

APPENDIX B: CARB'S ZERO-EMISSION VEHICLE PROGRAMS



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1. Overview

This appendix describes each of CARB's programs that affect the adoption of light-, medium-, and heavy-duty ZEVs. This appendix is divided into four sections: light-duty ZEV programs, heavy-duty ZEV programs, programs spanning both the light- and heavy-duty ZEVs, and supporting ZEV programs. In addition to programs managed by CARB, the supporting programs are all programs that CARB contributes to but are managed by other State agencies, public-private partnerships, or nonprofit organizations.

2. Light-Duty ZEV Programs

A. The Advanced Clean Cars ZEV Program

Website: <https://ww2.arb.ca.gov/our-work/programs/advanced-clean-cars-program>

Program description

In 1990, CARB adopted the first Low-Emission Vehicle (LEV I) regulations requiring automobile manufacturers to introduce progressively cleaner passenger cars and light-duty trucks with more durable emission controls from the 1994 through 2003 model years. These LEV I regulations included three primary elements: 1) tiers of exhaust emission standards for increasingly more stringent categories of low-emission vehicles, 2) a mechanism requiring each auto manufacturer to phase-in a progressively cleaner mix of vehicles from year to year with the option of credit banking and trading, and 3) a requirement that a specified percentage of passenger cars and light-duty trucks be ZEVs with no exhaust or evaporative emissions.

Building on LEV I, the LEV II regulations continued to reduce criteria pollutant emissions from new light- and medium-duty vehicles starting with the 2004 model year. In 2003, CARB approved the landmark Pavley regulations¹ to require automakers to control greenhouse gas emissions from new vehicles for the 2009 through 2016 model years.

In January 2012, CARB adopted the Advanced Clean Cars (ACC) program, which brought together three light-duty vehicle regulations to lay the foundation for the next generation of ultra-clean vehicles: the LEV criteria pollutant emissions program, the Greenhouse Gas (GHG) vehicle program, and the Zero-Emission Vehicle program. The LEV III GHG and LEV III criteria emission rules are fleet-average performance standards for new vehicles that yield continued annual emission reductions as stringency increases through 2025.² The ACC program includes tighter criteria pollutant standards (e.g., carbon monoxide, oxides of nitrogen, particulate matter, and hydrocarbons) for all light- and medium-duty vehicles starting with the 2015 model year. It also requires more stringent GHG emissions standards (e.g., carbon dioxide,

¹ CARB, Clean Car Standards, Pavley Assembly Bill 1493, <https://www.arb.ca.gov/cc/ccms/ccms.htm>.

² CARB, 2016. "California Mobile Source Strategy." <https://ww3.arb.ca.gov/planning/sip/2016sip/2016mobsrsrc.pdf>.

methane, nitrous oxide) for passenger vehicles starting with the 2017 model year, and increased ZEV production requirements starting in 2018, to ensure electric drive technology is commercialized and brought to production scale for cost reductions by 2025.

The program requires vehicle manufacturers who sell light-duty vehicles in California to also produce a minimum number of ZEV credits or to purchase ZEV credits, as a percentage of the total number of vehicles sold in California by each manufacturer.³ Manufacturers generate credits by producing a ZEV or plug-in electric vehicle (PHEV) and delivering that vehicle to a dealer. Annual requirements are in terms of percent credits, ranging from 4.5 percent in 2018 to 22 percent by 2025. Each ZEV receives credits based on the electric driving range of the vehicle. The more range a vehicle has, the more credit it receives. Credits not needed for compliance in any given year can be banked for future use, traded, or sold to other manufacturers. CARB releases reports of annual credit bank balances each year, including the total number of vehicles sold in California for that model year, and the total number of ZEVs sold.⁴ For example, in model year 2018, the ZEV regulation required approximately 90,000 credits total (equal to about 36,000 200-mile BEVs). Over four times that amount of credits were generated in model year 2018 among all vehicle manufacturers.⁵ As of model year 2018, all vehicle manufacturers are in compliance with the ZEV regulation. Because compliance is completed about a year after the model year, 2019 compliance will not be fully calculated until fall 2020.

Since its inception, the ZEV regulation has been adjusted nine times to reflect the pace of ZEV development, the emergence of new ZEV technologies, and the need to provide clarifying language.

Program goal

The primary goal of the ZEV regulation is to encourage the development and commercialization of advanced technology vehicles to meet long-term criteria pollutant and GHG emission reduction goals. Conventional hybrids are an example of advanced technology that has reached commercialization.

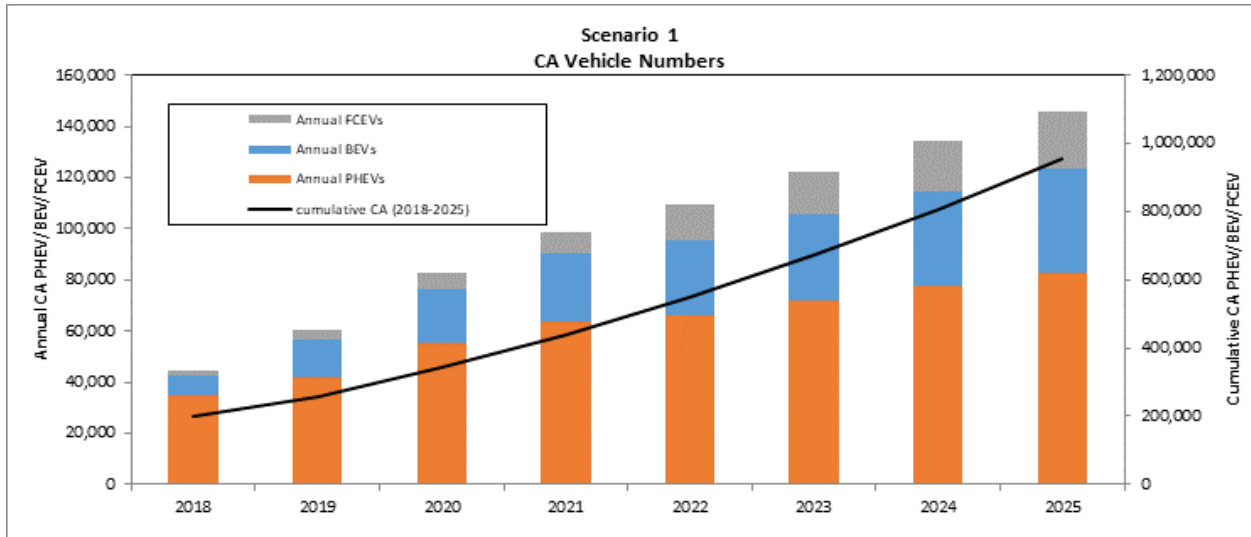
Figure B - 1 shows the Midterm Review mid-range scenario showing the projected minimum number of California ZEVs from the regulation from 2018 through 2025.

³ Cal. Code Regs., tit. 13, §§ 1962.1, 1962.2.

⁴ CARB. "Zero-Emission Vehicle Program." <https://ww2.arb.ca.gov/our-work/programs/zero-emission-vehicle-program/about>. Accessed July 15, 2019.

⁵ CARB, 2019. October 31, 2019. "2018 Zero Emission Vehicle Credits." https://ww2.arb.ca.gov/sites/default/files/2019-11/2018%20ZEV%20Credit%20Annual%20Disclosure_103119.pdf.

Figure B - 1 Mid-range California Vehicle Scenario of Projected Minimum ZEVs

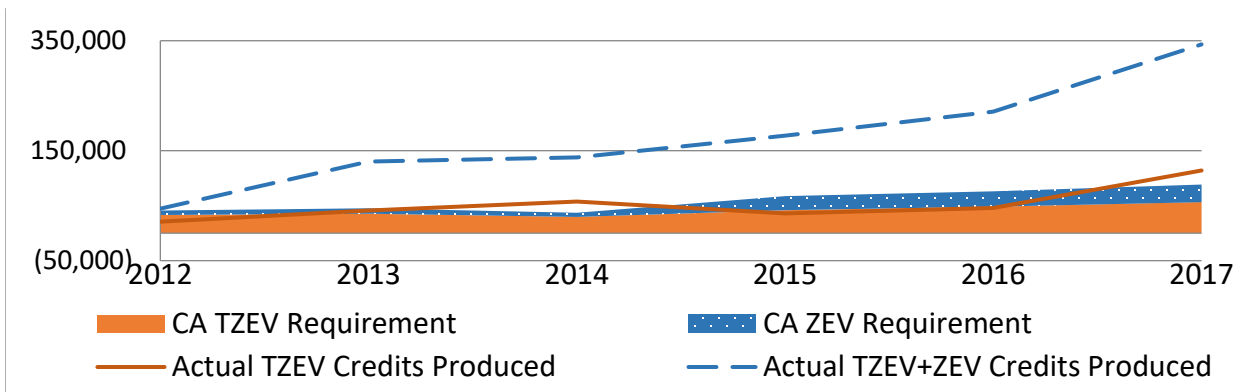


Source: CARB California's Advanced Clean Cars Midterm Review Appendix A: Analysis of Zero-Emission Vehicle Regulations Compliance Scenarios.⁶

Status of program in reaching goal (as of FY 2017-2018)

The ZEV regulation has successfully accomplished its mission to date. Since the beginning of the regulation through model year 2017, all vehicle manufacturers subject to the ZEV regulation have significantly over-complied as shown in Figure B - 2. The Advanced Clean Cars program has helped result in a total of over 5.7 million vehicles, including over 5,000 fuel cell electric vehicles (FCEVs), 200,000 battery-electric (and range-extended electric) vehicles (BEVs), 29,700 neighborhood electric vehicles, 150,000 plug-in hybrid electric vehicles (PHEVs), 800,000 clean conventional hybrid vehicles, and over 4.5 million clean gasoline vehicles.

