single-family homes.

As mentioned above, the Budget Act of 2023 did not include the additional \$20 million per year for three years that was previously projected specifically for hydrogen infrastructure funding. However, the Investment Plan allocates at least \$15 million in base Clean Transportation Program funding for medium- and heavy-duty hydrogen infrastructure. If grant funding solicitations are undersubscribed during the year, the CEC is authorized to reallocate the funding.

Greenhouse Gas Reduction Funds from the Budget Act of 2023 for medium- and heavy-duty ZEV infrastructure will also be used for hydrogen infrastructure, as will funding from the Emerging Opportunities category. Table ES-2 lists the funding categories where hydrogen projects are eligible. Therefore, the \$15 million for hydrogen infrastructure is a minimum amount, not a maximum.

For light-duty hydrogen infrastructure, the CEC proposes to use remaining funds from previous fiscal years, including about \$34 million in unexpired funds from the cancelled Shell agreement mentioned above. The CEC will continue to evaluate the FCEV market and is committed to providing a sufficient hydrogen fueling infrastructure that will provide the reliable coverage and the capacity to support current and future light-duty passenger vehicles. However, developers have been cautious in the face of inflationary pressures and market uncertainties, including low credit prices for the Low Carbon Fuel Standard (LCFS). As a result, the recent hydrogen solicitation GFO-22-607 was undersubscribed. The CEC will soon issue a new solicitation to support improved reliability for the existing network with funding for operations and maintenance, and will continue exploring strategies to support existing stations, improve the customer refueling experience, and expand the network to meet customer needs.

The Investment Plan allocates \$1.14 billion for medium- and heavy-duty ZEV infrastructure. This includes \$42.6 million of base Clean Transportation Program funding for medium- and heavy-duty ZEV infrastructure in Fiscal Year 2023–2024. These funds will support the deployment of ZEV drayage trucks, school buses, transit buses, and other medium- and heavy-duty vehicles within the state. In addition to grant funding, the CEC is working with partner agencies and exploring alternative funding mechanisms, such as loan financing.

Allocations from the base funding and ZEV Package funding will also support a broader portfolio of activities. The Emerging Opportunities allocation, for instance, includes \$46 million from the Greenhouse Gas Reduction Fund in Fiscal Year 2025–2026 for sectors that are only beginning to transition to zero-emission technologies, including zero-emission aviation, locomotive, and marine vehicles. The allocation will also support vehicle-grid integration efforts, such as reducing charging during peak-demand or high-carbon-intensity hours for

electric vehicles, and bidirectional charging to support the grid. Investments will support charging technologies and behaviors that benefit California’s electric grid system.

To support the development of clean, low-carbon fuels, the Investment Plan allocates \$5 million of Clean Transportation Program funding in Fiscal Year 2023–2024. Also, the CEC has received feedback on the importance of continuing to fund workforce training and development. The Investment Plan allocates \$5 million of Clean Transportation Program funding for Fiscal Year 2023–2024 to support ZEV workforce development, prioritizing members of disadvantaged and low-income communities. Workforce development strategies and investments will be refined through continued public engagement workshops.

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

Category	Eligible Fuel Types	Funding Source	2023–2024	2024–2025*	2025–2026*	2026–2027*
Light-Duty Charging Infrastructure†	Electric	Clean Transportation Program (Base)	\$42.6	-	-	-
Light-Duty Charging Infrastructure	Electric	Greenhouse Gas Reduction Fund (GGRF)	-	\$120	\$140	\$80
Equitable At-Home Charging	Electric	GGRF	\$95.0	\$80	\$60	\$40
Light-Duty Hydrogen Refueling	Hydrogen	Base	**	-	-	-
Medium- and Heavy-Duty Infrastructure	Electric, Hydrogen	Base	\$42.6**	-	-	-
Drayage Truck Infrastructure	Electric, Hydrogen	GGRF	\$80.75	\$50	\$50	\$49
School Bus Infrastructure††	Electric	General Fund (Proposition 98)	\$125.0	\$125	\$125	-
Clean Truck, Bus, and Off-Road Equipment Infrastructure	Electric, Hydrogen	GGRF	\$137.75	\$137	\$89	-
Port ZEV Infrastructure	Electric, Hydrogen	GGRF	-	-	-	\$130
Emerging Opportunities	Electric, Hydrogen	GGRF	-	-	\$46	-
Zero- and Near-Zero-Carbon Fuel Production and Supply	Multiple	Base	\$5.0	-	-	-
Workforce Training and Development	Electric, Hydrogen	Base	\$5.0	-	-	-
		Total Base	\$95.2			
		Total General Fund and GGRF	\$438.5	\$512	\$510	\$299

Compared to the previous budget agreement, the Legislature has reassigned most items that were funded from the General Fund to the Greenhouse Gas Reduction Fund (GGRF). These figures do not include administrative costs for fiscal year 2023–2024 GGRF funds: the total was reduced by \$16.5 million, which is the maximum administrative costs the CEC is allowed to incur associated with that funding. Similarly, these figures do not include administrative costs for Proposition 98 General Funds in fiscal years 2023–2024, 2024–2025, and 2025–2026. However, the GGRF figures for fiscal

years 2024–2025, 2025–2026, and 2026–2027 do still include administrative costs; see below. The CEC may use unused administrative costs to fund additional projects within each funding allocation.

*** Subject to future budget act appropriations. Does not include base Clean Transportation Program allocations for fiscal years 2024–2025, 2025–2026, and 2026–2027. Also, the anticipated GGRF amounts in these fiscal years have not been reduced to reflect administrative costs. Those fiscal year allocations will be reduced following direction in the associated budget act.**

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

**** AB 126 requires the CEC to spend at least 15 percent of Clean Transportation Program base funds per year on light-, medium-, or heavy-duty hydrogen infrastructure. For light-duty hydrogen refueling, the CEC proposes to reinvest funds from previous fiscal years, such as unspent funds remaining after Shell’s project cancellation, to build out new stations. The CEC will soon also release a new solicitation to improve reliability for the existing network. See the more detailed explanation above the table. For medium- and heavy-duty hydrogen refueling, the CEC proposes spending at least \$15 million in base funds in fiscal year 2023–2024 per AB 126. This \$15 million will be out of the \$42.6 million in overall medium- and heavy-duty base funding.**

†† The 2022 budget agreement had allocated \$375 million under Proposition 98 for ZEV school bus infrastructure for fiscal year 2022–2023, to be spent over five years beginning in fiscal year 2023–2024. The 2023 budget agreement maintains the total allocation of \$375 million and adjusts the annual allocation to \$125 million for fiscal year 2023–2024, and a projected \$125 million each for fiscal years 2024–2025 and 2025–2026.

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 modestly in recent years and more sharply in 2020, as Californians reduced travel because of the COVID-19 pandemic. It remains to be seen how much of this drop in emissions was permanent, however. When including upstream emissions, transportation is still the largest source of GHG emissions in California. Vehicle use and associated oil extraction, refining, and pipelines accounted for nearly 50 percent of in-state emissions in 2020.⁴

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 Protecting and improving public health in the state will require substantial reductions in criteria pollutant emissions. The California Air Resources Board (CARB) estimates that attaining federal air quality standards in 2023, 2024, 2031, and 2037 will require significant reductions of nitrogen oxide emissions in parts of the state.⁶

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

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

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

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

4 California Air Resources Board. October 26, 2022. [California Greenhouse Gas Emissions for 2000 to 2020: Trends of Emissions and Other Indicators](https://ww2.arb.ca.gov/sites/default/files/classic/cc/inventory/2000-2020_ghg_inventory_trends.pdf). Accessed April 4, 2023. 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](https://ww2.arb.ca.gov/sites/default/files/2021-12/2020_Mobile_Source_Strategy.pdf). Accessed March 21, 2023. Available at
https://ww2.arb.ca.gov/sites/default/files/2021-12/2020_Mobile_Source_Strategy.pdf.

6 Ibid.

AB 8 (Perea, Chapter 401, Statutes of 2013) extended the collection of fees that support the Clean Transportation Program to January 1, 2024. AB 126 (Reyes, Chapter 319, Statutes of 2023) extended the program again to July 1, 2035, with some new and changed requirements.

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

This *2023–2024 Investment Plan Update* is the fifteenth investment plan in the history of the Clean Transportation Program and builds on the analyses and recommendations contained in prior documents. The revised staff draft report is the second version of the *2023–2024 Investment Plan Update*. As part of developing the *2023–2024 Investment Plan Update*, the CEC planned two public meetings with the Clean Transportation Program Advisory Committee. The first meeting was held April 27, 2023, and the second will be on November 14, 2023. The advisory committee is a broad representation of interests that reflect California communities and provide representation of clean transportation industries, environmental justice communities, rural communities, tribes, and others. Representatives from the advisory committee, other interested and affected groups, and the public are encouraged to discuss and comment on drafts of this document during these meetings and through the CEC’s docket system.⁷

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

⁷ The Energy Commission’s [docket](https://efiling.energy.ca.gov/Lists/DocketLog.aspx?docketnumber=23-ALT-01) for the *2023–2024 Investment Plan Update for the Clean Transportation Program* (Docket #23-ALT-01) can be found at <https://efiling.energy.ca.gov/Lists/DocketLog.aspx?docketnumber=23-ALT-01>.

CHAPTER 2:

Context of the 2023–2024 Investment Plan

Implementation of the Clean Transportation Program

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

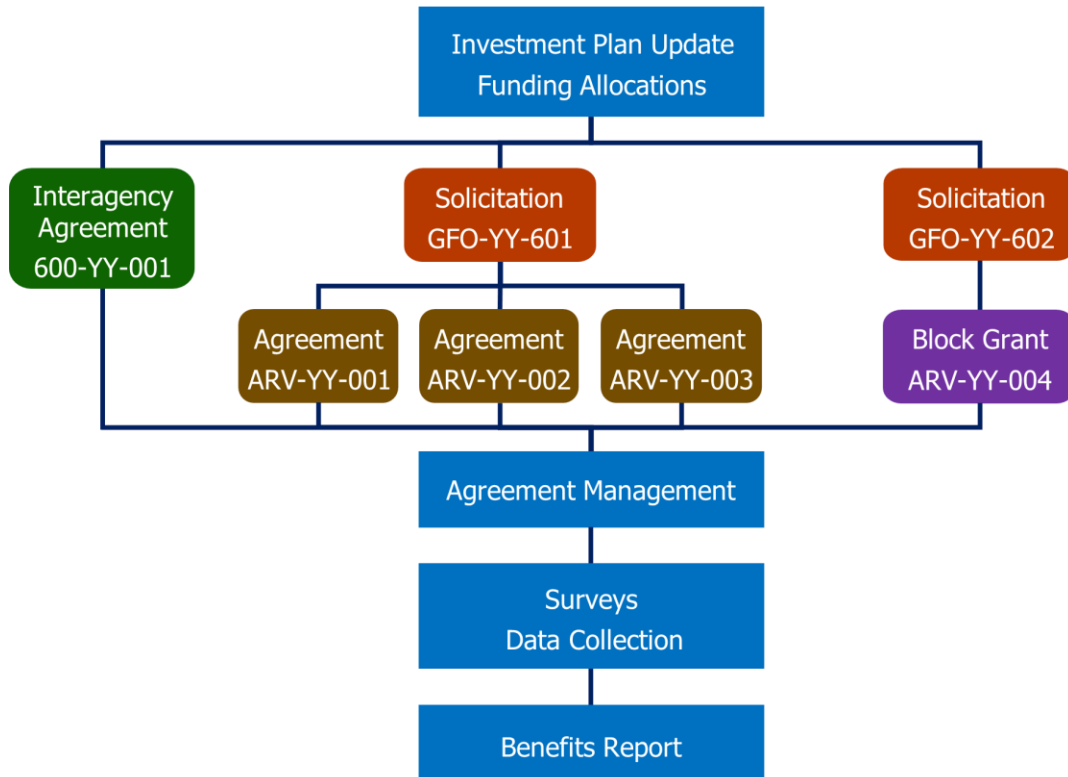
The funding allocations typically do not determine the specific funding solicitations and grant programs that will be issued. Rather, based on these funding allocations, the CEC subsequently issues a series of competitive solicitations, known as “grant funding opportunities” (GFOs).

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

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

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

Figure 1: Schematic of the Clean Transportation Program Implementation



Source: California Energy Commission

Description of Funding Mechanisms

To date, the CEC has used mainly grants to distribute funding, selecting awardees through competitive solicitations. Each potential funding and financing mechanism has strengths and weaknesses, and the CEC weighs these options 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 type of solicitation represents the most common funding mechanism for the Clean Transportation Program. It is flexible, as project requirements and scoring criteria can be adapted for a broad variety of commercial and technological maturity levels. Competitive scoring allows increased scrutiny on key issues for each project type. However, it also requires significant time and attention to review each application and oversee each subsequent funding agreement.
- **Block Grants** — The CEC has used this funding mechanism to distribute Clean Transportation Program funding through third-party implementers. The block grant implementer is selected through a competitive process. Block grants allow the CEC to select another organization to administer Clean Transportation Program funding while following set procedures for project and applicant eligibility.