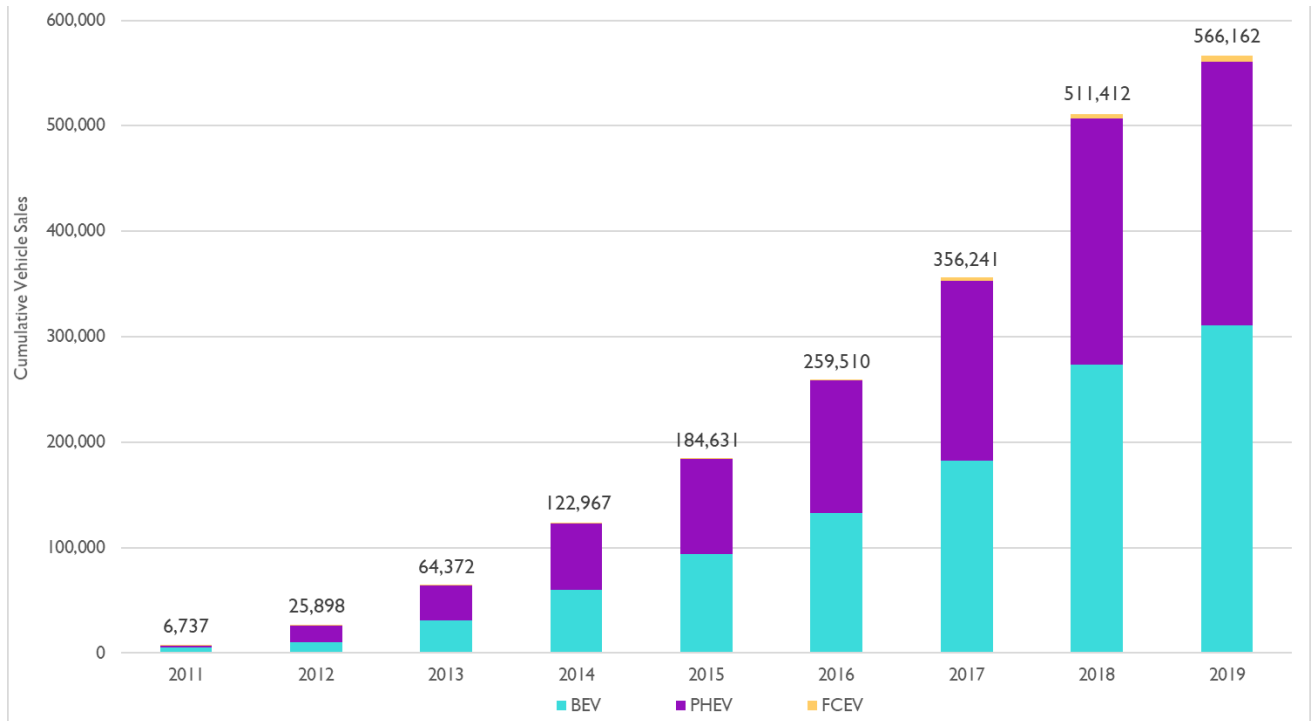
Figure B - 2 Credits and Requirements of the California ZEV Regulation



⁶ CARB, 2017. "2017 Midterm Review Report." Available at: <https://ww2.arb.ca.gov/resources/documents/2017-midterm-review-report>.

As a result of the ZEV regulation and supporting programs, Figure B - 3 shows that sales have increased in California to over 566,000 ZEVs and PHEVs in May 2019, representing well over half of the Senate Bill 1275⁷ ZEV goal of one million by 2023. Figure B - 4 shows the percentages of annual sales in California, with BEVs and PHEVs representing over 7.9 percent market share.

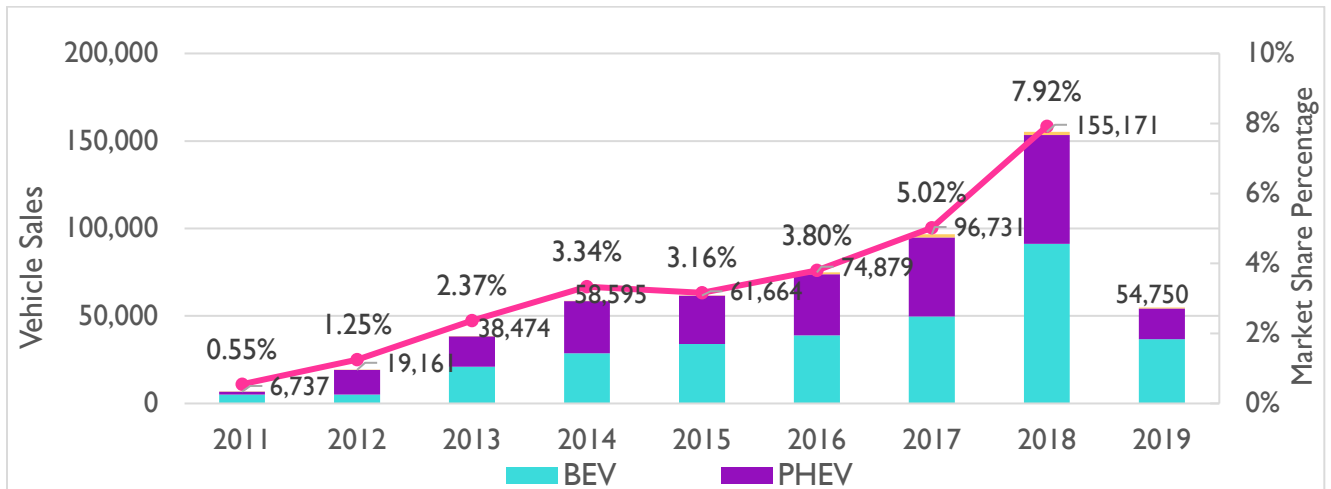
Figure B - 3 Cumulative California ZEV Sales through 5/31/2019



Source: CARB, References: [Auto Alliance Sales Dashboard](#) and [InsideEVs Scorecard](#).

⁷ De León, Chapter 530, Statutes of 2014.

Figure B - 4 Annual California New ZEV Sales and Market Share through 5/31/19



Source: CARB, References: [Auto Alliance Sales Dashboard](#) and [InsideEVs Scorecard](#), and [CA Auto Outlook](#).

Table B - 1 Model Year 2019 Credit-Eligible Vehicles

Fuel Cell Electric	Battery-Electric	Plug-In Hybrid Electric
Honda Clarity Fuel Cell	Audi e-tron Quattro	BMW 530e
Hyundai Nexo Fuel Cell	BMW i3	BMW 740e
Toyota Mirai Fuel Cell	Chevrolet Bolt	BMW i3 REx
	Fiat 500e	Chevrolet Volt
	Honda Clarity Electric	Chrysler Pacifica Hybrid
	Hyundai Ioniq Electric	Ford Fusion Energi
	Hyundai Kona Electric	Honda Clarity PHEV
	Jaguar I Pace	Honda Ioniq PHEV
	Kia Niro Electric	Hyundai Sonata PHEV
	Kia Soul EV	Kia Niro PHEV
	Nissan LEAF	Kia Optima PHEV
	Smart Electric Fortwo	Mercedes-Benz GLC350e
	Tesla Model 3	Mitsubishi Outlander PHEV
	Tesla Model S	Subaru Crosstrek PHEV
	Tesla Model X	Toyota Prius Prime
	VW e-Golf	Volvo S60 T8 PHEV
		Volvo S90 T8 PHEV
		Volvo XC60 T8 PHEV
		Volvo XC90 T8 PHEV

Source: CARB, Advanced Clean Cars; as of third quarter 2019.

Program lifetime numbers/statistics

As described in the section above, the ZEV regulation has resulted in a cleaner fleet of light- and medium-duty vehicles in California. Since 2012, the vehicle technology has advanced faster and developed more broadly than anticipated resulting in ZEV commercialization and transference of advanced technologies to other vehicle classes.

As of May 2018, there were 39 total credit-eligible ZEV and PHEV models for model year 2019 representing 20 manufacturers, three powertrain types, and a variety of vehicle sizes as shown in Table B - 1.

B. Clean Vehicle Rebate Project (CVRP)

Website: <https://cleanvehiclerebate.org/eng>

Program description

Started in 2009, the CVRP offers vehicle rebates for eligible light-duty ZEVs, PHEVs, and zero-emission motorcycles on a first-come, first-served basis. CVRP was created in response to Assembly Bill (AB) 118,⁸ which required CARB to create the Air Quality Improvement Program (AQIP), a voluntary incentive program to fund clean vehicle and equipment projects to reduce criteria pollutant emissions among other directions. CVRP is now part of California Climate Investments, and in recent years has been funded from the Low Carbon Transportation appropriations due to increasing demand. Previously, CVRP also received funding from AB 118 and AB 8.⁹

Since inception, the program has undertaken several changes. The rebate amount for different technology types has been adjusted over the years based on technology advancement, market share, and adoption rate. The standard rebate eligible California consumers receive is \$1,000 for purchase or lease of a PHEV, \$2,000 for a BEV, and \$4,500 for a FCEV, effective December 2019. Since 2016, CVRP provides increased rebates to lower-income consumers. Per-vehicle rebate amounts are based on consumers' income and vehicle technology as shown in Table B - 2.

In addition, SB 1275¹⁰ directed CARB to make a number of changes to CVRP including limiting consumer eligibility based on income and considering incorporating pre-qualification and point-of-sale mechanisms in CVRP. Both changes are in effect now, with pre-qualification and point-of-sale being in a pilot phase in San Diego County.

CVRP also provides increased rebates of up to \$7,000 for public fleets that own and operate eligible vehicles in disadvantaged communities. Public entities are limited to 30 rebates per calendar year and rental and carshare fleets are capped at 20 rebates per calendar year. Because public fleets are not always eligible for additional incentives, such as the federal tax credit, that bring down the higher costs associated

⁸ Nuñez, Chapter 750, Statutes of 2007.

⁹ Perea, Chapter 201, Statutes of 2013.

¹⁰ De León, Chapter 530, Statutes of 2014.

with advanced clean vehicles, this increased incentive helps overcome higher upfront cost and other barriers. Previously, the Public Fleet Pilot Project (PFP) was a stand-alone project.

Table B - 2 Current Clean Vehicle Rebate Project incentive amounts

Rebate Type	Eligibility		Vehicle Type			
	Filing Status	Gross Annual Income	Fuel Cell	Battery Electric	Plug-in Hybrid ¹¹	Zero-Emission Motorcycles
Increased Rebate for Low-Income Applicants		≤ 300 % of the federal poverty level (FPL)	\$7,000	\$4,500	\$3,500	
Increased Rebate for Public Fleets in Disadvantaged Communities			\$7,000	\$4,500	\$3,500	\$750
Standard Rebate	Individual	300% FPL to \$150,000	\$4,500	\$2,000	\$1,000	
	Head of Household	300% FPL to \$204,000				
	Joint	300% FPL to \$300,000				
	Individual	> \$150,000	\$4,500	Not Eligible		
Income Cap	Head of Household	> \$204,000				
	Joint	> \$300,000				

Rebate amounts effective December 2019, reflecting changes approved at the October 24, 2019 Board Meeting.

Program goal

The objective of CVRP is to support the widespread commercialization of the cleanest vehicles by helping to motivate consumer purchase decisions. CVRP is intended to encourage and accelerate zero- and near-zero-emission, on-road light-duty vehicle deployment and technology innovation by providing rebates to qualified individuals, businesses, public agencies and entities, and nonprofit organizations for the purchase or lease of eligible vehicles.

Status of program in reaching goal

Through September 2019, CVRP has provided approximately \$810 million in rebates for nearly 350,000 vehicles since the project's launch in 2010. Since March 2016,

¹¹ With an all-electric range of at least 35 miles.

nearly 17,000 of these rebates have been increased rebates issued to low-income consumers at a cost of approximately \$68 million.¹² Overall, approximately 60 percent of rebates have gone to BEVs and 37 percent for PHEVs, with only a small number of rebates issued for FCEVs, zero-emission motorcycles, and other eligible vehicles. CARB allocated an additional \$238 million, with at least \$25 million reserved for low-income applicants, in its FY 2019-20 Funding Plan approved in October 2019.

Program lifetime numbers/statistics

CVRP expended approximately \$465 million during fiscal years 2014-15 through 2017-18 to incentivize the purchase or lease of 124,377 BEVs, 72,368 PHEVs, and 4,552 FCEVs. Overall, approximately 1.5¹³ million metric tons of GHG reduction are attributed to vehicles incentivized during this time period,¹⁴ with the majority of these reductions coming from BEVs (63 percent) followed by PHEVs (35 percent).

The increased rebate for low-income consumers¹⁵ was available starting in 2016. About five percent of all CVRP incentives went to low-income consumers between 2016 and mid-2018, accounting for about nine percent of the funds. Regardless of recipient type, all incentives are available on a first-come, first-serve basis, except a reserve is held for low-income consumer incentives to prioritize getting this population into these vehicles. Application processing is also prioritized for increased rebates. In total, 9,859 individual rebates for households with incomes less than 300 percent of the federal poverty level¹⁶ (which for a family of four is a household income of less than \$75,300) received \$40 million for increased rebates during the period evaluated in this report. Since the increased rebate for low-income consumers went into effect, over 30 percent of CVRP funds have benefitted priority populations as defined by AB 1550.¹⁷ In addition, public fleets domiciled and primarily operated within disadvantaged communities also received an increased rebate for 735 vehicles.

C. Clean Cars 4 All

Participating Air Districts' Websites:

¹² <https://cleanvehiclerebate.org/eng/rebate-statistics>, accessed November 12, 2019.

¹³ This number is significantly lower than the ~5.5 million MTCO₂e that was reported in the [2019 California Climate Investments Annual Report](#). This difference is mostly due to a change in the quantification period from 15 years in 2015 and 2016 quantification methodologies and 2.5 years in 2017 and 2018. This report also uses a consistent quantification period of 2.5 years since this is the minimum vehicle ownership requirement for CVRP.

¹⁴ Although the vehicles were incentivized during the four fiscal years, the emission benefits are calculated for a quantification period of 2.5 years based on the vehicle ownership requirement for CVRP. So for vehicles funded in FY 2016-17 and FY 2017-18 the emissions quantified include those that haven't happened as of publication of this report.

¹⁵ Defined as households with incomes less than or equal to 300 percent of the federal poverty level.

¹⁶ The federal poverty level varies by household size and income.

¹⁷ Gomez, Chapter 369, Statutes of 2016.

- South Coast Air Quality Management District (Replace Your Ride)
<https://xappprod.aqmd.gov/RYR/Home>
- San Joaquin Valley Air Pollution Control District (Drive Clean)
<https://www.valleyair.org/drivecleaninthesanjoaquin/replace/>
- Bay Area Air Quality Management District (Clean Cars for All)
<http://www.baaqmd.gov/funding-and-incentives/residents/clean-cars-for-all>
- Sacramento Metropolitan Air Quality Management District (Clean Cars 4 All)
<http://www.airquality.org/Businesses/Incentive-Programs>
- San Diego Air Pollution Control District adopted resolution to start participating in the FY 2020-21 funding plan discussions.

Program description

The Clean Cars 4 All (CC4A) program is a voluntary car scrap and replacement program. Assembly Bill 630¹⁸ codified the existing Enhanced Fleet Modernization Program (EFMP) Plus-Up project into Clean Cars 4 All. This transportation equity program receives funding from the California Climate Investments to help low-income individuals living in disadvantaged communities retire a functioning, high-polluting vehicle and replace it with new or used conventional hybrid, plug-in hybrid, battery electric, or fuel cell vehicle or to give up a vehicle altogether via an alternative mobility incentive voucher to use on public transit and other clean transportation options. The program also supports the installation of an electric vehicle charger at the participant's home. The guiding legislation also aims to focus the benefits of the program on low-income and disadvantaged communities, has a heavy emphasis on consumer protection, education about the new technologies, and coordination with other clean transportation programs.

Clean Cars 4 All incentive funding can be stacked with other incentive programs to provide further saving towards a newer, cleaner vehicle for low-income individuals living in disadvantage communities. The current funding amounts are shown in Table B - 3. CVRP has also helped Clean Cars 4 All participants with funding. Stacking from multiple funding sources with Clean Cars 4 All is allowed as long as the total vehicle cost is not exceeded and each program's criteria are satisfied. Incentive amounts have changed over time.

¹⁸ Cooper, Chapter 636, Statutes of 2017.

Table B - 3 Current Clean Cars 4 All incentive amounts

Income Eligibility	Vehicle Type (Eight Years Old Or Newer)		Alternative Transportation Mobility Options
	Conventional Hybrid Vehicles (35+ MPG)	PHEVs, BEVs, and FCEVs	
Low-Income ≤ 225% of the Federal Poverty Level	\$7,000	\$9,500	\$7,500
Moderate-Income 226%-300% of the Federal Poverty Level	\$5,000	\$7,500	\$7,500
Above Moderate-Income 301-400% of the Federal Poverty Level	Not Available	\$5,500	\$7,500

Since FY 2014-15, CARB has allocated \$112 million for EFMP Plus-Up, including \$102 million of Low Carbon Transportation funding and \$10 million of FY 2017-18 Volkswagen funding. Of this total, CARB has allocated \$82 million (\$41 million each) to the South Coast Air Quality Management District (AQMD) and the San Joaquin Valley Air Pollution Control District, and \$5 million each to the Bay Area AQMD and Sacramento Metropolitan AQMD to launch Clean Cars 4 All in these air districts. The remaining \$20 million is available to any air district to implement these programs and is based on demand.

Program goal

The primary focus of the Clean Cars 4 All Program is to help low-income individuals living in disadvantaged communities afford and benefit from clean transportation options.

Status of program in reaching goal

Through the end of June 2018, 88 percent (i.e., a total of 1,685) of program participants who have gotten a ZEV or PHEV had annual incomes below 225 percent of the federal poverty level, which is \$56,475 per year for a family of four. Indicators that help to realize that the program is reaching its goal are:

- Participation rates by lower-income consumers and disadvantaged communities.
- Number of vehicles funded in total and by technology type.
- GHG benefits achieved.
- Increased fuel economy achieved by the replacement vehicle and the age of the old vehicle being retired.

Program lifetime numbers/statistics

During the first three years of the program,¹⁹ approximately \$17 million State dollars were spent to incentivize the scrappage of a functioning, high-polluting vehicle and replacement with 1,396 PHEVs and 518 BEVs. A total reduction of 15,000 metric tons of GHG reductions are attributed to these vehicles during this time period,²⁰ with about a third of these reductions coming from BEVs and the rest from PHEVs. Note that CC4A also incentivizes conventional hybrids and mobility options such as transit passes, but those are not quantified here because they are outside of the scope of SB 498. Furthermore, although there were no FCEVs incentivized by the program during the first three years, two were funded in FY 2018–19.

D. Clean Mobility Options

Website: <https://ww3.arb.ca.gov/msprog/lct/carsharing.htm>

Active Pilot Programs' Website:

- City of LA Carshare Pilot Project (BlueLA Car Share)
<https://www.bluela.com/>
- Our Community Carshare in Sacramento
<http://www.airquality.org/our-community-carshare>
- The Ecosystem of Shared Mobility (MioCar)
<https://miocar.org/>

Program description

The Clean Mobility Options pilot project consists of grant projects designed to address the barriers and transportation needs of low-income residents and those living in disadvantaged communities. The project provides funding for various clean mobility options (other than vehicle ownership) in order to overcome barriers identified through CARB's SB 350²¹ Low-Income Barriers Study,²² and to increase access to clean mobility options, zero-emission and plug-in hybrid carsharing, vanpools, electric and regular bicycle sharing, ride-hailing, and other clean mobility options. There are seven existing projects, a Statewide Clean Mobility Voucher Pilot Program and six local carsharing and clean mobility pilot projects in different disadvantaged communities throughout California.

¹⁹ The program was first implemented in FY 2015-16.

²⁰ Although the vehicles were incentivized during the fiscal years analyzed, the emission benefits are calculated for a quantification period of three years based on the vehicle ownership requirement for Clean Cars 4 All. Therefore, for vehicles funded in FY 2016-17 and FY 2017-18, the emissions quantified include those that have not happened as of publication of this report.

²¹ De León, Chapter 547, Statutes of 2015.

²² CARB, 2018. February 21, 2018. "Low -Income Barriers Study, Part B: Overcoming Barriers to Clean Transportation Access for Low -Income Residents." https://ww2.arb.ca.gov/sites/default/files/2018-08/sb350_final_guidance_document_022118.pdf.

Although these pilot projects are each unique in characteristics and design, there have been common implementation challenges to overcome. These include technical issues during installation of electric vehicle infrastructure, prolonged permitting and evaluation process involving multiple agencies, language barriers in some communities during outreach phase, and developing agreements and contracts with project partners, which takes time and can be complex.

Program goals

- Address a core recommendation from the SB 350 Low-Income Barriers Study for increasing access to clean transportation funds in disadvantaged communities.
- Streamline funding application process for rural and more remote communities.
- Build capacity to implement small-scale carsharing and ridesharing projects for disadvantaged communities.
- Create a platform to test clean shared mobility concepts, develop standardized metrics, share the best practices and lessons learned, and build a knowledge base to apply these lessons for future projects.

Status of program in reaching goals

The Statewide Clean Mobility Voucher Pilot Program provides \$32 million in funding for a Statewide administrator to award funding on a first-come, first-served basis for small carsharing and other clean mobility options projects serving disadvantaged communities. This program is anticipated to launch in early 2020.

Two local carsharing pilot projects, Our Community Carshare in Sacramento and L.A. City Carshare in Los Angeles, were launched in 2017 and 2018, respectively. There are four new local carsharing and clean mobility pilot projects that either launched in 2019 or are in the needs assessment phase:

- **The Lift Line Paratransit Dial-A-Ride Program** (\$0.268M): operated by Community Bridges, this project will replace two existing gasoline-powered shuttles with two 16-seat electric vehicle shuttles equipped with wheel-chair lifts that will be recharged by two direct current fast charger (DCFC) publicly accessible charging stations installed at a disadvantaged community in Watsonville.
- **The Car Sharing and Mobility Hubs in Affordable Housing Pilot Project in the Bay Area** (\$2.25M): will serve 2,800 residents of low-income housing operated by the Metropolitan Transportation Commission. This project will have 24 electric vehicles in the fleet with related charging infrastructure at 3 affordable housing complexes in Oakland, Richmond, and San Jose. The exact project design will be dependent on feedback from residents through

transportation need assessments. The design may also include electric bikes, scooters, and subsidized transit, etc.