- **First-Come, First-Served** — Once eligibility requirements are established, the funding can be administered relatively quickly and provide greater market certainty for a project type.
- **Direct Agreements** — The CEC may make a sole source award for applied research. The CEC may also enter into interagency agreements or contracts with public entities to obtain technical, scientific, or administrative services to support the Clean Transportation Program.
- **Loans** — The CEC is embarking on an in-depth examination of loan programs to be administered by a partner agency on the CEC’s behalf.

Program Outreach and Engagement

The CEC seeks to increase the participation of disadvantaged and underrepresented communities from 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:

- Diversifying the Clean Transportation Program Advisory Committee, as done in 2020, to better reflect California communities and provide increased representation of program beneficiaries, environmental justice communities, rural communities, tribes, and others.
- Consulting with the Disadvantaged Communities Advisory Group (DACAG)⁸ for guidance and recommendations on program effectiveness as it relates to disadvantaged communities and other vulnerable and underrepresented groups. In the first half of 2023, staff met with DACAG subject matter experts to discuss the Community Benefits Framework and the West Coast Truck Charging and Fueling Corridor program.
- Consulting with the CEC’s Tribal Program and the Tribal Lead Commissioner for assistance with outreach and promotion of transportation-related funding opportunities to tribes.
- Launching the IDEAL⁹ Communities Partnership Project through an agreement with the Foundation for California Community Colleges. Since the start of the project in early 2021, the foundation has completed an equity-focused assessment of the Clean Transportation Program, drafted an outreach and engagement plan, created outreach materials, and launched the ZEV IDEAL Student Ambassadors Program (a cohort of eight community college students across five rural geographic focus areas). In 2022, the IDEAL Communities Partnership Forum provided a public venue for community-based partners to share their clean transportation needs, outline charging infrastructure issues, and provide essential feedback to the CEC and Clean Transportation Program.
- Developing methods for measuring and tracking how CEC-funded projects benefit communities. CEC staff held two public workshops (November 29, 2022, and March 28,

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). Available at <https://www.energy.ca.gov/about/campaigns/equity-and-diversity/disadvantaged-communities-advisory-group>.

⁹ Inclusion, Diversity, Equity, Access, and Local

2023) to share and seek public feedback on a proposed framework for community benefits, including metrics for tracking the progress of those benefits. Four listening sessions were also hosted throughout the state to gather input from community-based organizations.

Highlights of Investments

As of July 2023, the CEC has invested more than \$1.8 billion through the Clean Transportation Program. This figure includes the base Clean Transportation Program funds and recent 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 nearly 24,500 chargers for plug-in electric vehicles, including about 6,000 at multi- and single-family homes, 155 for fleets, and 420 at workplaces; 15,500 public and shared-private Level 2 and Level 1 chargers; and 2,300 public and fleet DC fast chargers along highway corridors and urban metropolitan areas.
- Created the California Electric Vehicle Infrastructure Project (CALeVIP) to provide streamlined Clean Transportation Program incentives for light-duty electric vehicle charging infrastructure.
- Approved up to \$250 million for the CALeVIP 2.0 block grant project, which offers rebates for high-powered (150 kilowatt+) DC fast chargers. The first funding window awarded \$30 million in April 2023 to sites in disadvantaged and low-income communities only.
- Approved up to \$250 million for the Communities in Charge block grant project, which offers rebates for Level 2 chargers. The first funding window awarded \$30 million in July 2023, with 76 percent going to project sites in disadvantaged and low-income communities.
- Funded 86 regional readiness planning grants, regional readiness implementation grants, and medium- and heavy-duty ZEV blueprint grants for communities and fleets that are ramping up for the adoption of ZEV technologies.
- Released new solicitations targeting high-priority or underserved EV charging needs, including multifamily housing, rural communities, and infrastructure for high-mileage, on-demand transportation services.
- Released new solicitations to expand innovative and interoperable charging opportunities, including a vehicle-grid innovation laboratory, a symposium on electric vehicle charging interoperability, and the demonstration of innovative charging solutions to accelerate commercialization.
- Allocated funding for 107 publicly available hydrogen fueling stations. Of these stations, 15 will be capable of serving medium- and heavy-duty vehicles, as well as passenger vehicles. There are also 23 privately funded stations (16 privately funded stations under CEC agreement and 7 outside any CEC agreement) under development. With the expended funds and committed allocation of funds, California is on track to meet the previous AB 8 requirement of 100 stations. As of October 2023, 66 hydrogen fueling stations had achieved open retail status in California.

- 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.
- Developed retail fueling standards to enable hydrogen sales on a per-kilogram basis.
- Awarded 120 projects providing more than \$97 million¹⁰ 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 project uses a concierge-like model to work directly with eligible applicants to plan and fund the purchase of charging and hydrogen fueling infrastructure. The multiyear project, approved for up to \$276 million, will help communities most impacted by transportation-related pollution by meeting essential infrastructure needs and 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 developing funding agreements for two additional in-state ZEV manufacturing projects using one-time funding from the general fund. Furthermore, from this same one-time funding, a ZEV Battery Block Grant project was approved and awarded to CALSTART to implement 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.
- Launched 74 projects to promote the production of sustainable, low-carbon alternative fuels within California, with a cumulative annual production capacity equivalent to more than 128 million gallons of diesel fuel. Most of the projects use waste-based feedstocks such as municipal solid waste, which have some of the lowest carbon intensity pathways recognized under the Low Carbon Fuel Standard, a CARB regulation that requires the carbon intensity of transportation fuels to be cut by 20 percent by 2030.

10 CALSTART. "[EnergiIZE Monitoring Dashboard](https://calstartorg.maps.arcgis.com/apps/dashboards/93ba3501edad4f51beb4d8d4dda46647)." Accessed August 25, 2023. Available at <https://calstartorg.maps.arcgis.com/apps/dashboards/93ba3501edad4f51beb4d8d4dda46647>.

Table 1: Clean Transportation Program Investments as of July 2023

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	\$66.75	25 Projects
Renewable Hydrogen Production	\$21.93	6 Projects
Alternative Fuel Infrastructure		
Electric Vehicle Charging Infrastructure†	\$412.75	24,459 chargers
Light-Duty Hydrogen Fueling Infrastructure (Including Operations and Maintenance)	\$256.87	107 Public Fueling Stations
Medium- and Heavy-Duty ZEV Infrastructure	\$302.51	99 Projects
E85 Fueling Infrastructure	\$3.61	21 Fueling Stations
Upstream Biodiesel Infrastructure	\$6.98	7 Infrastructure Sites
Natural Gas Fueling Infrastructure	\$24.07	70 Fueling Stations
Alternative Fuel and Advanced Technology Vehicles		
Natural Gas and Propane Vehicle Deployment, Hybrid and ZEV Deployment (Including CVRP, HVIP, and Low-Income Mobility Incentives), and Advanced Technology Freight and Fleet Vehicles	\$250.40	14,516+ Natural Gas, Propane, Hybrid and ZEVs and 54 Demonstrations
Related Needs and Opportunities		
Manufacturing	\$278.04	40 Manufacturing Agreements
Workforce Training and Development	\$39.71	32,000 Trainees
Fuel Standards and Equipment Certification	\$3.90	1 Project
Sustainability Studies	\$2.04	2 Projects
Regional Alternative Fuel Readiness	\$17.66	86 Regional Plans
Centers for Alternative Fuels	\$5.41	5 Centers
Technical Assistance and Program Evaluation	\$17.52	N/A
Total	\$1.81 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 \$1.1 billion in private and other public funds. However, this amount represents only the minimal, contractually obligated amount of match funding provided toward Clean

Transportation Program projects; the actual amount of investment prompted by program funding exceeds this amount.

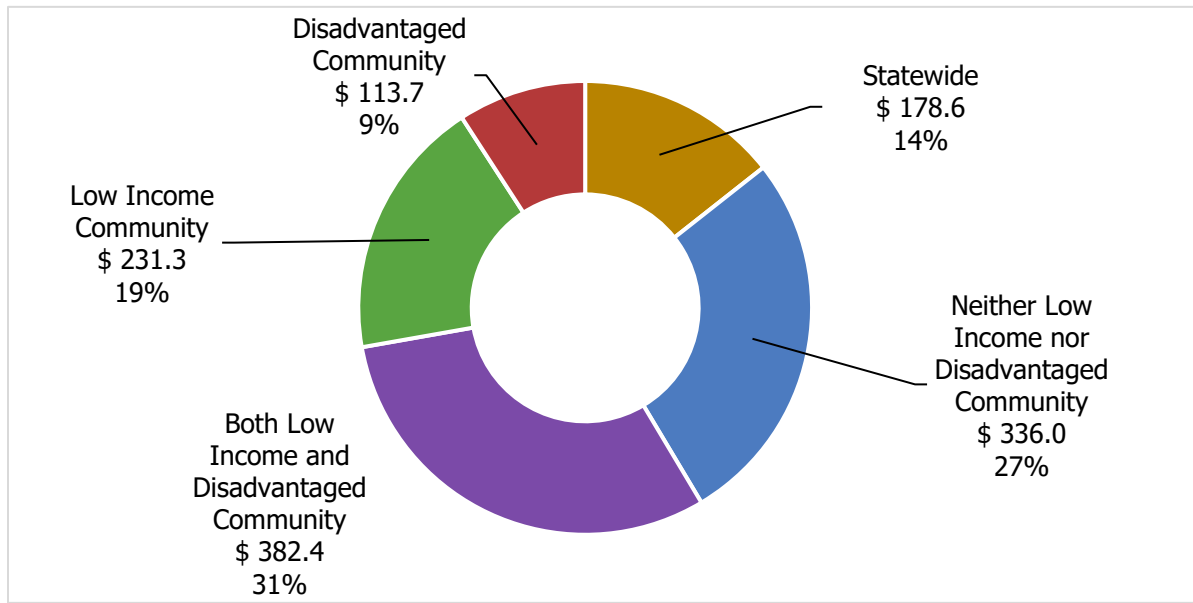
Summary of Program Funding for Disadvantaged Communities

The CEC seeks to increase participation and benefits to disadvantaged and underrepresented communities from a diverse range of regions in implementing the Clean Transportation Program. As depicted in Figure 2, to date, 58.6 percent of funds have gone to projects located in disadvantaged and/or low-income communities. This figure excludes about \$430 million in block-grant funds, and \$32 million in standard grant funds, that have either not yet been assigned to a specific site address or that are still in the process of being completed. This methodology has changed somewhat compared to past Investment Plan Updates, and is intended to be more accurate. Only after funding is assigned to specific sites can staff determine if those sites are in a low-income or disadvantaged community, both, or neither.

The CEC recognizes that the location of a project is not the only metric of whether a project will benefit low-income and disadvantaged communities. The CEC seeks to invest more than 50 percent of funding to support projects benefitting low-income and disadvantaged communities for the remainder of the Clean Transportation Program. AB 126 formally requires this goal to be met starting January 1, 2025.

The CEC will continue to work with the Clean Transportation Program Advisory Committee, DACAG, communities, and interested and affected groups to define and track project benefits to increase program equity and inclusion. These efforts include engaging in partnerships with community-based organizations and community organizers in project scoping and grant applications. In spring of 2023, the Foundation for California Community Colleges held four listening sessions with community-based organizations, which laid the groundwork for a new Community Benefits Framework. The framework aims to establish a more accurate and nuanced understanding of who benefits from Clean Transportation Program projects. The CEC will hold a third public workshop on community benefits to gather feedback and expects to release a pilot version of the framework by the end of 2023.

Figure 2: 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 2023. "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.

Related Policies and Goals

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

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

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

Source: California Energy Commission

Federal Laws

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

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

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

CARB reports that more than 28 million Californians live in communities that exceed the ozone and particulate matter standards set by the U.S. EPA and that the South Coast and San Joaquin Valley have the most severe near-term air pollution problems in the nation. The concepts described in the *2020 Mobile Source Strategy* intend to address these problems through transitioning the mobile fleet to zero-emission, where feasible.¹¹

Infrastructure Investment and Jobs Act

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

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

Inflation Reduction Act of 2022

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

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

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

available for used electric vehicles and up to \$40,000 for vehicles heavier than 14,000 pounds.¹²

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

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

State Laws

AB 32, SB 32, and the Greenhouse Gas Reduction Fund

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

In November 2022, CARB released an update to its AB 32 Climate Change Scoping Plan. The update addresses both the statutory 2030 target and the path to achieving carbon neutrality by 2045. This includes reducing GHG emissions 85 percent compared to 1990 levels by 2045 and carbon removal strategies to make up the difference.¹³

AB 1279: Carbon Neutrality

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

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

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

SB 350 and the Disadvantaged Communities Advisory Group

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

On April 16, 2020, DACAG provided comments on the *2020–2023 Investment Plan Update*.¹⁴ 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 will also have the opportunity to provide recommendations for the *2023–2024 Investment Plan Update*, as well as future investment plans.