- **The Valley Air ZEV Mobility Pilot (\$0.750M):** operated by the San Joaquin Valley Air Pollution Control District, this project will deploy 12 electric vehicles and 16 electric bikes for a combined service of vanpool, carshare and e-bike share in Merced, Bakersfield and West Fresno County in disadvantaged communities census tracts. These will offer a mix of mobility options for daily commuting as well as casual trips.
- **The Ecosystem of Shared Mobility – MioCar (\$2.25M):** operated by the San Joaquin Valley Air Pollution Control District, this project consists of carsharing and ride-hailing programs which will be established at seven affordable housing complexes in Tulare and Kern County communities with 24 electric vehicles and 17 chargers.

CARB allocated an additional \$10 million for Clean Mobility Options in its FY 2019-20 Funding Plan approved in October 2019. This funding will be split between the Statewide Clean Mobility Voucher Pilot Program and local projects based on demand.

Program lifetime numbers/statistics

City of LA Carshare Pilot Project (BlueLA Car Share):

The Phase 1 project, which launched in April 2018, has provided 65 electric vehicles and 18 sites—each site consists of 5 charging stations—for carshare service, with over 1,500 active members as of January 2019. Total miles driven since program launch is 190,479 miles, with 59 percent of trips made by residents from disadvantaged communities. Starting in June 2019 and through July 2022, up to 78 additional carsharing sites are being constructed and 200 additional electric vehicles will be deployed as part as Phase 2 serving further disadvantaged communities located in South Los Angeles, East Hollywood, and Boyle Heights. Phase 2 will also include a shared fleet of at least 600 electric bicycles and scooters at or proximate to existing charging stations.

Our Community Carshare in Sacramento:

Phase 1, launched in mid-2017, serves four affordable housing communities located in a disadvantaged community in Sacramento. There is one carsharing site located in each housing community—each site houses two electric vehicles and consists of two charging stations. Phase 2, which launched in early 2019, expands the project to three additional communities and includes a ride-hailing subsidy pilot component. As of September 2018, the project has 254 participants with over 41,500 clean vehicle miles travelled, and provides increased mobility options for up to 2,000 community residents. Phase 3 is under development and will serve between four and six

additional communities, while expanding the ride-hailing pilot and incorporating electric bike sharing.

E. Financing Assistance for Lower-Income Consumers

Statewide Administrator Website:

- Statewide Financing Assistance Project: <https://cleanvehiclegrants.org/>

Local Pilot Website:

- Regional Financing Assistance Project:
<https://www.communityhdc.org/transportation-department/>

Program description

The Financing Assistance for Lower-Income Consumers pilot project is a grant project that helps lower-income Californians overcome the barrier of obtaining financing for new and used vehicles by providing low interest loans and vehicle price buy-downs to consumers for conventional hybrid, plug-in hybrid, battery electric, and fuel cell electric vehicles. Currently there is a Statewide and a regional financing assistance project.

Both projects keep a loan loss reserve to mitigate risk for partner lenders. Project participants buying BEVs (and soon buyers of PHEVs) are eligible for home charger incentives through the project. This pilot is meant to complement CVRP and Clean Cars 4 All by providing low-interest loans. Project administrators build in financial literacy and advanced vehicle technology training for consumer protection, to ensure that loans are successful and vehicles meet participant needs.

The Regional Financing Assistance Project, run by the Community Housing Development Corporation, launched in early 2016 to help lower-income residents in the San Francisco Bay Area region get into clean vehicles. CARB has allocated a total of \$4.9 million to the project through FY 2018-19.

The Statewide Financing Assistance Project, run by Beneficial State Foundation, launched in June 2018 with \$5 million and committed all their funding for clean vehicle incentives by mid-November 2018. CARB has allocated an additional \$26 million to the Statewide project through FY 2018-19, and it will relaunch in early 2020.

CARB allocated an additional \$10.9 million for Financing Assistance for Lower-Income Consumers in its FY 2019-20 Funding Plan approved in October 2019. This funding will be split between the Statewide and regional projects based on demand.

Program goals

- Improve access to affordable financing mechanisms for lower-income consumers throughout California to purchase or lease clean vehicles, addressing the affordability barrier identified in the SB 350 Low-Income Barriers Study.²³
- Accelerate the adoption of zero-emission and near zero-emission light-duty vehicles in lower-income households.
- Result in GHG and criteria pollutant emissions benefits in lower-income and disadvantaged communities.

Status of program in reaching goals

- Participants in the regional and the Statewide financing assistance projects are offered the option to finance their vehicle with a loan with no higher than 8 percent annual percentage rate (APR). Participants may also work with their own preferred lender. The average interest rate for all vehicle loans received by program participants has been under 10 percent APR, indicating a reduced debt burden on lower-income households who, due to income or credit factors, may otherwise have only qualified for financing with a higher-interest rate in the sub-prime marketplace.
- As of May 2019, a total of 450 participants have purchased clean vehicles through the local and Statewide financing projects. The average income for a household of four was \$47,000, and the 84 percent of participants in the program have had incomes below 300 percent of the Federal Poverty Level (which for a household of four is \$75,300).

Program lifetime numbers/statistics

- Statewide Financing has provided funding for 370 clean vehicles as of May.
- Regional Financing has provided funding for 80 participants as of May 2019.
- The requirement for qualifying for the program is an income of less than or equal to 400 percent FPL; as of May 2019, 84 percent of participants have an income less than 300 percent FPL.
- As of May 2019, the majority (396 out of 450) of vehicles financed have been BEVs (43 percent) and PHEVs (45 percent).

F. One-Stop-Shop

Program description

The One-Stop-Shop is a new project aimed at directly addressing a core recommendation from CARB's SB 350 Low-Income Barriers Study to increase

²³ CARB, 2018 "Low -Income Barriers Study, Part B: Overcoming Barriers to Clean Transportation Access for Low - Income Residents" https://ww2.arb.ca.gov/sites/default/files/2018-08/sb350_final_guidance_document_022118.pdf.

awareness for low-income residents by expanding education and outreach on clean transportation and mobility options. The broader vision of the One-Stop-Shop is to streamline access for low-income consumers to clean energy, energy efficiency upgrades in housing that serve low-income residents, transportation, and other related consumer-based incentives and augment existing outreach and education on clean transportation and mobility options.

In 2018, CARB selected GRID Alternatives to pilot the One-Stop-Shop via a competitive grant solicitation.

Pilot goal(s)

- Develop a single application for low-income consumers to apply and qualify for CARB’s Low Carbon Transportation Equity programs (e.g., CVRP, Clean Cars 4 All, Financing Assistance, and Clean Mobility Options).
- Provide coordinated community-based outreach and education to maximize program participation and promote advanced technology vehicle adoption in priority populations:
 - Develop one place for applicants and community advocates to learn about all Low Carbon Transportation Equity programs.
 - Develop a “community of practice” to serve as a space for One-Stop-Shop outreach partners, Low Carbon Transportation program administrators, GRID Alternatives, and CARB staff to share lessons learned, and best practices when conducting outreach in their respective communities.
- Help low-income residents access 100% of incentives they are eligible for, in a way that is financially sustainable for them, and serves their specific mobility needs.

Status of program in reaching goal

Field testing is currently underway and is being done in conjunction with the One-Stop-Shop project outreach partners and participating CARB Low Carbon Transportation Equity Project administrators.

Program lifetime numbers/statistics

Staff expect the One-Stop-Shop to launch in 2020.

G. Zero-Emission Assurance Project

Program description

The Zero-Emission Assurance Project (ZAP) will help lower-income Californians reduce the risk of buying a used ZEV by providing a rebate for the purchase of a replacement battery or fuel cell component. One of the biggest barriers to ZEV adoption in the used marketplace is the life of the vehicle’s battery. Replacement batteries in electric vehicles can cost over \$5,000 and for lower-income consumers this type of expenditure makes it financially risky to drive a used ZEV.

This project is under development and will begin as a pilot project within the local financing assistance project and is expected to expand to the Statewide financing assistance program, Clean Cars 4 All, and other programs that provide incentives for used ZEVs. Starting the program at a smaller scale will allow staff to uncover lessons learned and prepare for a larger, Statewide deployment.

Program goal

The goal of the Zero-Emission Assurance Project is to reduce the financial risk of buying used ZEVs for lower-income Californians by providing warranties for battery and fuel cell components.

Status of program in reaching goal

ZAP is still being developed and staff is working with the project administrator in designing the program's specifics, such as vehicle eligibility, measures to determine the battery state of health, and rebate amounts. Staff anticipates to launch the pilot phase of the project in 2020.

H. Clean Miles Standard

Website: <https://ww2.arb.ca.gov/index.php/our-work/programs/clean-miles-standard>

Program description

Transportation Network Companies (TNCs), which provide prearranged transportation services for compensation using an online-enabled application to connect drivers using their personal vehicles with passengers, are becoming more ubiquitous. The Clean Miles Standard regulation is being developed in response to Senate Bill 1014 (Statutes of 2018), specifically to decrease the GHG emissions per-passenger-mile from TNCs. Statute requires CARB to establish a 2018 baseline GHG emissions per-passenger-mile traveled for vehicles used in TNCs. It additionally requires CARB to adopt and the California Public Utilities Commission (CPUC) to implement annual GHG reduction targets beginning in 2023. These targets shall include increasing passenger miles traveled using zero-emission means.

The Clean Miles Standard is being developed to be aligned with other State policies, including SB 375, the Sustainable Communities and Climate Protection Program, and the light-duty vehicle GHG and ZEV vehicle manufacturer regulations. This regulation is being designed to promote pooling, active transport, and transit usage, to maximize transportation access equity, and to account for driverless automated vehicles and other innovations within ride-hailing fleets.

Program goal

The goal of the Clean Miles Standard is to decrease the GHG emissions per-passenger-mile from the transportation network companies.

Status of program in reaching goal

The Clean Miles Standard is still being developed and will take effect beginning in 2023.

I. On-Road Motorcycle Regulation

Website: <https://ww2.arb.ca.gov/index.php/our-work/programs/on-road-motorcycles>

Program description

CARB has regulated emissions from on-road motorcycles (ONMCs) since 1978. Current ONMC emission standards were adopted in 1998 and became effective starting with the 2006 model year. Historically, ONMCs have only accounted for a small fraction of all mobile source emissions. However, as emissions from passenger vehicles continue to decrease, motorcycles become a larger part of the overall emissions inventory with reactive organic gas (ROG) emissions projected to nearly match those of passenger vehicles by the year 2035.

CARB staff are working on amending the existing regulations for ONMCs to include more stringent exhaust and evaporative emission standards for new vehicles starting in 2024. The regulations will significantly reduce ROG emissions from new ONMC starting in 2024, providing critical benefits to help meet federal air quality standards. Advanced emissions control technologies from passenger cars are readily available, and can be scaled down for use in ONMCs. The European Union (EU) has already adopted more stringent standards for ONMC, which could serve as the basis for future CARB regulations.

Currently, zero-emission ONMC are eligible for federal tax credits and California's Clean Vehicle Rebate Program (CVRP). Further rebates are available from some local air districts. Staff is investigating additional strategies for accelerating development and consumer acceptance of zero-emission ONMC, which will be included in future regulatory amendments that are scheduled to be considered by the Board in late 2020.

Program goal

Develop regulations that accelerate adoption of zero-emission ONMC, thereby reducing ROG emissions, as well as GHG.

Status of program in reaching goal

CARB staff will continue to assess the availability of zero-emission technologies for ONMC, for potential inclusion in future regulatory amendments. The Board is scheduled to consider amendments to the ONMC regulation in late 2020.

Program lifetime numbers/statistics

There are approximately 700,000 ONMC registered in California. Less than 0.5 percent of these are zero-emission vehicles. Through March 2019, less than 1,000 zero-emission ONMC have received rebates through the Clean Vehicle Rebate Program.

3. Heavy-Duty ZEV Programs

A. Carl Moyer Memorial Air Quality Standards Attainment Program

Website: <https://www.arb.ca.gov/msprog/moyer/moyer.htm>

Program description

The Carl Moyer Memorial Air Quality Standards Attainment Program (Moyer Program) is a voluntary grant program that funds the incremental cost of cleaner-than-required engines, equipment, vehicles and other sources of air pollution. Since 1998, the Moyer Program has been successful in reducing smog-forming and toxic emissions cost-effectively. The Moyer Program complements California's regulatory programs by providing incentive funds to obtain early or extra emission reductions. Incentive grants enable applicants to replace dirty engines before required by a regulation or by funding a replacement technology that goes above-and-beyond the standard. Grant incentives also stimulate the economy by encouraging participants to purchase emerging technologies across the State, which in turn stimulate the marketplace to produce emission reduction technologies.

The Moyer Program is implemented as a partnership with the local air districts; air districts administer the grants and select the projects to fund while CARB establishes guidelines and provides oversight. Incentive grants also benefit environmental justice communities; air districts with one million or more inhabitants must spend at least half of their program funds on projects that benefit low-income and minority populations.

Program goal

The Moyer Program's primary goal is obtaining cost-effective and surplus emission reductions that can also be credited toward California's legally-enforceable obligations in the State Implementation Plan (SIP)—California's road map for attaining health-based national ambient air quality standards. The current cost-effectiveness limit is \$30,000 per weighted ton of emission reductions for a base projects and \$100,000 per weighted ton of emission reductions for advanced technology projects. School bus projects have a higher limit of \$276,230 per weighted ton to further incentivize cleaner transportation and reduce exposure of toxic emissions for children. The pollutants reduced include NO_x, ROG, and particulate matter (PM). PM emissions are weighted by a factor of twenty in the cost-effectiveness calculation to reflect the heightened health impacts of diesel PM toxicity.

Status of program in reaching goal

The Moyer Program has been an especially successful and popular voluntary emission reduction program. The program began in 1998, the first of its kind, and has been successfully reducing emission in California through voluntary grant incentives. Authorized at \$69 million per year, and that amount is increased to \$93 million in fiscal

year 2018-19, the Moyer Program continues to fund cost-effective projects that provide surplus emission reductions creditable in the SIP. The Program funds a variety of project types including:

- On-road vehicles such as drayage trucks, solid waste collection vehicles, and school buses;
- Off-road projects such as construction equipment, agricultural equipment, cargo handling equipment and stationary/portable agricultural pumps;
- Marine vessels such as ferries, fishing vessels and tug boats;
- Locomotive engines such as switchers;
- Lawn and garden equipment such as lawn mowers; and
- Infrastructure projects such as electric vehicle plug-in charging stations.

The Moyer Program continues to evolve to meet the changing technology and California's regulatory landscape.

Program Lifetime Numbers/Statistics

For more than 20 years, CARB has worked alongside local air districts to execute more than \$1 billion in incentive funds to clean up over 61,700 engines and reduce ozone precursors by 186,000 tons and particulates by 6,800 tons. The Moyer program has funded many off-road electric agricultural pumps and other zero-emission off-road equipment over the years. In turn, the recent increase in the incentive amounts for ZEV and near-zero replacement projects, the Moyer Program expects to fund on-road ZEVs projects moving forward.

B. Proposition 1B: Goods Movement Emission Reduction Program

Website: <https://www.arb.ca.gov/gmbond>

Program description

In November 2006, California voters approved the Proposition 1B: Goods Movement Emission Reduction Program (Program), which, among other things, authorized

\$1 billion dollars to reduce emissions from freight movement in California's trade corridors. The Program is a partnership between CARB and local agencies, such as air districts and seaports, to quickly reduce air pollution emissions and health risk from freight movement along California's four trade corridors—the San Francisco Bay Area, Central Valley, Los Angeles/Inland Empire, and San Diego/Border.

Local agencies apply to CARB for funding, and then those agencies offer financial incentives to owners of equipment used in freight movement to upgrade to cleaner technologies. Projects funded under this Program must achieve early or extra emission reductions not otherwise required by law or regulation.

The Program provides funding to retrofit, purchase engines, or replace vehicles, and may include on-road or off-road vehicles and equipment, such trucks, locomotives, harbor craft, transport refrigeration units, cargo handling equipment, and supporting infrastructure, as well as technologies to reduce ship emissions at berth.

The Program's drivers are to reduce exposure to toxic diesel PM emissions (a component of PM 2.5) as part of the Diesel Risk Reduction Plan,²⁴ which specifies an 85 percent reduction in health risk by 2020. The Program also focuses on reducing NO_x emissions to meet health-based State and federal air quality standards.

The latest Program Guidelines, adopted in June 2015, prioritized zero and near-zero emission equipment and are consistent with the previous funding year. The 2015 Guidelines place an even greater emphasis on the funding of zero-emission vehicles and equipment, especially given the expectation of a materializing commercial market. Initially, the program focused primarily on the reduction of criteria emissions as part of the diesel risk reduction plan. Over time, it shifted to support development of the zero-emission market.

Program goal

The Program goals are to maximize the emission reduction benefits and achieve the earliest possible health risk reduction in communities heavily impacted by freight movement through a \$1 billion investment to accelerate turnover of older, dirtier vehicles and freight equipment operating in the four primary trade corridors.

The Program has established the following metrics that are the basis for determining the progress of meeting the program goals:

- Number of freight equipment cleaned up in the source categories based on air districts' quarterly reports, information reporting into the Program's database, and annual reporting by the grantee to air districts.
- PM and NO_x reduced based on cleaner equipment in operation.
- CARB and other State agencies conduct periodic audits and evaluations of the Program.

Status of program in reaching goal

The Program's progress of achieving its goals is summarized below:

- The entire \$1 billion has been appropriated in State budgets (over multiple years), with \$980 million to CARB for this Program (including \$42 million in State administrative costs) and \$20 million set aside by the control agencies to cover bond issuance and oversight costs. Of the \$1 billion, the funding was awarded as follows:

²⁴ CARB, 2010. "Final Diesel Risk Reduction Plan." <https://ww3.arb.ca.gov/diesel/documents/rrpapp.htm>.

- \$764 million awarded for trucks and transport refrigeration units (TRUs): Over 13,100 trucks and 26 TRUs have been replaced or retrofitted. Approximately 1,100 trucks will be replaced, along with related charging equipment installed (1,900) over the next two years.
- \$88 million awarded for locomotives: 49 locomotives have been replaced or repowered in the Bay Area, Central Valley, and South Coast Air Basin with an additional 13 to be upgraded or replaced in 2019.
- \$84 million for shore power and cargo handling equipment: 37 ship berths have been electrified in the Los Angeles and Oakland regions. Approximately 36 pieces of cargo handling equipment will be replaced over the next two years.
- \$2 million awarded for commercial harbor craft: 9 harbor craft have been repowered in San Diego.

Program Lifetime Numbers/Statistics

The Program's December 2018 Semi-Annual Status Report (Status Report)²⁵ for the Department of Finance provides an update on the implementation of the \$1 billion. The document summarizes data throughout the life of the program. The Program will reduce an estimated of 2,400 tons of PM 2.5 and 82,000 tons of NO_x over the life of the program. This translates into the operation of over 13,800 projects with approximately another 3,160 in process. Included in these totals are approximately \$58M to replace almost 400 pieces of higher emitting equipment with cleaner zero-emission equipment consisting of trucks, transport refrigeration units, and cargo handling equipment.

C. Advanced Technology Demonstration Projects

Website: <https://ww2.arb.ca.gov/our-work/programs/low-carbon-transportation-investments-and-air-quality-improvement-program-0>

Program description

Advanced Technology Demonstration Projects are intended to accelerate into the California marketplace advanced emission reducing technologies on the cusp of commercialization. In this first phase of technology advancement toward commercialization, per-vehicle incentives are high because manufacturing is not standardized and is focused on smaller batches of vehicles. Higher levels of incentives per vehicle are also needed to help manufacturers cover the costs of technology development and testing. While Advanced Technology Demonstration Projects carry inherent complexities and engineering challenges, CARB's investment mitigates this potential by requiring a competitive selection process to award funding to the most

²⁵ CARB, 2018. December 27, 2018. "Proposition 1B: Goods Movement Emission Reduction Program - December 2018 Semi-Annual Status Report."
https://www.arb.ca.gov/bonds/gmbond/docs/prop_1b_goods_movement_december_2018_semi_annual_report_to_dof.pdf.

promising technologies, requiring a significant cost share from technology demonstrators, and requiring that project applicants be California-based entities with expertise in the project category.

CARB's investment to demonstrate new technologies and vehicle applications helps to achieve GHG reductions, as well as criteria pollutant and toxic air contaminant reductions, sooner than would be possible otherwise. The investment encourages industry to expeditiously invent, develop, test, and introduce cutting edge emission reducing technologies. All demonstration projects must have the potential for widespread commercialization that will significantly transform the industry while achieving GHG, criteria pollutant, and toxic emission reductions. Once demonstration projects reach the goal of market deployment, longer-term future emission reductions in considerably larger magnitudes can be achieved.

Advanced Demonstration Projects were first introduced in FY 2009-10 and initially funded by the Air Quality Improvement Program. The first four years of AQIP's demonstration project funding has been predominately directed toward off-road equipment, like marine vessels, locomotives, and yard tractors, and school buses. Starting in FY 2014-15, the funding source shifted to the Greenhouse Gas Reduction Fund with a focus on freight demonstrations and significantly increased funding levels compared to AQIP projects. Grants are awarded to facilitate the management of the day-to-day administration of the projects with CARB oversight. Typically, public agencies are local air districts, port authorities, or public school districts, but non-public agencies may also be eligible. Although many projects have been funded, this report only includes those utilizing zero-emission technologies.