Table 3: Recommendations From the Disadvantaged Communities Advisory Group and Others, Along With 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).
Funding projects exclusively in and benefiting disadvantaged communities.	Committed to seeking to award at least 50 percent of funding to support projects benefitting low-income and disadvantaged communities for the remainder of the Clean Transportation program. 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. Staff is working to better define, measure, track, and increase community benefits from the Clean Transportation Program.
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. CALeVIP 2.0 and Communities in Charge require at least 50% of funds to be spent in low-income or disadvantaged communities.

¹⁴ SB 350 Disadvantaged Communities Advisory Group, "[SB 350 Disadvantaged Communities Advisory Group comments on 2020-2023 Investment Plan Update](#)," written on April 16, 2020, and submitted April 30, 2020, to Docket 19-ALT-01, TN# 232879. Available at <https://efiling.energy.ca.gov/Lists/DocketLog.aspx?docketnumber=19-ALT-01>.

Recommendations	Actions Taken by CEC
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 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 ¹⁵ 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.	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.
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.
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.

Source: California Energy Commission

AB 841: Electric Vehicle Infrastructure Training Program

The Electric Vehicle Infrastructure Training Program (EVITP) website states that it is “a collaboration of industry stakeholders including automakers, electric vehicle supply equipment (EVSE) manufacturers, educational institutions, utility companies, electric industry professionals, and key EV industry stakeholders.”¹⁶ According to AB 841 (Ting, Chapter 372, Statutes of 2020), the CPUC, CEC, and CARB shall require that EV charging infrastructure on

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

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

the customer side of the electrical meter that is funded by those state entities be installed by a contractor with the appropriate license classification and at least one electrician on each crew who holds an EVITP certification. On February 10, 2023, staff held a workshop¹⁷ to discuss, among other items, strategies and actions aimed at increasing EVITP training and certification across the state. An EVITP 4.0 curriculum is under development.

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

SB 643 (Archuleta, Chapter 646, Statutes of 2021) requires that the CEC, in consultation with CARB and the CPUC, prepare a statewide assessment of the FCEV fueling infrastructure and fuel production needed to support the adoption of zero-emission trucks, buses, and off-road vehicles at levels that will meet statewide goals, including those set forth in Executive Order N-79-20, and regulations including Advanced Clean Fleets. The CEC released a staff report¹⁸ in September 2023, held a public workshop in October 2023 to receive feedback from interested parties, and expects to complete the inaugural version of this report by January 2024.

AB 2061: Charging Station Reliability and Uptime

Ensuring a reliable charging experience will be critical to encouraging wider adoption of electric vehicles. The CEC held a workshop on this topic in March 2022, focused on (1) how to define and measure reliability, and (2) how to set reliability standards for charging infrastructure funded by the CEC.¹⁹

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

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,*

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

18 California Energy Commission. September 2023. [Senate Bill 643: Clean Hydrogen Fuel Production and Refueling Infrastructure to Support Medium- and Heavy-Duty Fuel Cell Electric Vehicles and Off-Road Applications](https://efiling.energy.ca.gov/GetDocument.aspx?tn=252410&DocumentContentId=87407). Accessed September 28, 2023. Available at <https://efiling.energy.ca.gov/GetDocument.aspx?tn=252410&DocumentContentId=87407>.

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

and Reliability Reporting, in September 2023 and held a workshop on the rulemaking in October 2023.²⁰

Executive Orders

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

Executive Order B-16-12 set a target of 1.5 million zero-emission vehicles by 2025 and tasked various state agencies with specific actions needed to support this goal.²¹ Subsequently, in January 2018, Executive Order B-48-18 set an expanded target of 5 million zero-emission vehicles by 2030, as well as a network of 200 hydrogen fueling stations and 250,000 electric vehicle charging stations, including 10,000 DC fast chargers, installed or constructed by 2025.²² These executive orders have been part of the guidance for the electric vehicle charging and hydrogen fueling infrastructure investments of the Clean Transportation Program.

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

To meet the ambitious statewide targets set in Executive Order N-79-20, Governor Newsom tasked GO-Biz with collaborating with several agencies and partners to shepherd the administration's ZEV Market Development Strategy. The *California Zero-Emission Vehicle Market Development Strategy*²³ was published in February 2021 and is part of the ongoing effort to turn California's 100 percent ZEV vision into reality. The strategy is centered around four market pillars: vehicles, infrastructure, end users, and workforce.

Regulations by the California Air Resources Board

Low Carbon Fuel Standard

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

20 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 March 28, 2023. Available at <https://efiling.energy.ca.gov/GetDocument.aspx?tn=248612&DocumentContentId=83100>.

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

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

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

2030. The LCFS sets a carbon intensity standard (or benchmark) that declines each year. Providers of low-carbon fuels earn credits under the LCFS by producing fuels with a carbon intensity below the annual carbon intensity standard. CARB has signaled that it intends to strengthen the carbon intensity targets through 2030 and establish longer-term targets post-2030 through a rulemaking in the near future.

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

Advanced Clean Cars Regulations

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

Innovative Clean Transit Regulation

CARB adopted the Innovative Clean Transit Regulation²⁴ in December 2018 to replace the Fleet Rule for Transit Agencies. This regulation requires all public transit agencies to gradually transition to a 100-percent zero-emission bus fleet and encourages them to provide innovative first- and last-mile connectivity and improved mobility for transit riders. The Innovative Clean Transit Regulation mandates an increasing annual zero-emission bus purchase percentage. The purchase requirements begin in 2023 with a 25 percent ZEV share of new bus purchases for large transit agencies, phasing in small transit agencies in 2026, and increasing to a 100 percent ZEV purchase requirement beginning in 2029. As of December 31, 2021, there were 510 zero-emission buses (56 FCEVs and 454 BEVs) in service and another 424 (62 FCEVs and 362 BEVs) on order, for a total of 934 zero-emission buses.

Advanced Clean Trucks

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

24 California Air Resources Board. "[Innovative Clean Transit](https://ww2.arb.ca.gov/our-work/programs/innovative-clean-transit/about)." Available at <https://ww2.arb.ca.gov/our-work/programs/innovative-clean-transit/about>.

be as follows: 55 percent of Classes 2b–3 truck sales, 75 percent of Classes²⁵ 4–8 truck sales, and 40 percent of tractor sales. The Advanced Clean Trucks regulation is expected to result in 100,000 ZEV trucks in California by 2030 and 300,000 by 2035.

Advanced Clean Fleets

In April 2023, CARB adopted the Advanced Clean Fleets regulation. It is part of a comprehensive strategy that would, consistent with public health needs, accelerate the widespread adoption of ZEVs in the medium- and heavy-duty truck sector. The regulation builds on other policies including the Advanced Clean Trucks regulation to continue reducing emissions. It is the next significant step in accelerating toward a zero-emission transportation system as well as a more equitable future in California. The Advanced Clean Fleets regulation will require state and local government fleets, drayage trucks, high-priority fleets, and federal fleets to phase in medium- and heavy-duty ZEVs over time. The regulation also sets a clear end date for new internal combustion-powered medium- and heavy-duty vehicle sales in California by 2036.

Complementary Funding Programs

California Energy Commission’s School Bus Replacement Program

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

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

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

California Air Resources Board Funding Programs

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

²⁵ According to CARB, Classes 2b–3 cover on-road vehicles with a gross vehicle weight rating of 8,501 to 14,000 pounds. Classes 4–8 cover those over 14,000 pounds.

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

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

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

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

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

Source: California Air Resources Board²⁶

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

26 CARB. October 2022. [Fiscal Year 2022–23 Funding Plan for Clean Transportation Incentives](https://ww2.arb.ca.gov/sites/default/files/2022-10/proposed_fy2022_23_funding_plan_final.pdf). Available at https://ww2.arb.ca.gov/sites/default/files/2022-10/proposed_fy2022_23_funding_plan_final.pdf.

2023–24 Funding Plan is under development; CARB released a draft version in August 2023²⁷ and expects to consider approving the plan in November 2023.

Investor-Owned Utility Investments

The CPUC initially approved infrastructure pilot programs for Pacific Gas and Electric Company (PG&E),²⁸ San Diego Gas & Electric Company (SDG&E),²⁹ and Southern California Edison (SCE)³⁰. Subsequently, in December 2018, the CPUC approved \$22 million in bridge funding for the SCE Charge Ready Pilot to build at least 1,000 Level 2 chargers. In August 2020, the CPUC approved SCE's Charge Ready 2 infrastructure program, with a \$436 million budget that will fund about 38,000 electric vehicle chargers in the utility's service territory. In April 2021, the CPUC approved SDG&E's Power Your Drive Extension Program for \$43.5 million that will fund nearly 2,000 electric vehicle chargers.

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

Much of the CPUC's current ZEV work is focused on SB 350 implementation. The CPUC directed the six investor-owned electric utilities (IOUs) under the CPUC's jurisdiction to propose portfolios of transportation electrification programs and investments. Under this array of programs, the CPUC reports that the IOUs collectively hold \$1.48 billion in authorized unspent funding. The CPUC's current transportation electrification funding policy will last through 2024. In November 2022, the CPUC approved a new funding strategy to start in 2025. This strategy includes \$600 million (potentially up to \$1 billion) in transportation electrification rebates administered by third parties instead of the IOUs.³¹

Volkswagen Diesel Emissions Settlement

California received about \$423 million from the Volkswagen Environmental Mitigation Trust for projects to reduce the lifetime excess nitrogen oxides (NO_x) emissions caused by illegal devices installed in certain 2.0- and 3.0-liter diesel vehicles to defeat emissions tests. In May

27 CARB. August 2023. [Draft Fiscal Year 2023–24 Funding Plan for Clean Transportation Incentives](https://ww2.arb.ca.gov/sites/default/files/2023-08/Draft_Fiscal_Year_2023-24_Funding_Plan_Final.pdf). Accessed October 2, 2023. Available at https://ww2.arb.ca.gov/sites/default/files/2023-08/Draft_Fiscal_Year_2023-24_Funding_Plan_Final.pdf.

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

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

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

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

2018, CARB approved a Beneficiary Mitigation Plan outlining how these funds will be spent.³² California's three largest air districts are administering this funding statewide. The first installments across different categories have been made available starting with the release of zero-emission bus funds in fall 2019.

In addition, Volkswagen has an \$800 million ZEV Investment Commitment in the state and must offer and sell additional battery-electric vehicle models in California between 2019 and 2025. The ZEV Investment Commitment³³ will occur over a 10-year period. Eligible projects include:

- the design, planning, construction, and operation and maintenance of qualified fueling infrastructure for ZEVs.
- brand-neutral education and public outreach to increase consumer awareness of ZEVs.
- actions to increase public exposure or access or both to ZEVs without requiring a consumer purchase or lease (for example, programs for car-share and ride-hail services).
- two "Green City" initiatives that may include ZEV car-sharing services, transit applications, and freight transport projects.

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

National Electric Vehicle Infrastructure (NEVI) Formula Program

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

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

On August 1, 2023, the CEC and Caltrans submitted to the U.S. Joint Office of Energy and Transportation an update to California's NEVI Deployment Plan. California's deployment plan update for 2023 is pending federal approval. To maximize NEVI investments and benefits, California's deployment plan includes ongoing engagement and outreach, including with

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

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

organized labor, to shape the continued development and refinement of plan elements. The deployment plan focuses on investments in light-duty vehicle charging infrastructure and will consider projects that can also accommodate medium- and heavy-duty charging infrastructure. Subsequent plans will reevaluate NEVI formula funding investments across segments and continue to evaluate the NEVI formula funding in the context of the broader set of state and federal investments in light-duty, medium-duty, and heavy-duty vehicle infrastructure.

Charging and Fueling Infrastructure Discretionary Grant Program

The Infrastructure Investment and Jobs Act also authorized \$2.5 billion in competitive grants nationwide to expand EV charging and other alternative-fuel infrastructure along corridors and in communities. This is intended to complement the NEVI formula program, which focuses on long-distance travel between communities. On March 14, 2023, the Biden-Harris administration opened applications for the first round of funding, totaling up to \$700 million.³⁴

In June 2023, Caltrans, the CEC, Oregon Department of Transportation, and Washington State Department of Transportation submitted an application to the US Department of Transportation's Charging and Fueling Infrastructure Discretionary Grant Program. The application is to create a West Coast Truck Charging and Fueling Corridor Project, which will 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. The project proposes 34 charging stations and five hydrogen fueling stations for trucks in California, Washington, and Oregon. Currently, there are just four publicly accessible charging stations and three hydrogen fueling stations supporting zero-emission trucks on the West Coast.

Alternative Fuel Refueling Property Credit

The Inflation Reduction Act of 2022, signed into law by President Biden in August 2022, extends and expands a federal tax credit for alternative fuel infrastructure, including charging equipment and hydrogen refueling equipment. The law extended the alternative fuel infrastructure tax credit of up to 30 percent of the equipment cost, to a new maximum of \$100,000 (up from \$30,000) for equipment subject to depreciation (such as chargers installed for business or investment purposes). In other situations the maximum is \$1,000.³⁵ The credited equipment must be installed in a low-income or nonurban community. The amount of the credit can also be significantly increased under certain prevailing wage and apprenticeship circumstances.

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

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

CHAPTER 3:

Funding Allocations for 2023–2024

The funding allocations for FY 2023–2024, and the projected funding allocations for the subsequent fiscal years, are outlined in Table 5. For FY 2023–2024, \$95.2 million of Clean Transportation Program funds may be available for the purposes described in this Investment Plan Update. If a different amount of funding is available, the allocations in this document may be amended either before or after final adoption.

Table 5 shows the proposed funding allocations for the FY 2023–2024 and the anticipated Greenhouse Gas Reduction Fund and General Fund allocations under the Budget Act of 2022 and Budget Act of 2023. The additional funds will help close funding gaps in infrastructure deployment and accelerate charging and hydrogen fueling station deployment. General Fund and Greenhouse Gas Reduction Fund allocations for future fiscal years are subject to change with the development of future budgets.

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

Table 5 shows combined allocations of more than \$600 million to support light-duty passenger vehicle infrastructure (first three rows) and more than \$1.1 billion to support medium- and heavy-duty ZEV infrastructure (next five rows). Much of this funding can be used for both EV charging and hydrogen refueling projects. 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.

The Budget Act of 2023 did not include the additional \$20 million per year for three years that was previously projected specifically for hydrogen infrastructure funding. However, the Investment Plan allocates at least \$15 million in base Clean Transportation Program funding for medium- and heavy-duty hydrogen infrastructure. If grant funding solicitations are undersubscribed during the year, the CEC is authorized to reallocate the funding.

Greenhouse Gas Reduction Funds from the Budget Act of 2023 for medium- and heavy-duty ZEV infrastructure will also be used for hydrogen infrastructure, as will funding from the Emerging Opportunities category. Table 5 lists the funding categories where hydrogen projects are eligible. Therefore, the \$15 million for hydrogen infrastructure is a minimum amount, not a maximum.

For light-duty hydrogen infrastructure, the CEC proposes to use remaining funds from previous fiscal years, including about \$34 million in unexpired funds from the cancelled Shell agreement. The CEC will continue to evaluate the FCEV market and is committed to providing a sufficient hydrogen fueling infrastructure that will provide the reliable coverage and the capacity to support current and future light-duty passenger vehicles. However, developers have been cautious in the face of inflationary pressures and market uncertainties, including low credit prices for the LCFS. As a result, the recent hydrogen solicitation GFO-22-607 was undersubscribed. The CEC will soon issue a new solicitation to support improved reliability for the existing network with funding for operations and maintenance, and will continue exploring strategies to support existing stations, improve the customer refueling experience, and expand the network to meet customer needs.

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

Category	Eligible Fuel Types	Funding Source	2023–2024	2024–2025*	2025–2026*	2026–2027*
Light-Duty Charging Infrastructure†	Electric	Clean Transportation Program (Base)	\$42.6	-	-	-
Light-Duty Charging Infrastructure	Electric	Greenhouse Gas Reduction Fund (GGRF)	-	\$120	\$140	\$80
Equitable At-Home Charging	Electric	GGRF	\$95.0	\$80	\$60	\$40
Light-Duty Hydrogen Refueling	Hydrogen	Base	**	-	-	-
Medium- and Heavy-Duty Infrastructure	Electric, Hydrogen	Base	\$42.6**	-	-	-
Drayage Truck Infrastructure	Electric, Hydrogen	GGRF	\$80.75	\$50	\$50	\$49
School Bus Infrastructure††	Electric	General Fund (Proposition 98)	\$125.0	\$125	\$125	-
Clean Truck, Bus, and Off-Road Equipment Infrastructure	Electric, Hydrogen	GGRF	\$137.75	\$137	\$89	-
Port ZEV Infrastructure	Electric, Hydrogen	GGRF	-	-	-	\$130
Emerging Opportunities	Electric, Hydrogen	GGRF	-	-	\$46	-
Zero- and Near-Zero-Carbon Fuel Production and Supply	Multiple	Base	\$5.0	-	-	-
Workforce Training and Development	Electric, Hydrogen	Base	\$5.0	-	-	-
		Total Base	\$95.2			
		Total General Fund and GGRF	\$438.5	\$512	\$510	\$299

Compared to the previous budget agreement, the Legislature has reassigned most items that were funded from the General Fund to the Greenhouse Gas Reduction Fund (GGRF). These figures do not include administrative costs for fiscal year 2023–2024 GGRF funds: the total was reduced by \$16.5 million, which is the maximum administrative costs the CEC is allowed to incur associated with that funding. Similarly, these figures do not include administrative costs for Proposition 98 General Funds in fiscal years 2023–2024, 2024–2025, and 2025–2026. However, the GGRF figures for fiscal

years 2024–2025, 2025–2026, and 2026–2027 do still include administrative costs; see below. The CEC may use unused administrative costs to fund additional projects within each funding allocation.

*** Subject to future budget act appropriations. Does not include base Clean Transportation Program allocations for fiscal years 2024–2025, 2025–2026, and 2026–2027. Also, the anticipated GGRF amounts in these fiscal years have not been reduced to reflect administrative costs. Those fiscal year allocations will be reduced following direction in the associated budget act.**

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

**** AB 126 requires the CEC to spend at least 15 percent of Clean Transportation Program base funds per year on light-, medium-, or heavy-duty hydrogen infrastructure. For light-duty hydrogen refueling, the CEC proposes to reinvest funds from previous fiscal years, such as unspent funds remaining after Shell’s project cancellation, to build out new stations. The CEC will soon also release a new solicitation to improve reliability for the existing network. See the more detailed explanation above the table. For medium- and heavy-duty hydrogen refueling, the CEC proposes spending at least \$15 million in base funds in fiscal year 2023–2024 per AB 126. This \$15 million will be out of the \$42.6 million in overall medium- and heavy-duty base funding.**

†† The 2022 budget agreement had allocated \$375 million under Proposition 98 for ZEV school bus infrastructure for fiscal year 2022–2023, to be spent over five years beginning in fiscal year 2023–2024. The 2023 budget agreement maintains the total allocation of \$375 million and adjusts the annual allocation to \$125 million for fiscal year 2023–2024, and a projected \$125 million each for fiscal years 2024–2025 and 2025–2026.

Source: California Energy Commission.

CHAPTER 4:

Zero-Emission Vehicle Infrastructure

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 1.6 million ZEVs or plug-in hybrids sold through the second quarter of 2023. More than one-quarter of new light-duty sales were ZEVs or plug-in hybrids in the second quarter of 2023.

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

Light-Duty Electric Vehicle Charging Infrastructure

Quantifying Charging Infrastructure for Light-Duty Vehicles

To track progress toward the state’s 2025 goal, the CEC conducts quarterly surveys, which started in July 2020, to obtain combined counts of public- and shared-access chargers within California. Table 6 below provides estimates of the existing number of public or shared Level 2 and DC fast chargers within the state as of July 2023. The table also provides estimates of 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 6: Progress Toward 250,000 Chargers and Beyond

Category	Level 2 Chargers	DC Fast Chargers	Total Chargers
Existing Chargers (Estimated)*	82,135	9,808	91,943
Anticipated Chargers for Which Funding Has Been Allocated (including anticipated funding from Clean Transportation Program)†	161,870	10,637	172,507
Total	244,005	20,445	264,450
2025 Goal (Executive Order B-48-18)	240,000**	10,000**	250,000
Gap From Near-Term Goal	0	0	0
Inaugural AB 2127 Report's 2030 Estimate of Charging Needs	1,126,855	37,461	1,164,316
Gap from 2030 Estimates	882,850	17,016	899,866

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

† Derived from public presentations and statements by utilities, California Public Utilities Commission, CARB, other entities, and the CEC. Includes funding from State Budget Act of 2021 and State Budget Act of 2022, intended to close the gaps for both Level 2 and DC fast chargers, and federal NEVI funding. The estimated number of chargers could change as solicitations are released. Does not include charger estimates from CPUC's five-year, statewide \$1 billion transportation electrification program starting in 2025.

** This analysis is as of July 2023. CEC expects to reach 240,000 Level 2 chargers in 2026. The state reached 10,000 DC fast chargers ahead of schedule in September 2023.

Source: California Energy Commission.

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

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

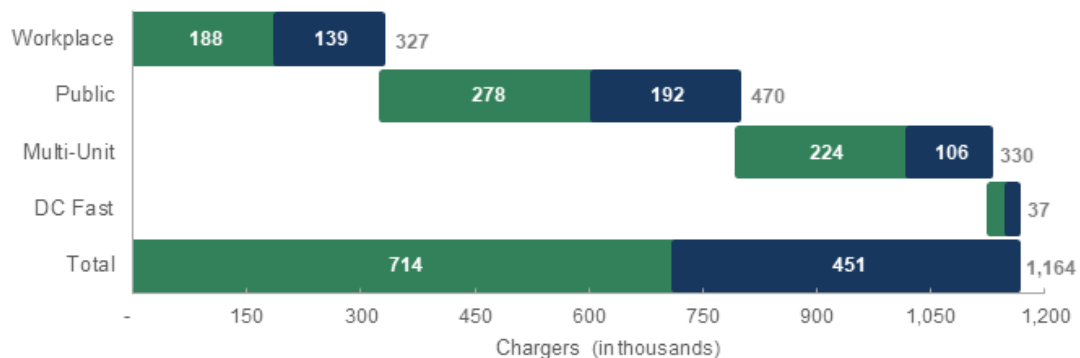
The CEC adopted the first *Assembly Bill 2127 Electric Vehicle Charging Infrastructure Assessment Analyzing Charging Needs to Support Zero-Emission Vehicles in 2030*³⁶ (*AB 2127 Report*) in June 2021. The *AB 2127 Report* included a scenario using CARB's *2020 Mobile*

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

Source Strategy. The report projected nearly 8 million ZEVs by 2030, which, at that time, was an estimate of the trajectory needed to achieve the Executive Order N-79-20 target of 100 percent light-duty ZEV sales by 2035.

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

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



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

Source: CEC and National Renewable Energy Laboratory.

Staff published the second AB 2127 draft report in August 2023.³⁷ This second report was the subject of a public workshop in September 2023.³⁸ (The CEC has not yet approved the second report, so the targets in this Investment Plan Update reflect the results from the first report for now.) The second report includes updated ZEV adoption scenarios and improved charging infrastructure models for light-duty vehicles and medium-/heavy-duty vehicles. The report uses the Integrated Energy Policy Report (IEPR) “Additional Achievable Transportation Electrification 3” scenario for PEV adoption. This scenario includes 7.1 million PEVs in 2030 and 15.3 million PEVs in 2035. The scenario complies with CARB’s Advanced Clean Cars II,

37 Davis, Adam, Tiffany Hoang, Thanh Lopez, Jeffrey Lu, Taylor Nguyen, Bob Nolty, Larry Rillera, Dustin Schell, and Micah Wofford. August 2023. [Assembly Bill 2127 Electric Vehicle Charging Infrastructure Assessment: Assessing Charging Needs to Support Zero-Emission Vehicles in 2030 and 2035 — Staff Report](https://www.energy.ca.gov/efiling.energy.ca.gov/GetDocument.aspx?tn=251866&DocumentContentId=86859). California Energy Commission. Publication Number: CEC-600-2023-048. Accessed August 25, 2023. Available at <https://efiling.energy.ca.gov/GetDocument.aspx?tn=251866&DocumentContentId=86859>.

38 California Energy Commission. [“Assembly Bill \(AB\) 2127 Assessment Workshop on Staff Draft Report.”](https://www.energy.ca.gov/event/workshop/2023-09/assembly-bill-ab-2127-assessment-workshop-staff-draft-report) Accessed September 29, 2023. Available at <https://www.energy.ca.gov/event/workshop/2023-09/assembly-bill-ab-2127-assessment-workshop-staff-draft-report>.

Advanced Clean Trucks, and Advanced Clean Fleets regulations. Models for light-duty ZEV charging infrastructure are updated to produce results for a finer geographic scale of analysis (traffic analysis zones), more granularity of charging types, and more realistic behaviors for simulated BEV and PHEV drivers.

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

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

SB 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.³⁹ If the CEC finds that chargers have been disproportionately deployed, the CEC shall use program funds, to the extent authorized by law, and other mechanisms to deploy chargers 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,⁴⁰ on average, have fewer public chargers per capita than middle- or high-income communities.⁴¹ 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

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

40 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.