Through FY 2018-19, CARB has allocated over \$85 million to the advanced technology demonstration projects through the AQIP and Low Carbon Transportation Program. In addition, the Zero and Near-Zero Emission Freight Facilities Projects described later in this appendix also include advanced technology demonstration elements.

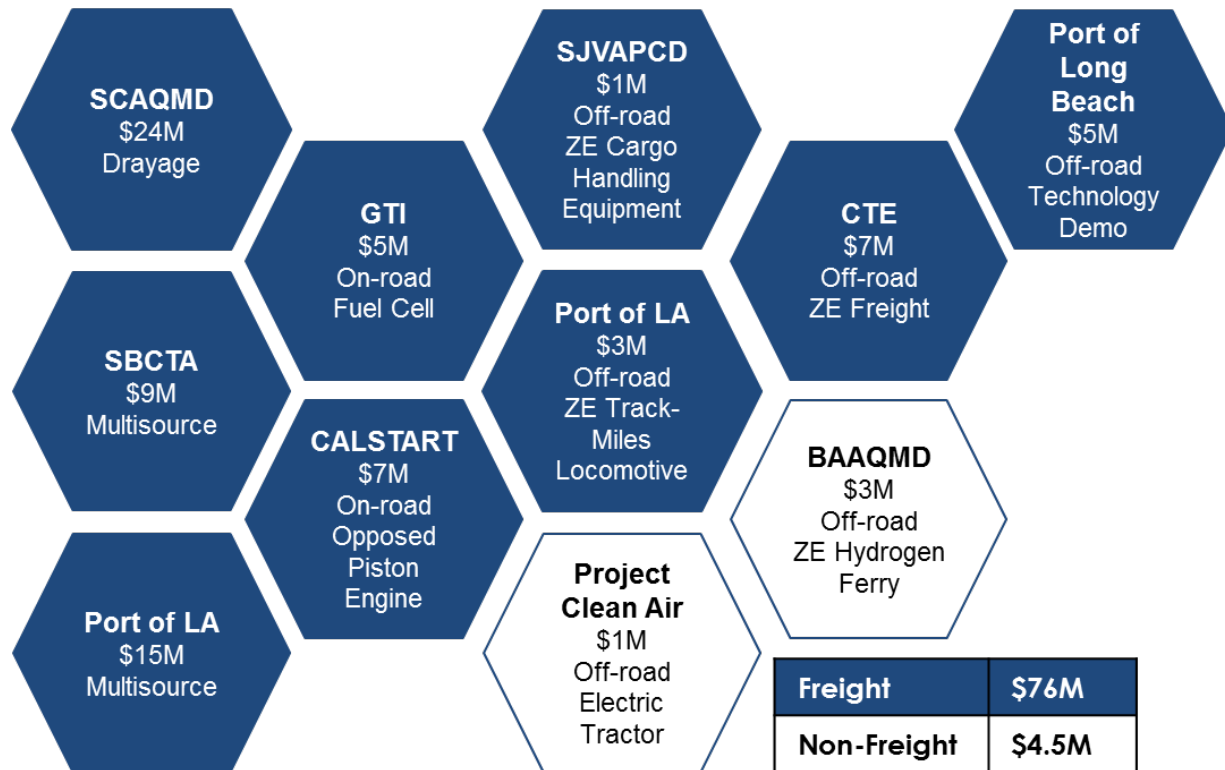
CARB allocated an additional \$40 million for Advanced Technology Demonstration and Pilot Projects in its FY 2019-20 Funding Plan approved in October 2019. This new funding will be directed to three project types:

- A zero-emission drayage truck pilot to building on the drayage truck demonstration project described above.
- An ocean-going vessels at berth capture and control system demonstration project.
- An inducement prize project for advance the state of zero-emission off-road equipment in the freight sector.

Project Summaries

Figure B - 5 summarizes CARB’s investments in advanced technology demonstration of important technologies and applications critical in helping California meet its long-term air quality and GHG goals. Additional information on each on-road project with a zero-emission component is provided below. There are many more on- and off-road projects, as identified in Figure B - 5 that are not included here because they are outside of the SB 498.

Figure B - 5 Summary of Advanced Technology Demonstration Projects



Note: Funding amount rounded to the millions

- South Coast Air Quality Management District (SCAQMD), \$24M:** Demonstrate 44 pre-commercial battery electric, plug-in hybrid electric, and range-extending Low NOx Trucks at the ports of LA, Long Beach, San Diego, and Oakland. During phase 1, nine battery electric trucks and one plug-in hybrid electric truck have been deployed along with supporting EVSE infrastructure with five different trucking fleets serving the different ports. Phase 2 vehicles are being designed with improvements based on the lesson learned during the first phase.
- San Bernardino County Transportation Agency (SBCTA), \$9M:** Demonstrate 23 class 8 battery electric yard trucks and four class 5 battery electric service trucks at 2 rail yards and a freight distribution center. Demonstration of phase 1

with nine class 8 battery yard trucks, and three class 5 battery service trucks continues and phase 2 began in April 2019.

- **Los Angeles Harbor Department (Port of LA), \$15M:** Multiple zero- and near zero-emission technologies; microgrid; battery storage; energy management system. Two drayage trucks, four yard tractors, and three forklifts have been delivered. All charging infrastructure has been installed, but certification still pending for some units. The ShoreKat treatment system has been placed at the terminal. Battery storage system has been delivered and is being modified for certification. Solar array will be installed in 2020.
- **Gas Technology Institute (GTI), \$5M:** Demonstration of fuel cell class-8 on-road trucks in two phases with Hydrogenics and Loop. Grant was executed in June 2018 and the project is in progress. Finalizing updates of three existing electric Navistar trucks for phase 1. Phase 2 subsystems are in the assembly process.

Program goals

- Technology advancement through field demonstrations of freight-related on- and off-road vehicles and equipment to identify refinements needed before transitioning to commercialization.
- Reduce GHG, NOx, and PM emissions to meet California's goals.
- All demonstration project funding will benefit disadvantaged communities.
- Supporting technology evolution.
- Validate the performance of vehicles and equipment in real-world conditions to support user acceptance.

Status of program in reaching goals

- Projects have demonstrated a number of different vehicle technologies, vehicle types, and infrastructure and moving them towards the path of commercialization.
- All funded vehicles will help provide emission reductions and are a part of California's strategy to meet State air quality and climate change goals.
- All funded vehicles and equipment are located in, or serve a freight hub in, a zip code that contains a disadvantaged community census tract.
- Investments are accelerating technology transfer to new applications, such as drayage trucks, port operations, and off-road equipment as technology performance improves.
- Demonstrations are also helping to optimize technologies for various applications though data captured during testing.

Program lifetime numbers/statistics

Advanced Technology Demonstration Projects have supported the testing and applicability of zero-emission heavy-duty vehicles and equipment in various applications. In recent years, demonstration projects have focused on the freight sector at ports across California including on-road, off-road, and also marine applications. The Advanced Technology Demonstration Projects cover a wide array of zero-emission vehicle and equipment types ranging from class 5 service trucks to a hydrogen fuel cell ferry, including:

- On-road
 - 44 battery electric and 5 fuel cell electric trucks
 - 28 battery electric and 1 fuel cell electric yard tractors
- Off-road
 - 5 heavy-duty battery electric forklifts
 - 4 battery electric agriculture tractors
 - 3 battery electric and 1 hydrogen fuel cell electric top loader
 - 1 battery electric switcher locomotive
 - 1 hydrogen fuel cell electric ferry

D. Hybrid and Zero-Emission Truck and Bus Voucher Incentive Project

Website: <https://www.californiahvip.org/>

Program description

The Hybrid and Zero-Emission Truck and Bus Voucher Incentive Project (HVIP) is intended to encourage and accelerate the deployment of zero-emission trucks and buses, vehicles using engines that meet the optional low NOx standard, and hybrid trucks and buses capable of operating in zero-emission modes in California. HVIP uses a streamlined process to provide vouchers to vehicle purchasers to reduce the upfront cost of these advanced technology vehicles. In many cases, HVIP funding can be combined with other federal and local funding sources, such as from the Federal Transit Administration for transit buses, to provide up to 100 percent of total vehicle cost. Although the program also provides incentives for low NOx engines, those are not discussed here because they are outside the scope of SB 498.

HVIP provides vouchers of up to \$300,000 for California purchasers and lessees of zero-emission trucks and buses on a first-come, first-served basis. In addition, HVIP provides increased incentives for fleets located in disadvantaged communities.

HVIP is part of a portfolio of funding opportunities to support the commercialization of clean trucks and buses. One of the key distinctions unique to HVIP is that fleets are not required to scrap an existing baseline vehicle. Scrappage is a cornerstone of other incentive programs such as the Carl Moyer Program and Proposition 1B, as well as

upcoming funding available from the Volkswagen Environmental Mitigation Trust. Since scrapping is not required for HVIP, voucher funding is usually less than funding from other incentive programs with scrap requirements.

HVIP was established in 2009 under the Air Quality Improvement Program. Starting in FY 2015-16, HVIP was shifted to the GGRF. Through FY 2018-19, CARB allocated a total of about \$440 million to HVIP. Despite increased allocations in recent years, HVIP demand significantly exceeded expectations which has resulted in waiting lists between budget cycles.

CARB allocated an additional \$142 million to HVIP in its FY 2019-20 Funding Plan approved in October 2019. However, demand continues to outpace funding. Fleets requested vouchers for the entire \$142 million budget by November 2019, and CARB has stopped accepting HVIP voucher requests until additional funding is identified.

Investments in HVIP have provided an opportunity for California to continue to invest in the deployment of clean heavy-duty technologies in new vehicle applications and fully meet market demand. For example, HVIP has been successful in bringing hybrid and zero-emission heavy-duty vehicle technologies to California. Building on the success of past HVIP investments, new manufacturers are entering the market with technologies transferring to heavier weight classes, such as 60-foot transit buses and class 8 trucks, that the project is now able to further support.

Program goals

- Spur the deployment of early commercial zero-emission, hybrid trucks and buses, and low NOx engines.
- Encourage manufacturing production and fleet acceptance of advanced technologies.
- Contribute to vehicle cost reductions through larger production volumes.
- Funding to benefit disadvantaged communities.
- Reduce GHG, NOx, and PM emissions to meet California's goals.
- Grow the green economy in California.

Status of program in reaching goal

- As of early November 2019, HVIP has spurred deployment by providing vouchers for about 2,500 hybrid trucks, 800 zero-emission trucks and buses, 160 utility trucks equipped with ePTO, and 1,100 low NOx engines. Furthermore, the program has reserved funding for at least 110 hybrid trucks, 2,600 zero-emission trucks and buses, 70 utility trucks equipped with ePTO, and 2,000 low NOx engines more.²⁶

²⁶ CALSTART, 2019. "Program Numbers." <https://www.californiahvip.org/tools-results/#program-numbers>. Accessed November 13, 2019.

- There are now over 20 hybrid and zero-emission truck and bus manufacturers with over 100 different models eligible for vouchers.
 - Larger manufacturers, such as Cummins, Tesla, and Daimler/Freightliner, are entering the zero-emission heavy-duty vehicle market.
- CARB observed a reduction in cost for a number of eligible vehicles. For example, the manufacturer suggested retail price for some battery electric buses has dropped by over 10 percent over the last three years.
- Approximately 60 percent of the funding to date has benefited disadvantaged communities.
- All funded vehicles will help provide emission reductions and are a part of California's strategy to meet State air quality and climate change goals.
- Incentives are helping to expand the supply chain for advanced technology components and manufacturers choosing California for clean heavy-duty vehicle manufacturing, including Proterra, BYD, Chanje, GreenPower, New Flyer, El Dorado, and many others.

Program lifetime numbers/statistics

Approximately \$32 million were spent from fiscal years 2014-15 through 2017-18 to incentivize 161 electric heavy-duty trucks, 113 zero-emission buses, and 136 trucks equipped with an electric-power-take-off unit. Over 200,000 tons of GHG, 230 tons of NO_x, 10 tons of PM 2.5, and 4 tons of ROG emission reduction are attributed to these vehicles over their lifetime.²⁷

E. Zero-Emission Truck and Bus Pilot Project

Website: None

Program description

Early adopter fleets typically deploy a limited number of zero-emission vehicles at each fleet location. However, zero-emission medium- and heavy-duty vehicle deployment must be significantly accelerated for California to meet its post-2020 air quality and climate goals. While HVIP has enabled zero-emission technology to be widely deployed, the Zero-Emission Truck and Bus Pilot takes the next step by leveraging resources, promoting efficiencies and helping drive down per vehicle costs via large, location-specific deployments.

These projects place a significant number of zero-emission trucks and buses in a handful of strategic truck or bus "hubs", encouraging advanced technology clusters

²⁷ Although the vehicles were incentivized during the fiscal years analyzed, the emission benefits are calculated for a quantification period of 15 years based on the average lifetime of these vehicles. So for all the vehicles funded during FY 2014-15 through FY 2017-18 the emissions quantified include those that won't happen for many more years.

with infrastructure, marketing, workforce training, and other synergies. The technology hub or ecosystem concept, when fully implemented, can help address many of the deployment challenges we see today by supporting economies of scale in manufacturing, workforce training and vehicle maintenance and repair, and infrastructure/grid issues. This program also helps achieve the California's ZEV Action Plan goal of encouraging zero-emission vehicle deployment in public and private fleets.

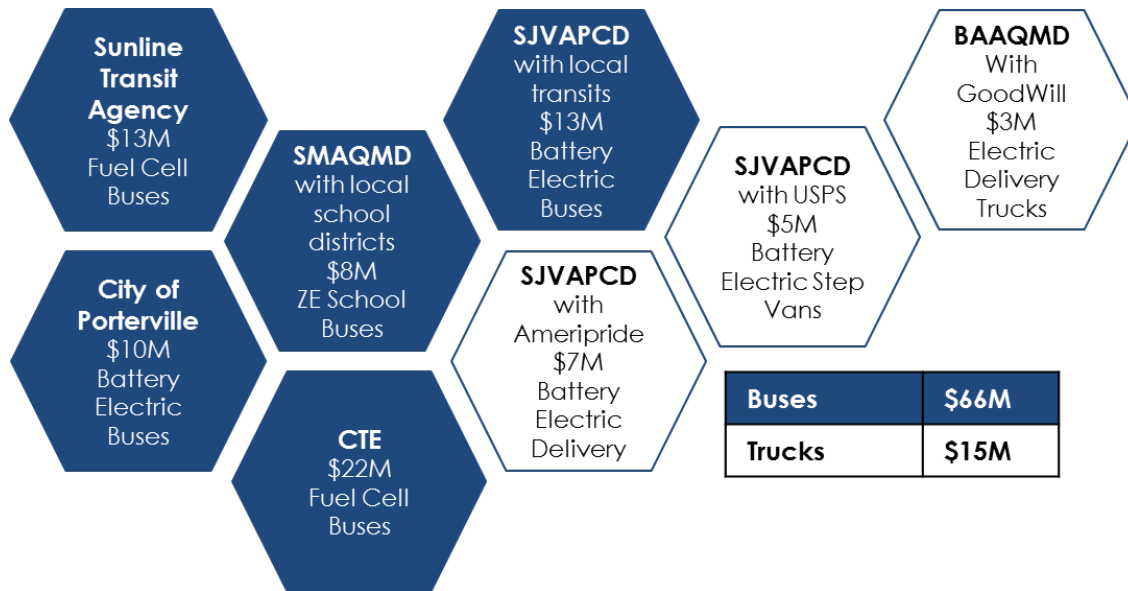
In October 2015, CARB released a competitive solicitation for the Zero-Emission Truck and Bus Pilot Commercial Deployment Project that included \$24 million carried forward from FY 2014-15, with an option to add future funds upon appropriation by the Legislature.²⁸ An additional \$60 million from FY 2016-17 was allocated in October 2016, for a total of \$84 million. The solicitation was significantly oversubscribed, with funding requests totaling \$290 million. CARB selected eight projects, to be supplemented with an additional ~\$60 million in match funding from federal, state, local, and private sources. These projects included, among others, \$9.5 million to the City of Porterville to help fund the purchase and operation of 10 zero-emission transit buses; \$8.0 million to the Sacramento Metropolitan Air Quality Management District to help deploy 29 zero-emission school buses with 29 electric charging ports; and \$2.7 million to the Bay Area Air Quality Management District to help deploy 11 zero-emission battery electric trucks for Goodwill Industries.

Project Summaries

Figure B - 6 summarizes CARB's Truck and Bus Pilot Commercial Deployment Projects. Additional information on each project is also provided below.

²⁸ CARB, 2019. "Low Carbon Transportation Investments and AQIP Grant Solicitations."
<https://ww2.arb.ca.gov/our-work/programs/low-carbon-transportation-investments-and-air-quality-improvement-program/low>.

Figure B - 6 Summary of Truck and Bus Pilot Commercial Deployment Projects



Note: Funding amount rounded to the millions

- San Joaquin Valley Air Pollution Control District (SJVAPCD), \$13M:** 15 Proterra battery transit buses deployed in 4 transit agencies; depot and on-route chargers. All electric buses and charging infrastructure have been delivered and are nearly in service. Fresno County Rural Transit Agency received five buses, Visalia Transit Agency received 3 buses, and San Joaquin Regional Transit District received two buses. Modesto Transit Agency has deployed five buses. An original project fleet partner had to leave the project, which required some reshuffling of project funds and equipment. Data collection is ongoing with all partners.
- Center for Transportation and the Environment (CTE), \$22M:** 20 New Flyer fuel cell bus project, 10 to be deployed by Orange County Transit Agency (OCTA) and 10 to be deployed by Alameda-Contra Costa Transit District (ACTransit). First buses delivered and in acceptance testing. Remaining buses scheduled to be delivered and in service by summer 2019. OCTA Station capable of fueling 50 buses (1,750 kg/day capacity) is now operating, and the ACTransit station capable of fueling 30 buses (1,050 kg/day capacity) will be commissioned by the end of 2019.
- Sunline Transit Agency, \$13M:** Five New Flyer Fuel Cell buses operated out of 1000 Palms and a new hydrogen station by NelH2/Proton OnSite. Buses were all delivered by January 2019 and are fueling at SunLine’s existing hydrogen

station. The new on-site hydrogen generation station, capable of fueling 22 fuel cell buses, is now operating.

- **City of Porterville, \$10M:** Ten GreenPower battery transit buses deployed throughout Porterville; depot chargers. Eight buses have been delivered and started daily revenue service in October 2018. The charging station infrastructure is also now operating.
- **Sacramento Metropolitan Air Quality Management District (SMAQMD), \$8M:** Deploy 29 state-of-the-art zero-emission school buses with 29 Electrical Vehicle Supply Equipment charging ports in disadvantage communities in the Greater Sacramento Region, including Elk Grove, Sacramento City, and Twin Rivers Unified School Districts. Currently, there are 16 electric buses deployed, transporting students daily. The electric bus fleet will be expanded by 20 new vehicles over the next 18 to 20 months.
- **San Joaquin Valley Air Pollution Control District (SJVAPCD), \$7M:** 21 battery linen delivery trucks (with Motiv powerdrive) are operating out of four hubs. AmeriPride facility in Stockton received four trucks and Merced facility received five trucks. Fresno's ten trucks and Bakersfield's two trucks were delivered summer 2018, but due to delays with charging equipment, vehicle use was initially limited. All vehicles are now in service.
- **San Joaquin Valley Air Pollution Control District (SJVAPCD), \$5M:** 15 battery-electric class 4 mail step vans (Motiv and EDI powertrains) operating out of two United States Postal Service hubs; depot chargers. Two designs (one of each manufacturer) both completed Acceptance Testing and are currently deployed. Driver training has been completed. 15 charging stations located at two sites has been completed.
- **Bay Area Air Quality Management District (BAAQMD), \$3M:** Ten BYD class 6 delivery trucks and 1 BYD Class 8 debris hauler deployed by Goodwill Industries in SF area; depot chargers. All vehicles have been built and delivered. All vehicles have been tested during normal business operations. Issues have been identified and are currently being addressed. All chargers have been installed with time-clock functionality to limit the amount of simultaneous charging.

Program goals

- Support advanced technology cost reductions by funding large deployments of commercially available zero-emission trucks and buses.
- Contribute to meeting disadvantaged community goals for Low Carbon Transportation funding. The solicitation required that:
 - 40 percent of funding must benefit disadvantaged communities.

- 27 percent of funding must go to projects located in disadvantaged communities.
- Ensure distribution of funding among geographic regions, grantees, and technology types by including the following funding caps in the solicitation:
 - No more than 60 percent to a single air basin;
 - No more than 30 percent to a single grantee; and
 - No more than 60 percent to a single technology type (i.e., fuel cell or battery electric).
- Leverage available funding by requiring a minimum match of 25 percent.
- Use competitive scoring criteria to maximize emissions reductions.
- Validate the performance of trucks and buses in real-world conditions to support user acceptance.