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

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

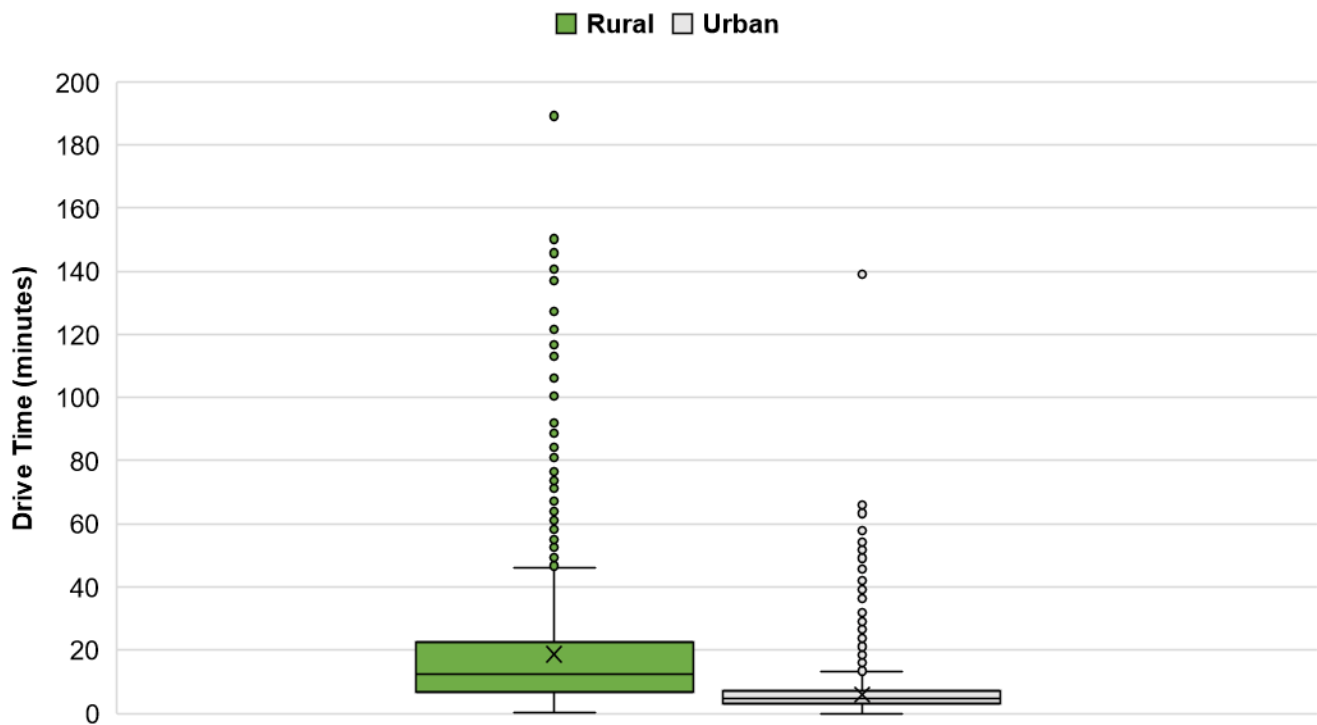
have less public fast charging station coverage than urban communities⁴² (Figure 4). About 88 percent of urban communities are within 10 minutes of a public DC fast charger; in contrast, about 40 percent of rural communities are within 10 minutes of one. Low-income rural communities have the least access to public fast charging — 69 percent are 10 minutes or more from a public DC fast charger, which is more than any other group (Table 7). Finally, Figure 5 shows that several disadvantaged communities in the Los Angeles area have long drives to public fast charging.⁴³ The CEC has created drive time maps showing rural, low-income, and disadvantaged communities with sparse public fast charging coverage.⁴⁴ These can be used to guide Clean Transportation Program DC fast charging investments within underserved communities. Solutions to improve charging access will vary and depend on the intersecting characteristics of a community. Staff will continue to refine and update the analysis to identify charging network gaps in underserved communities and build out charging infrastructure that serves all Californians.

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

43 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.

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

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



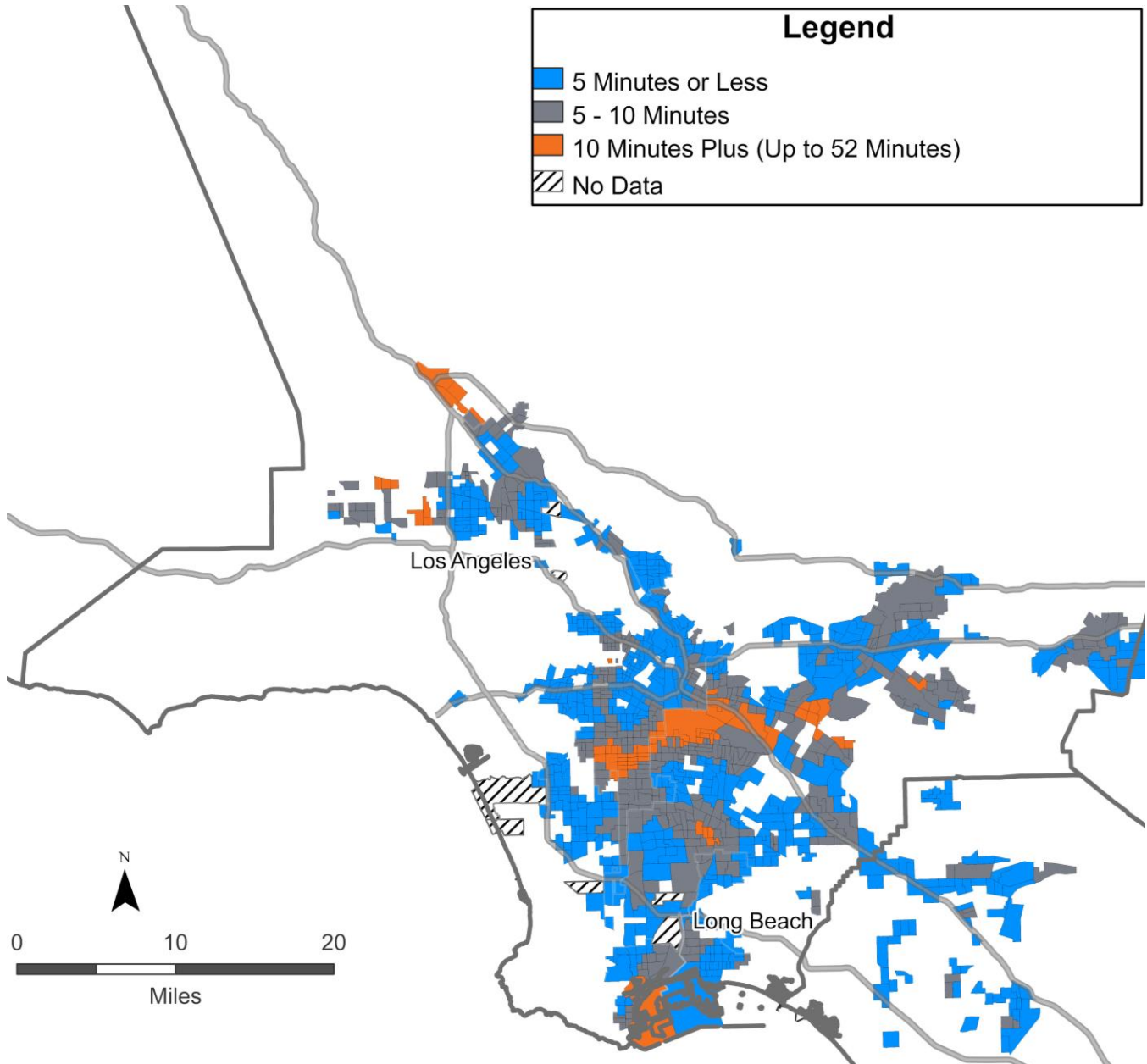
Source: U.S. Census Bureau 2010 Urban and Rural Classifications, U.S. Department of Energy’s Alternative Fuels Data Center Charger Data as of February 2021, and California Air Resources Board California Hydrogen Infrastructure Tool Roadway Data.

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

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

Source: California Energy Commission analysis using data from the U.S. Census Bureau 2010 Urban and Rural Classifications, U.S. Census Bureau 2014–2018 American Community Survey Median Household Income and Average Household Size 5-Year Estimates, California Department of Housing and Community Development 2020 State Income Limits, U.S. Department of Energy Alternative Fuels Data Center as of February 2, 2021, and California Air Resources Board California Hydrogen Infrastructure Tool roadway data.

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



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

Clean Transportation Program Funding To Date

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

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

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

	Private Access	Share-private Access	Shared-private Access	Shared-private Access	Public Access	Public Access	Mixed Access*	Total
Charger Type/ Setting	Level 2: Residential (Single & Multifamily)	Level 2: Fleet	Level 1 and Level 2: Workplace	Level 2: Residential (Multifamily)	Level 1 and Level 2: Public	Level 2 and DC fast: Corridor/Rural/Urban Metro	Level 2 and DC fast: CALeVIP	-
Installed	3,936	155	419	341	3,108	532	3,816	12,307
Planned	0	0	0	1,728	206	130	10,088†	12,152
Total	3,936	155	419	2,069	3,314	662	13,904	24,459

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

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

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

Source: California Energy Commission.

California Electric Vehicle Infrastructure Project (CALeVIP) 1.0

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

The incentives provided through CALeVIP simplify the funding process and accelerate charger deployment compared to the previously used grant solicitations. Each CALeVIP 1.0 project provides incentives for the purchase and installation of electric vehicle infrastructure in specific regions throughout the state, with funding targeted at regions that have low rates of infrastructure installation or lack adequate incentives from utilities and other sources.

Dedicated funding amounts or higher incentive amounts or both are also available under CALeVIP 1.0 for project sites within disadvantaged communities and multifamily complexes.

Through 2022, the CEC allocated \$200 million (\$186 million for rebates and \$14 million for administrative fees) for charger rebates through CALeVIP 1.0; however, not all of these funds have been paid out to, or reserved by, incentive recipients. CALeVIP 1.0 launched 13 regional incentive projects covering 36 counties.

Second Block Grants for Light-Duty EV Charging Infrastructure

In December 2021, the CEC approved funding for two block grants of up to \$250 million each for light-duty EV charging infrastructure. The two implementers, CALSTART and the Center for Sustainable Energy,⁴⁵ will each implement projects that complement one another and include strict readiness requirements as a means of minimizing charger installation times and attracting higher-quality applications. The application processes and project requirements vary between the two block grants as they are designed to best serve each project.

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

CALSTART is implementing the Communities in Charge project, offering up to \$250 million in rebates for level 2 EV chargers. The first incentive project of \$30 million closed in May 2023. Applications were sorted into readiness tiers like those in CALeVIP 2.0. These applications were scored with priority given to disadvantaged and low-income communities, including tribal lands, which are now designated as a disadvantaged community. 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. Out of the first \$30 million, 76 percent of the funding was awarded for installations on sites in disadvantaged or low-income communities.

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

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

- On November 24, 2021, the CEC released the Reliable, Equitable, and Accessible Charging for multifamily Housing (REACH) solicitation. A NOPA was released in May

⁴⁵ CALSTART is a national nonprofit consortium that provides third-party analysis of clean vehicles, technologies, and fuels. The Center for Sustainable Energy is a national nonprofit focused on clean transportation and distributed energy, according to the organization's website.

2022, recommending \$26.6 million in funding for 13 projects. Awarded projects demonstrated replicable and scalable models for large-scale deployment of EV charging infrastructure capable of maximizing access and EV travel for multifamily housing residents. Following the success of REACH, the CEC released REACH 2.0 on April 26, 2023. This made \$20 million available in funding for EV charger installation projects that will benefit and be used by multifamily housing residents within disadvantaged communities, low-income communities, and affordable housing. All projects will include community engagement and outreach to nearby residents. A NOPA is expected for REACH 2.0 in November 2023.

- On December 14, 2021, the CEC released the Clean Transportation Program Rural Electric Vehicle (REV) Charging solicitation. This solicitation will 1) demonstrate replicable and scalable models that can dispatch EV charging stations to serve rural EV drivers, 2) support travel by EV drivers, especially those in low-income or disadvantaged communities, 3) provide EV charging access in rural areas that are not served or inadequately served by charging stations, 4) provide support and maintenance services to ensure reliable and readily accessible chargers, and 5) engage local rural communities and businesses in increasing charger awareness and promoting EV adoption. The CEC released a NOPA on June 24, 2022, recommending \$20.6 million in funding for 17 projects.
- The Charging Access for Reliable On-Demand Transportation Services (CARTS) was released August 31, 2021, targeting projects to support charging infrastructure for high-mileage on-demand transportation services, including services such as ride-hailing, taxis, and meal grocery delivery. On February 14, 2022, the CEC announced proposed awards of more than \$16 million for 10 projects. The CEC followed CARTS with the Fast and Available Charging for All Californians (FAST) solicitation, which funds charging projects that are open to the public but focused on on-demand transportation. The CEC released a NOPA for FAST on August 25, 2023, recommending \$10.5 million in funding for three projects.
- The CEC is partnering with CARB through an interagency agreement to expand program eligibility and funding under the Clean Mobility Options Program. Clean Mobility Options is a statewide program that offers vouchers for shared mobility projects in traditionally underserved communities, aiming to increase residents' access to clean transportation and zero-emission mobility solutions. The interagency agreement added \$8 million to the original CARB funding of \$37 million for additional vouchers, technical assistance, and outreach to communities not identified in the first round of funding. Projects are required to be operational for four years.

Projects to Support Innovation and Standardization in Charging

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

- In August 2020, the CEC released the “BESTFIT Innovative Charging Solutions” solicitation, which offered funding to projects that demonstrate transformative technology solutions. They are meant to accelerate the successful commercial deployment of EV charging for light-duty and medium- and heavy-duty applications. There is no one-size-fits-all solution to charging needs, and there is instead a need for a portfolio of charging solutions that complement one another.
- The Vehicle-Grid Innovation Lab (ViGIL) solicitation was released May 21, 2021. This solicitation supported increased capacity for electric vehicle supply equipment conformance and certification testing in California. On October 14, 2021, the CEC announced a proposed award of nearly \$2 million in grant funding for DEKRA to establish ViGIL in Concord (East Bay Area). ViGIL opened in late 2022 and offers a variety of electric vehicle supply equipment testing services, including Open Charge Point Protocol certification, DIN 70121 conformance testing, ISO 15118 conformance testing, and submeter accuracy testing.
- The Vehicle Interoperability Testing Symposium (VOLTS) solicitation was released September 24, 2021. This solicitation provided funding for a charging interoperability conference and testing symposium, with a focus on interoperability between electric vehicles and electric vehicle supply equipment. On January 6, 2022, the CEC announced an award of nearly \$1 million to innos, Inc., to plan and execute VOLTS. VOLTS took place in May 2023 in Long Beach, California and was among the largest interoperability testing events to date, convening over 500 attendees and 38 charging companies across the three-day event.

Planning and Readiness

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

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

Proposed Funding Allocation

The CEC is required to allocate \$95 million from the Greenhouse Gas Reduction Fund for light-duty electric vehicle charging infrastructure for FY 2023–2024. CEC staff proposes adding \$42.6 million in Clean Transportation Program funds for FY 2023–2024. This combined funding will provide the buildout of EV infrastructure that can close the EV charging infrastructure gap for 2025.

The Investment Plan Update is a high-level document and generally does not determine the details of funding solicitations for any funding allocation. However, staff developing the Investment Plan Update have taken steps to share common feedback with the teams that develop individual solicitations, so they can incorporate those recommendations into upcoming funding opportunities. Frequent feedback related to light-duty charging includes:

- More funding for workplace charging.
- Continued funding for affordability- and accessibility-focused charging solicitations.
- Learning from different payment models that have been tried, to see how to best increase charging access for unbanked and underbanked Californians (including those without credit cards).

Light-Duty Hydrogen Fueling Infrastructure

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. The CEC interprets this to allow funding stations for both light-duty vehicles and medium- and heavy-duty vehicles. This section of Chapter 4 focuses on light-duty hydrogen infrastructure; see below for additional information on medium- and heavy-duty hydrogen infrastructure.

Evaluating the Deployment of FCEVs and Hydrogen Fueling Stations

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

Based on this evaluation, CARB reports the information to the CEC. CARB estimates station and FCEV projections for up to six years in the future, based on mandatory survey information provided by vehicle manufacturers for the next three model years and voluntary information for an additional three following model years.

In September 2022, CARB released the *2022 Annual Evaluation of Fuel Cell Electric Vehicle Deployment & Hydrogen Fuel Station Network Deployment* report (Annual Evaluation).⁴⁶ In this assessment, CARB noted that the growth potential put in place by the planned hydrogen station network will provide an opportunity for auto manufacturers to accelerate their FCEV deployment plans for California. CARB also reported that automakers project having 65,600 FCEVs on the road by 2028. However, past automaker projections have overestimated future sales. Actual vehicle sales have turned out to be lower than the projections, and automakers have begun to roll back those projections partly in response to the recent network developments.

⁴⁶ California Air Resources Board. September 2022. [2022 Annual Evaluation of Fuel Cell Electric Vehicle Deployment & Hydrogen Fuel Station Network Development](https://ww2.arb.ca.gov/resources/documents/annual-hydrogen-evaluation). Available at <https://ww2.arb.ca.gov/resources/documents/annual-hydrogen-evaluation>.

In December 2022, the CEC and CARB released the *Joint Agency Staff Report on Assembly Bill 8: 2022 Annual Assessment of Time and Cost Needed to Attain 100 Hydrogen Fueling Stations in California*.⁴⁷ With the expended funds and committed allocation of funds, California is on track to meet the original AB 8 minimum requirement of 100 stations. In this report, staff anticipated 175 stations by 2027 and estimated that the gap to the 200-station goal would be closed using additional funding from the state's general fund. However, one grant recipient (Equilon Enterprises LLC, doing business as Shell Oil Products US) requested to cancel their \$41 million agreement in June 2023, which was expected to develop 50 new stations. Also, the latest grant funding opportunity, GFO-22-607, which was intended to help California reach the 200-station goal, was undersubscribed.

Between public and private investments, staff anticipates that California will have 130 stations. CEC staff will continue exploring ways to expand the network of stations to provide sufficient, convenient, and reliable refueling options.

When all 130 stations are open, CEC staff estimates that the network of hydrogen stations will have a nameplate capacity to support about 188,000 light-duty FCEVs. When assuming operation at 80 percent of nameplate capacity, these stations will be able to support nearly 150,000 FCEVs. However, the current open-retail station network is experiencing reliability issues due to equipment failures, hydrogen supply issues, and supply-chain issues. 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.

Clean Transportation Program Funding to Date

Through the Clean Transportation Program, the CEC has allocated \$257 million of funding to support 107 publicly available hydrogen stations capable of light-duty vehicle fueling, including associated operations and maintenance. As of October 2023, 66 hydrogen fueling stations had achieved open retail status in California. Allocated funds may also be used for a solicitation to support operations and maintenance of existing stations, and other projects to be determined in the future.

The CEC's recent funding solicitation GFO-22-607 offered up to \$27 million to fund projects that will provide publicly available hydrogen refueling stations. The solicitation was undersubscribed and resulted in six stations. Two of the six are multi-use stations, which will address several markets and accelerate the development of commercial fuel cell electric trucks with the potential to reduce local air pollution from the goods movement sector.

Stations funded by the Clean Transportation Program before GFO-19-602 are required to dispense fuel with at least 33 percent renewable hydrogen content. Stations resulting from GFO-19-602 and GFO-22-607 are mandated to comply with the renewable hydrogen requirements specified in the CARB Low Carbon Fuel Standard (LCFS) regulation, which

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

requires at least 40 percent of the hydrogen be from renewable sources. CARB's definition of renewable hydrogen per the LCFS includes hydrogen produced through fossil natural gas, which is combined with carbon capture from biomethane through "book and claim." CARB's 2022 Annual Evaluation stated that 65 percent renewable content for the first quarter of 2022 was reported to CARB's LCFS Hydrogen Refueling Infrastructure program. This reported renewable content most likely includes the purchase of biogas credits.

Other Sources of Project Support

The Hydrogen Refueling Infrastructure credit provision of the LCFS allows eligible hydrogen fueling station operators to earn credits based on the capacity of the hydrogen station for a limited period, rather than being limited to credit generation based on the amount of hydrogen fuel dispensed.⁴⁸

One hydrogen fueling station funding recipient has received \$5 million from the Volkswagen Mitigation Trust fund⁴⁹ to support development of five hydrogen refueling stations as part of GFO-19-602. The use of the \$5 million mitigation trust funds and cooperation among CARB, the Bay Area Air Quality Management District, and the CEC will reduce the time and funding required to reach the statutory goal of at least 100 publicly available hydrogen fueling stations operating in California.

Proposed Funding Allocation

California is on track to meet the 100-station goal previously set by AB 8 with the stations funded by the combined expended and committed funds. The CEC has historically focused efforts in this category on light-duty vehicle fueling stations, but reserves the right to shift these funds toward stations for medium- and heavy-duty vehicles. This investment plan proposes funding for medium- and heavy-duty hydrogen fueling infrastructure, but not specifically for light-duty hydrogen infrastructure, for fiscal year 2023–2024 of the Clean Transportation Program. However, the CEC expects to spend previously allocated funds on light-duty hydrogen infrastructure, such as by reinvesting unexpired funds (about \$34 million remaining) from the canceled Shell agreement.

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

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

49 This \$5 million is included as part of \$257 million allocated by the CEC.

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 state⁵⁰ because of comparatively low fuel efficiency and high number of miles traveled per year.⁵¹ Medium- and heavy-duty vehicles additionally account for one-third of statewide NO_x and 25 percent of PM_{2.5}⁵² emissions from on-road transportation in California.⁵³ 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

As part of the analyses conducted for the inaugural *AB 2127 Report*, the CEC evaluated infrastructure needs to support medium- and heavy-duty vehicles through the Medium- and Heavy-Duty Electric Vehicle Infrastructure Load, Operations, and Deployment (HEVI-LOAD) model in collaboration with Lawrence Berkeley National Laboratory. This model aims to characterize regional charging infrastructure needs for on-road medium- and heavy-duty electric vehicles. It will determine the number, locations, and types of charger deployments and examine suitable power levels ranging from overnight charging (less than 50 kilowatts) to public fast charging (multimegawatt) for the range of applications envisioned in California's transition to ZEVs.

HEVI-LOAD leverages CARB's *Draft 2020 Mobile Source Strategy*, which projected that the state will need 180,000 medium- and heavy-duty electric vehicles in 2030 to achieve climate and air quality goals and comply with Executive Order N-79-20. The model, which considered 50-kilowatt and 350-kilowatt charging power levels, estimated that to charge these vehicles, 157,000 DC fast chargers will be needed.

The second AB 2127 report will include updated modeling for medium- and heavy-duty vehicle charging needs based on the IEPR Additional Achievable Transportation Electrification 3 scenario. This scenario complies with CARB's Advanced Clean Trucks and Advanced Clean Fleets regulations. The HEVI-LOAD model has been updated to use a bottom-up approach, which aggregates, or groups, simulated vehicle trips to a total charging need.

50 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 2000-2018.](https://ww2.arb.ca.gov/sites/default/files/classic/cc/inventory/ghg_inventory_scopingplan_sum_2000-20.pdf)" Accessed August 4, 2023. Available at https://ww2.arb.ca.gov/sites/default/files/classic/cc/inventory/ghg_inventory_scopingplan_sum_2000-20.pdf.

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

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

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

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.

The inaugural *SB 643 Report* mentioned above 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. 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.

Clean Transportation Program Funding To Date

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

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

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

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

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

- EV Fast Track: For year one of the project, the EV Fast Track funding lane launched March 23, 2022. Under this lane, a total of \$15.8 million was provided for incentives and was available on a first-come, first-served basis.
- Hydrogen: The Hydrogen funding lane was competitively scored and provided \$17 million in incentive funding. The lane launched June 30, 2022, and closed July 14, 2022.

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

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

For year two of the project, EnergIIZE Commercial Vehicles has launched three of the four main funding lanes in addition to two set-aside funding lanes for transit and drayage fleets.

- The EV Fast Track funding lane launched on February 17, 2023, and offered \$9.7 million for incentives. This was a first-come, first-served lane and was quickly subscribed.
- The year-two Hydrogen funding lane launched on April 27, 2023 and closed on May 12, 2023. This funding lane was competitively scored and offered \$29.7 million in incentive funding.
- The EV Jump Start funding lane launched on July 19, 2023 and closed on August 18, 2023. This funding lane was competitively scored and offered \$25 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 first set-aside funding lanes for both transit and drayage fleets launched on July 27, 2023 and closed on September 15, 2023. The transit set-aside funding lane offered \$11.4 million for incentives and the drayage fleet set-aside funding lane offered \$22.275 million for incentives.
 - Transit set-aside funding supports CARB's Innovative Clean Transit regulation, which sets a goal for public transit agencies to "gradually transition to 100 percent zero-emission bus fleets by 2040."
 - Drayage Fleet set-aside funding allows fleets purchasing a drayage vehicle through CARB's HVIP program to receive direct incentives for electric vehicle charging, hydrogen refueling infrastructure, or both.

The remaining main funding lane, EV Public Charging, is expected to launch in Q4 2023.

EnergIIZE anticipates releasing two additional carve-out lanes specifically targeting public charging for drayage trucks and school buses as the transition to zero-emission continues.

Targeted Projects for Medium- and Heavy-Duty ZEV Infrastructure

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

On February 28, 2022, the CEC held a workshop focused on identifying funding opportunities for medium- and heavy-duty ZEV infrastructure projects.⁵⁴ Because of limited funds, the CEC may not pursue all these funding opportunities or may provide grant funding for concepts not presented at the workshop. Decisions regarding funding implementation are made based on interested and affected group feedback, emerging needs or opportunities, alignment with key state policies, and other considerations.

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

- "Light-Duty Vehicle and Multi-Use Hydrogen Refueling Infrastructure," GFO-22-607, was released in October 2022. This solicitation offered up to \$27 million to fund projects that will provide publicly available hydrogen refueling stations. The funding was split between two funding competitions: Light-Duty Vehicle Hydrogen Refueling Infrastructure Competition and Multi-Use Hydrogen Refueling Infrastructure Competition. On April 12, 2023, the CEC announced proposed awards of nearly \$10 million to three projects: one light-duty hydrogen refueling project and two multi-use hydrogen refueling projects.
- "Innovative Hydrogen Refueling Solutions for Heavy Transport," GFO-22-502, was released in October 2022. This solicitation offered up to \$16.5 million to develop and demonstrate innovative hydrogen refueling solutions. Goals included supporting the decarbonization of emerging medium- and heavy-duty on-road and off-road vehicle applications, reducing hydrogen delivery and refueling costs, improving reliability, enabling higher fill rates, and minimizing energy losses. This solicitation was a collaboration between the CEC's Clean Transportation Program and the CEC's Gas Research and Development Program. The Clean Transportation Program offered up to \$8 million to fund projects in "Group 3: Medium- and Heavy-Duty On-Road Vehicles." A NOPA was released on May 24, 2023 recommending \$16.5 million in funding for six applications, three of which were for Group 3 projects.
- "Electric School Bus Bi-Directional Infrastructure," GFO-22-612, was released in April 2023. This solicitation offered up to \$15 million to fund Phase 1 projects that help enable managed charging and bidirectional power flow for electric school buses and their associated infrastructure, by installing bidirectional DC fast charging stations at key building sites throughout California that support school districts. A NOPA was

⁵⁴ CEC. February 28, 2022. "[Staff Workshop on Funding Allocations for Future Medium- and Heavy-Duty Charging and Refueling Infrastructure Projects](https://www.energy.ca.gov/event/workshop/2022-02/staff-workshop-funding-allocations-future-medium-and-heavy-duty-charging-and)." Available at <https://www.energy.ca.gov/event/workshop/2022-02/staff-workshop-funding-allocations-future-medium-and-heavy-duty-charging-and>.

published in September 2023 recommending \$10.8 million in funding for four applications. There may be additional funding available for Phase 2 awards at a later date, which would occur in a subsequent solicitation.

- “Innovative Charging Solutions for Medium- and Heavy-Duty Electric Vehicles,” GFO-22-615, was released in May 2023. This solicitation made available \$20 million in Phase 1 funding for innovative charging technologies and/or business models that highlight the unique needs of medium- and heavy-duty vehicles and fleets. This solicitation consists of a two stage application process: a pre-application abstract stage, followed by a full application stage for those with passing the pre-application abstracts. A Notice of Pre-Application Abstract Results (NOPAR) was published in September 2023 and a NOPA is expected in December 2023. There may be additional funding available for Phase 2 awards at a later date, which would occur in a subsequent solicitation.

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

- Medium- and Heavy-Duty Blueprint Technical Assistance and implementation of completed medium- and heavy-duty blueprints.
- A Medium- and Heavy-Duty Loan Pilot project.

Proposition 98 Funding

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

The Budget Act of 2023 replaced the five-year funding with allocations for FY 2023 only (SB 114, Committee on Budget and Fiscal Review, Chapter 48, Statutes of 2023). This includes \$375 million to CARB and \$125 million to CEC in FY 2023–2024. Future budget acts are projected to allocate more funding, including another \$250 million in Proposition 98 funds to CEC for ZEV school bus infrastructure.

Proposed Funding Allocation

For FY 2023–2024, the CEC allocates \$42.6 million in Clean Transportation Program funding to the medium- and heavy-duty sectors, in addition to \$218.5 million from the Greenhouse Gas Reduction Fund and the \$125 million in Proposition 98 general funds mentioned above. This funding is intended to meet the growing needs of charging and hydrogen fueling infrastructure for medium- and heavy-duty ZEVs. A significant portion of this funding is directed by the state budget to specific sectors such as drayage trucks.

Emerging Opportunities

The Emerging Opportunities allocation (currently planned for FY 2025–2026 funding) will support fueling infrastructure for emerging vehicle segments and the development of vehicle-grid integration products and services. Funded activities may include:

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

ZEV Infrastructure for Emerging Sectors

In July 2023, CARB released a competitive solicitation for “Advanced Technology Demonstration and Pilot Projects” offering \$175 million in CARB funds for innovative zero-emission projects in multiple categories. This solicitation will support a wide array of zero-emission off-road equipment and vessel projects as well as “Green Zones,” which are focused on a city or group of cities. The Green Zones category is very broad, with possible examples including zero-emission construction, waste collection, and landscaping equipment for schools and parks.

The CEC will offer up to \$50 million in funding to support infrastructure, such as charging and hydrogen refueling, for certain awarded projects. Awards are expected to be announced in November 2023.

Vehicle-Grid Integration

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

In July 2022, the CEC held a workshop discussing the market status of vehicle-grid integration and potential funding concepts.⁵⁵ Based on feedback from this workshop, the CEC developed

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

and issued the Responsive, Easy Charging Products With Dynamic Signals (REDWDS) solicitation in March 2023.⁵⁶ In September 2023, the CEC released a NOPA proposing \$20.3 million in grant funds. 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. The solicitation builds upon the Open Charging Point Protocol and ISO 15118 technical requirements included in CEC's block grant projects, as well as recent revisions to the Load Management Standards.

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.⁵⁷

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

57 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, 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 5:

Alternative Fuel Production and Supply

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

The California transportation sector relies largely on petroleum, which accounts for 89 percent of ground transportation fuel used in the state.⁵⁸ Low-carbon substitute fuels that can displace the roughly 14 billion gallons of petroleum-based gasoline and 3.3 billion gallons of petroleum-based diesel used per year in California could provide opportunities to reduce GHG emissions and criteria air pollution.⁵⁹ Biofuels — defined in this document as nonpetroleum diesel substitutes, gasoline substitutes, and biomethane — represent the largest existing stock of alternative fuel in the California transportation sector.⁶⁰ In addition, production of and demand for renewable hydrogen are expected to increase in the coming years as more hydrogen FCEVs are sold and applications in other sectors expand.

The carbon intensity of renewable fuels can vary significantly depending on the pathway, which accounts for the specific feedstock and production process of the fuel. CARB provides carbon intensity values for most transportation fuels as part of the LCFS. The carbon intensity value accounts for the life-cycle GHG emissions of the fuel, including production, transportation, and consumption, and is reported in grams of carbon dioxide equivalent greenhouse gases per megajoule (gCO₂e/MJ).⁶¹ Maximizing renewable fuel production from the lowest carbon pathways represents a key opportunity to reduce near-term GHG emissions in combustion engines and FCEVs. Clean Transportation Program funding uniquely drives innovative biofuel production plants to California, providing an in-state source for fuel which may otherwise come from out of state.

Fuel Type Overview

Renewable Diesel and Biodiesel

In 2022, renewable diesel was the most common diesel substitute in California, with 1.449 billion diesel-gallon equivalents sold and more than doubling in usage compared to 2020.⁶² Renewable diesel that meets the fuel specification requirements of ASTM International

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

59 Ibid.

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

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

62 California Air Resources Board. July 18, 2023. “[CARB Data Dashboard](https://ww3.arb.ca.gov/fuels/lcfs/dashboard/dashboard.htm).” Available at <https://ww3.arb.ca.gov/fuels/lcfs/dashboard/dashboard.htm>.

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

Renewable diesel and biodiesel have carbon intensities up to 92 percent lower than diesel fuel, depending on the pathway used.⁶³ Together, renewable diesel and biodiesel accounted for about 59 percent of LCFS credits in 2022.⁶⁴ Of the 3.6 billion gallons of diesel fuel consumed in California in 2020, about 949 million (or 26 percent) were from low-carbon biodiesel or renewable diesel.

Biomethane

Biomethane (or “renewable natural gas”) is a commercially mature biofuel that serves as a low- or negative-carbon substitute for conventional natural gas. Biomethane from anaerobic digestion of wastewater sludge can reduce GHG emissions by as much as 92 percent below diesel. Biomethane derived from high-solids anaerobic digestion of prelandfill food and green wastes has a carbon intensity around *negative* 23 gCO_{2e}/MJ (or roughly 125 percent below diesel), indicating that the pathway contributes a net GHG emission reduction. Biomethane derived from dairy biogas has the lowest carbon intensity approved under the LCFS — about negative 404 gCO_{2e}/MJ.⁶⁵

The potential of low-carbon biomethane to replace natural gas in the transportation sector is based on the availability of waste-based feedstocks, and estimates vary on technical and economical availability. The University of California, Davis, Institute of Transportation Studies indicated an economically feasible potential of roughly 623 million diesel gallon equivalents. According to the U.S. Department of Energy’s *2016 Billion-Ton Report*, slightly higher estimates indicate that waste residues from in-state dairies, landfills, food diversion, and wastewater treatment plants could be used to produce biomethane in volumes ranging from 750 million to 1.2 billion diesel gallon equivalents per year. This amount would displace 23 to 36 percent of the on-road diesel fuel consumption in California.⁶⁶ However, based on other studies provided by NREL, the technical availability (under preferable market conditions) could be four times higher.⁶⁷ Regardless, given the limited availability, the carbon reduction benefits from

63 Compared to California diesel (102.01 gCO_{2e}/MJ), with biodiesel carbon intensity as low as 8.63 gCO_{2e}/MJ and renewable diesel carbon intensity as low as 19.51 gCO_{2e}/MJ. Based on data from the [LCFS Fuel Pathway Table](#) (August 25, 2022), available at https://www.arb.ca.gov/fuels/lcfs/fuelpathways/current-pathways_all.xlsx.

64 California Air Resources Board. July 18, 2023. [“LCFS Quarterly Data Spreadsheet.”](#) Available at <http://www.arb.ca.gov/fuels/lcfs/lrtqsummaries.htm>.

65 California Air Resources Board. July 5, 2023. [“LCFS Pathway Certified Carbon Intensities.”](#) Available at <https://www.arb.ca.gov/fuels/lcfs/fuelpathways/pathwaytable.htm>.

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

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

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

Renewable Hydrogen

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

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

According to the California Independent System Operator, increasing amounts of renewable power generation may result in electricity oversupply as California renewable power requirements grow from 33 to 50 percent.⁶⁸ 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.⁶⁹ The use of renewable electricity could also contribute to reductions in capital costs for renewable hydrogen production. Additional cost-reduction methods include improvements in how hydrogen is treated, stored, and delivered, as well as economies of scale afforded by expanding applications of hydrogen fuel.

Clean Transportation Program Funding to Date

To date, the CEC has awarded approximately \$193 million to low-carbon fuel production projects. These awards are summarized by fuel type in Table 9.

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

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

Table 9: Summary of Clean Transportation Program Low-Carbon Fuel Production Awards as of July 2023

Fuel Type	Qualifying Proposals* Submitted	Funds Requested by Qualifying Proposals* (in Millions)	Awards Made	Funds Awarded (in Millions)
Gasoline Substitutes	28	\$71.80	14	\$26.94
Diesel Substitutes	58	\$177.07	25	\$66.75
Biomethane	61	\$185.38	29	\$77.67
Renewable Hydrogen	11	\$43.70	6	\$21.93
Total	158	\$477.95	74	\$193.29

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

Source: California Energy Commission.

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

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

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

In February 2023, the CEC released GFO-22-608, titled “Ultra-Low-Carbon Fuel: Demonstration- and Commercial-Scale Production Facilities Using Forest Biomass.” This solicitation is an offer to fund ultra-low-carbon transportation fuel production at new or existing facilities using forest biomass at two development stages: demonstration- and commercial-scale. In June 2023, the CEC issued a NOPA for two grants for a total of \$10 million.

Other Sources of Funding

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

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

Continuing in September 2022, the CDFA awarded \$18.9 million in grant funding from the Alternative Manure Management Program to 27 methane emission reduction projects in the state. This program funds projects other than dairy digesters that reduce manure methane emissions.⁷⁰ As of December 2022, the DDRDP has successfully completed 66 percent of the 131 projects already funded, and the Alternative Manure Management Program has completed 71 percent of its 140 awarded projects.

On the federal level, in January 2023, the U.S. Department of Energy awarded \$118 million in grant funding to 17 projects that will accelerate the use of domestic feedstock and production of biofuels from prepilot to demonstration scale.⁷¹ Of the total 17 projects that were awarded, 6 projects were California based, supporting biofuel production technologies at prepilot and pilot scale-up development stages.

USDA's Higher Blends Infrastructure Incentive Program has provided incentives to increase the availability of higher blends of biofuels such as ethanol and biodiesel through transportation fueling and fuel distribution facilities. This program supports efforts in California to increase access to fuels with a lower carbon intensity than conventional fuels. Since the debut of the program in August 2020, USDA has invested more than \$77.8 million in projects expected to increase biofuels sales by 1.2 billion gallons annually.⁷² The USDA announced in August 2022 the availability of \$100 million for the Higher Blends Infrastructure Incentive Program.⁷³

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

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

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

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

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

fuels. The incentives earned through the LCFS provide steady financial support to low-carbon fuel producers, distributors, and blenders in California. In 2021, about 77.2 percent of LCFS credits were granted for biofuels including biomethane, ethanol, biodiesel, and renewable diesel.⁷⁴ These credits equate to an incentive of more than \$2.89 billion for biofuel producers and retailers if sold at the average credit price of \$187 for 2021.⁷⁵ It is expected that the LCFS will serve as the state's primary source of financial support for low-carbon fuel production and distribution.

Proposed Funding Allocation

The CEC will continue to examine the best use of funds in these categories through outreach to interested and affected groups, backed up with data and analysis. Several factors will be considered, including the near-term petroleum and GHG emission reduction potential of low-carbon, drop-in gasoline or petroleum replacement, the need to decarbonize hydrogen production, and market conditions.

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

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

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

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

CHAPTER 6:

Related Opportunities

Manufacturing

Transportation Equipment Manufacturing was the fourth largest export in California by trade dollar value in 2022.⁷⁶ 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.⁷⁷ California has 56 ZEV-related manufacturers⁷⁸ and leads the nation in ZEV manufacturing jobs.

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

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

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

Since the inception of the Clean Transportation Program, seven solicitations have been issued under the manufacturing category totaling \$278 million for 40 projects recommended for funding. Clean Transportation Program grants have been invaluable in attracting companies to California, leveraging the state’s policy objectives and regulations, scaling growth in-state and abroad, and creating jobs.

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

76 U.S. Census Bureau. “[California Top 6 Exports](https://www.bls.gov/mxp/publications/regional-publications/charts/california-top-6-exports.htm).” Accessed August 21, 2023. Available at <https://www.bls.gov/mxp/publications/regional-publications/charts/california-top-6-exports.htm>.

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

78 CEC. “[California Zero-Emission Vehicle-Related Manufacturing web map](https://experience.arcgis.com/experience/95583f19bddd4bf0bdd0fddd4dd77c85/?draft=true).” Available at <https://experience.arcgis.com/experience/95583f19bddd4bf0bdd0fddd4dd77c85/?draft=true>.

The Budget Acts of 2021 and 2022^{79,80} allocated a total of \$250 million in one-time funds to the CEC toward supporting ZEV manufacturing grants that increase in-state manufacturing of ZEVs, ZEV components, and ZEV charging or refueling equipment.

On March 30, 2022, the CEC released the competitive grant solicitation GFO-21-605 — Zero-Emission Transportation Manufacturing with this funding.⁸¹ This solicitation funded projects that increase in-state manufacturing of ZEVs, ZEV components and batteries, and ZEV charging/refueling equipment. The CEC initially announced the availability of \$60 million to fund resulting agreements. The solicitation was oversubscribed, and CEC increased this amount to support the additional passing proposals and funding requested. The March 15, 2023, NOPA announced plans for awards totaling \$197.9 million among 13 projects as indicated in Table 10.

Table 10: Summary of Proposed Awards for GFO-21-605, Zero-Emission Transportation Manufacturing

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

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

Source: CEC.

The 13 Zero-Emission Transportation Manufacturing projects recommended for funding, summarized in Table 11, are spread across 19 project sites, 13 cities, and 9 counties in California. The projects recommended for funding will promote a diversity of manufactured products in the ZEV supply chain. In total, the proposed projects are expected to create 2,989 direct jobs and other cobenefits, many of which are within or adjacent to disadvantaged and low-income communities.

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

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

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

Table 11: GFO-21-605 Zero-Emission Transportation Manufacturing Awardees

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

* Proposed awardees are subject to approval at a CEC business meeting.

Source: CEC.

The second solicitation, GFO-21-606 — ZEV Battery Manufacturing Block Grant, released in August 2022, offered \$25 million in grant funds for projects that will increase in-state manufacturing of ZEV batteries.⁸² CALSTART was selected through this competitive solicitation to award these funds to battery manufacturers through a process in collaboration with the CEC. Further details on available funding to ZEV battery manufacturers are under development.

As of the July 2023 Business Meeting, the CEC has approved \$180.4 million in manufacturing funding awards from solicitations GFO-21-605 and GFO-21-606, with \$42.5 million pending approval. The CEC is committed to California’s goal of zero-emission transportation while growing high-quality manufacturing jobs in the state. Maintaining a steady and consistent flow of public capital will encourage manufacturers through incentives to establish and scale up operations in California. Thanks to the ambitious goals of the state to electrify and decarbonize transportation, California will continue to be a leader in manufacturing the technologies that will lead the state to a 100 percent clean energy future for all.

Proposed Funding Allocation

The CEC anticipates about \$17 million in 2022 Budget Act one-time funds remaining for supporting future manufacturing solicitations or projects. The CEC will explore ways for allocating these remaining funds to continue supporting in-state manufacturing of ZEV technologies and in-state jobs.

Workforce Training and Development

Investments in workforce training and development are critical to the advancement of ZEV and ZEV infrastructure markets. Incorporating high-road⁸³ policies and training into program investments is equally important to meeting economic and diversity goals for California’s workers. 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, which include:

- Directing workforce investments and accruing benefits to disadvantaged and low-income communities.
- Preparing the ZEV and ZEV infrastructure workforce in deployment areas.

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

83 California Workforce Development Board. “[High Road Training Partnerships](https://cwdb.ca.gov/initiatives/high-road-training-partnerships/).” Accessed March 10, 2023. Available at <https://cwdb.ca.gov/initiatives/high-road-training-partnerships/>. See also [Section 14005 of the California Unemployment Insurance Code](#). Available at https://leginfo.legislature.ca.gov/faces/codes_displayText.xhtml?lawCode=UIC&division=7.&title=&part=&chapter=2.&article=.

- Building new partnerships for co-investments, job support, and community workforce priorities.
- Supporting and incorporating high-road principles, job quality, job quantity, and occupational assessments for solicitations and incentives.
- Addressing employer workforce, market trends, and growth in all ZEV and ZEV infrastructure industries.

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

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

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

In 2023, staff began to work closely with the Contractors State License Board (CSLB) to better understand licensing and the occupations associated with ZEV infrastructure construction, installation, and maintenance. Of the 38,000 licensed electricians⁸⁴ in the state, an understanding of the existing knowledge, skills, and preparedness required for EV charger work will be part of necessary collaboration with CSLB, electricians, and electrical contractors.

Clean Transportation Program workforce investments will continue to refine and incorporate labor and workforce requirements into program solicitations and incentives. As the California Workforce Development Board (CWDB) and other state workforce entities develop policies, the CEC will work to build internal capacity and weave these policies into the Clean Transportation Program.

Proposed Funding Allocation

The CEC allocates \$5 million for workforce training and development in FY 2023–2024. 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

⁸⁴ This corresponds to the CSLB’s licensing classification “C-10 — Electrical Contractor.”

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.

GLOSSARY

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

Term	Definition
California Climate Investments	A set of programs that are administered by the California Air Resources Board and funded by the proceeds from California's Cap-and-Trade climate law.
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.
Clean Vehicle Rebate Project	A California Air Resources Board program that provides financial assistance for purchasing or leasing battery-electric, fuel cell, and plug-in hybrid vehicles.
Combined Charging System (CCS)	A commonly used standard plug for direct-current fast charging of electric vehicles.
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 has set an ambient air quality standard. Examples include ozone (O ₃), carbon monoxide (CO), nitrogen oxides (NO _x), sulfur oxides (SO _x), and particulate matter (PM ₁₀ and PM _{2.5}).
Dairy Digester Research and Development Program (DDRDP)	A California Department of Food and Agriculture program that provides financial incentives for anaerobic digesters to reduce methane emissions at dairy farms.
Direct current (DC) fast charger	Equipment that provides charging through a direct-current plug, typically at a rate of 50 kilowatts or higher.
Disadvantaged Communities Advisory Group (DACAG)	A group established under Senate Bill 350 (the Clean Energy and Pollution Reduction Act of 2015) that advises the California Energy Commission and California Public Utilities Commission on various programs.

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

Term	Definition
Fuel cell	A device capable of generating an electrical current by converting the chemical energy of a fuel (for example, hydrogen) directly into electrical energy.
Fuel cell electric vehicle (FCEV)	A type of electric vehicle that derives power from an onboard fuel cell.
gCO ₂ e/MJ	See the entry for "Carbon intensity."
Grant funding opportunity (GFO)	Where the California Energy Commission offers applicants an opportunity to receive grant funding for projects meeting certain requirements.
Greenhouse gas (GHG)	Any gas that absorbs infrared radiation in the atmosphere. Common examples of greenhouse gases include water vapor, carbon dioxide (CO ₂), methane (CH ₄), nitrous oxide (N ₂ O), halogenated fluorocarbons (HCFCs), ozone (O ₃), perfluorinated carbons (PFCs), and hydrofluorocarbons (HFCs).
High road	A set of economic and workforce development strategies to achieve economic growth, economic equity, shared prosperity, and a clean environment. Strategies include, but are not limited to, interventions that (1) improve job quality and job access, including for women and people from underserved and underrepresented populations, (2) meet the skill and profitability needs of employers, and (3) meet the economic, social, and environmental needs of the community.
High-solids anaerobic digestion	An anaerobic digestion process where the percentage of total solids of the feedstock is greater than 15 percent and little or no water is added to the digester.
Hybrid and Zero-Emission Truck and Bus Voucher Project (HVIP)	A program that provides incentives for purchasing clean commercial vehicles such as trucks and buses. Also known as the "Clean Truck and Bus Voucher Incentive Project."
Hybrid vehicle	A vehicle that uses two or more types of power, most commonly using a combustion engine together with an electric propulsion system. Hybrid technologies typically expand the usable range of electric vehicles beyond what an electric vehicle can achieve with batteries alone and increase fuel efficiency beyond what an internal combustion engine can achieve alone.
Investor-owned utility (IOU)	A private company that provides a utility, such as water, natural gas, or electricity, to a specific service area. The California Public Utilities Commission regulates investor-owned utilities that operate in California.

Term	Definition
Landfill gas	Gas generated by the natural degradation and decomposition of municipal solid waste by anaerobic microorganisms in sanitary landfills. The gases produced, carbon dioxide and methane, can be collected by a series of low-level pressure wells and processed into a medium-Btu gas that can be further processed into a transportation fuel or combusted to generate heat or electricity.
Level 1 charger	Equipment that provides charging through a 120-volt alternating-current plug.
Level 2 charger	Equipment that provides charging through a 240-volt (typical in residential applications) or 208-volt (typical in commercial applications) alternating-current plug. This equipment generally requires a dedicated 40-amp circuit.
Low Carbon Fuel Standard (LCFS)	A set of standards designed to encourage the use of cleaner low-carbon fuels in California, encourage the production of those fuels, and therefore reduce greenhouse gas (GHG) emissions.
Low-income communities/ households	Census tracts or households that are either at or below 80 percent of the statewide median income, or at or below the threshold designated as low-income by the California Department of Housing and Community Developments 2018 Income Limits.
Megajoule	One million joules. A joule is a unit of work or energy equal to the amount of work done when the point of application of force of 1 newton is displaced 1 meter in the direction of the force. One British thermal unit is equal to 1,055 joules.
Methane	A light hydrocarbon that is the main component of natural gas. It is the product of the anaerobic decomposition of organic matter or enteric fermentation in animals and is a greenhouse gas. The chemical formula is CH ₄ .
Metric ton	A unit of weight equal to 1,000 kilograms (2,205 pounds).
Micrometer	One millionth of a meter, equal to roughly 0.00004 inches.
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.

Term	Definition
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.
Overgeneration	When total electricity supply exceeds total electricity demand. This condition may negatively affect the reliable operation of the regional, state, or interstate electrical grid.
Particulate matter	Any material, except pure water, that exists in a solid or liquid state in the atmosphere. The size of particulate matter can vary from coarse, wind-blown dust particles to fine-particle combustion products.
Pathway	A descriptive combination of three components including feedstock, production process, and fuel type.
Plug-in electric vehicle (PEV)	A type of vehicle that is equipped with a battery that can be recharged from an external source of electricity. This includes battery-electric vehicles and plug-in hybrids.
Plug-in hybrid electric vehicle (PHEV)	A type of hybrid vehicle that is equipped with a larger, more advanced battery that can be recharged from an external source of electricity. This larger battery allows the vehicle to be driven on battery power alone, gasoline fuel alone, or a combination of electricity and gasoline.
PM _{2.5}	Particulate matter with particles 2.5 micrometers in diameter or smaller. Also called "fine particulate matter."
Senate Bill (SB)	A law or proposed law that originated in the California State Senate.
Vehicle-grid integration	Policies, technologies, and strategies that help coordinate vehicle charging with both customer mobility needs and grid needs. Examples of vehicle-grid integration include managed one-way

Term**Definition**

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.