Status of program in reaching goals

- The awards include funding for a total of 25 battery electric transit buses, 25 fuel cell electric transit buses, 29 battery electric school buses, and 46 battery electric trucks.
 - Fuel cell transit bus costs decreased from \$1.4 to \$1.2 million per bus due to a 25-bus order funded by this project.
- 78 percent of the total funding awarded will go toward projects located in disadvantaged communities, far exceeding program goals.
- Project diversity goals met through the project selection process.
 - Geographic diversity goals are met with 43 percent of the funding awarded to the San Joaquin Valley Air Basin, followed by 16 percent each to the South Coast, Salton Sea and San Francisco Bay air basins, and 9 percent to the Sacramento Valley Air Basin.
 - Grantee diversity goals were met with the project selection process.
 - Technology diversity goals are met with battery electric technologies receiving 56 percent of the total funding and fuel cell technologies receiving 44 percent.
- The eight projects totaling \$79.8 million in State funding will be supplemented with an additional ~\$60 million in match funding from federal, State, local, and private sources.
- The awarded applications estimate emissions reductions for the vehicles in the selected pilot projects are approximately 9,200 metric tons of CO₂e per year and 0.82 tons per year of weighted criteria pollutants.

- Projects are also helping to optimize technologies for various applications though data captured during testing.
 - CARB has contracted with a third-party subcontractor, Ricardo, to collect telematics and vehicle usage data.

Program lifetime numbers/statistics

Approximately \$80 million were allocated to incentivize 46 electric heavy-duty trucks, 50 zero-emission urban buses, 29 electric school buses and supporting refueling infrastructure during fiscal years 2014-15 and 2016-17. Approximately 56,000 metric tons of GHG, 36 tons of NO_x, 6 tons of PM 2.5, and 1 ton of ROG emission reduction are attributed to these vehicles over their lifetime.

F. Rural School Bus Pilot Project

Website: <http://www.ncuaqmd.org/index.php?page=rural.school.bus>

Program description

The Rural School Bus Pilot Project is a grant project designed to enhance the turnover of the California school bus fleets to lower-carbon transportation choices. The project provides funding for zero-emission and new conventionally-fueled school buses that use renewable fuels. Priority is given to school districts located in small air districts (as defined by the California Air Pollution Control Officers Association) that typically have the oldest and dirtiest fleets and have historically not had the opportunity to receive funds for replacement projects. The North Coast Unified Air Quality Management District administers the project with \$63 million allocated through FY 2019-20.

There are two primary project types:

- **Zero-Emission School Bus:** Eligible options include battery electric or fuel cell electric.
- **Hybrid or Internal Combustion Engine School Bus:** Only engines which are certified to meet or exceed the following emission standards are eligible: NO_x-0.20/bhp-hr and PM 0.01 g/bhp-hr. This project types requires the use of a renewable fuel.

In year 1, 2, and 3 of the Rural School Bus Pilot Project, fleet expansion was allowed for zero-emission bus purchases (meaning scrappage of an old bus was not required), but an old bus had to be dismantled/scrapped for hybrid or internal combustion bus projects. Starting in year 4, scrappage is required for both project types. Applicants may be awarded a maximum of three zero-emission projects per funding year. Hybrid or internal combustion engine school bus replacement projects are limited to one award per funding year. Old school bus chassis must be 20 years old or older, must have 14,000 pounds or greater gross vehicle weight rating (GVWR), must have current California Highway Patrol Certification, and must be applicant owned. Current funding

is expected to cover up to 160 new school buses, including supplemental funding for infrastructure. About two thirds of these are expected to be zero-emission buses.

Program goal

With approximately 21,000 diesel-fueled or gasoline-fueled school buses operating throughout California, this project provides opportunities to transform California's school bus fleet and meet zero-emission vehicle deployment goals along with near-term and long-term air quality goals.

Status of program in reaching goal

- All school district agreements executed for Year 1 (FY 2016-17) and vehicle delivery is required by February 1, 2020.
- School district agreements in the process of execution for Year 2 (FY 2017-18) and vehicle delivery is required by February 1, 2021.
- Year 3 Projects (FY 2018-19) were selected in summer of 2019.
- For Year 4 (FY 2019-20) funding, CARB plans to update the program guidelines and issue a new solicitation in 2020.

Program lifetime numbers/statistics

Zero-emission schools buses and electric charging infrastructure:

- Year 1 Vehicles: 32 school buses funded
- Year 1 Equipment: 29 charging stations funded
- Year 2: 46 school buses and charging stations expected to be funded

Hybrid or Internal Combustion Engine school buses:

- Year 1 Vehicles: 11 school buses funded
- Year 2 Vehicles: 29 school buses expected to be funded

Year 3 is expected to fund 30 to 60 new school buses, depending on the requested technology option. Based on projects funded for the 2016-17 fiscal year, staff expect that 75 percent of the buses funded will be zero-emission and the remaining 25 percent will operate on renewable fuel. Year 4 is expected to fund 13 new school buses.

Depending on the technology and school bus size purchased, staff expect tens of thousands of metric tons of CO₂ equivalent GHG emission reductions for the life of the project. Criteria pollutant and toxic air contaminant emission reductions are also expected as the advanced-technology school buses replace conventionally-fueled engines.

G. Clean Off-Road Equipment Voucher Incentive Project

Website: <https://ww2.arb.ca.gov/our-work/programs/clean-off-road-equipment-voucher-incentive-project>

Program description

While zero-emission technology is already being deployed in certain off-road applications, the main barrier to more widespread adoption is that production volumes are too low for the equipment to be cost competitive. The Clean Off-Road Equipment (CORE) Voucher Incentive Project would address this cost barrier and bring about greater adoption of cleaner, commercially available on-road freight vehicles and off-road equipment throughout California, particularly in areas such as ports, railyards, airports, and warehouses, that are most impacted by emissions from freight equipment. In addition, much of this funding will either be spent within or benefit disadvantaged and low-income communities because many freight facilities are located in these communities. The project is analogous to that of HVIP and similarly targets commercialized products providing voucher incentives on a first-come, first-served basis.

It is anticipated that eligible equipment types will include transport refrigeration units, on and off-road terminal trucks, forklifts (>8000 lbs. lift capacity), railcar movers, container handling equipment, wide-body aircraft tugs, airport cargo loaders, and rubber-tired gantry cranes; as the program evolves, more types of equipment will become eligible. This program, funding these types of equipment, is expected to help drive wide-scale adoption of zero-emission freight vehicles and off-road equipment and the expansion of zero-emission infrastructure, which will drive down costs and strengthen the supply chain to support a broader zero-emission market.

Program goal

CORE is intended to encourage and accelerate the deployment of zero-emission freight vehicles and off-road freight equipment in California by providing a streamlined way for fleets ready to purchase specific zero-emission equipment to receive funding to offset the higher cost of such technologies.

Status of program in reaching goal

This project was allocated \$40 million in the FY 2017-18 Funding Plan for Clean Transportation Incentives. Through a competitive solicitation process, a project administrator was selected in July 2019. Staff has held three public work groups to develop the program guidelines and details and released the FY 2017-18 competitive solicitation in February 2019. Staff anticipates funding for vouchers to be available in early 2020.

Although the project has yet to be launched, staff believes the project's \$40 million allocation will be fully expended within the first year of implementation. Furthermore, staff does not expect that demand for funding will diminish after the first year.

H. Zero and Near-Zero Emission Freight Facilities

Website: None

Program description

Zero- and Near-Zero Emission Freight Facilities Project was developed to support bold, transformative emission reduction strategies that can be emulated throughout freight facilities statewide. These projects will holistically reduce GHG, criteria pollutants, and toxic air contaminant emissions in and around freight facilities and will provide economic, environmental, and public health benefits to disadvantaged and low-income communities. The projects that include zero-emission on-road components are described below.

San Joaquin Valley Air Pollution Control District, \$15.4M: This project aims to completely replace the use of all diesel-powered freight equipment within one of Frito-Lay's largest food production, warehouse and regional distribution facilities. The project will integrate zero-emission and near zero-emission technologies in a number of applications, including: 15 heavy-duty Tesla battery electric tractors; six Peterbilt e220 battery electric straight trucks; three battery electric BYD yard trucks; 12 battery electric BYD forklifts; and 38 Low NOx Engine Volvo tractors fueled with RNG.

South Coast Air Quality Management District, \$45M: Volvo will build and deploy, over three phases, 23 class 8 BEVs in different configurations with multiple end user fleets and 16 of those trucks will be offered for rent from TEC Equipment in Fontana. One class 3 on-road truck will be deployed along with four zero-emission yard trucks and 24 zero-emission forklifts. Solar will be installed at the DHE facility in Ontario and NFI in Chino. Fast chargers and level 2 chargers will be installed at all project sites along with 15 level 2 chargers at two sites for employee vehicle charging, with a total of 58 total charging ports installed. Two 150kW chargers will be installed for public use at a Trillium station in Placentia. Non-proprietary EVSE charging protocols will be used.

Center for Transportation and the Environment, \$5.4M: Build and deployment of four fuel cell hybrid electric walk-in delivery vans designed to meet the needs of the United Postal Service (UPS). Linamar will lead final analysis and design for fuel cell integration, integrate the Ballard fuel cell, power electronics, hydrogen storage system, and controls into the vehicle. After the initial vehicle is confirmed, the additional three vehicles will be produced and tested, and then shipped to UPS for a real-world demonstration and validation period of at least 12 months.

Port of Los Angeles, \$41M: The project will build upon several existing publically funded projects that are deploying 25 zero and near zero-emission yard trucks, two zero-emission top picks and additional 3 yard trucks with automated charging at Port of

Los Angeles terminals and a hydrogen refueling station at the Port of Long Beach. This project will build and deploy 10 class-8 fuel cell trucks from Kenworth with Toyota fuel cells, two zero-emission yard trucks, two battery forklifts and build two hydrogen refueling stations, one in Wilmington at a Toyota facility and one in Ontario at the Travel Center of America and will have public access. Trucks will enter service with four local trucking fleets focused on drayage services. One truck will be dedicated to moving avocados from Oxnard to the Port of Hueneme and Port of Los Angeles for export. Port of Hueneme will operate two zero-emission yard trucks and Toyota will replace two propane forklifts with battery-electric forklifts at their warehouse in Long Beach.

Port of Long Beach, \$50M: Deploy 38 zero-emission yard trucks, 2 battery electric top handlers, 9 RTGs hybrid repowers, 15 class-8 battery electric vehicles, 18 16,000 pound lift capacity forklifts, 16 8,000 lift capacity forklifts, 1 railcar mover, hybrid tugboat and 2 ocean going vessels International Maritime Organization Tier 3 capable vessels among three California ports with worker training programs at area community colleges

Center for Transportation and the Environment, \$5.5M: Build and deploy 21 BYD class-8 BEVs with EVSE at four cities in the South Coast Air Quality Management District. The four cities are Carson, Sylmar, Riverside and Pomona. Solar will be installed at the Carson facility to support charging.

Center for Transportation and the Environment (CTE), \$4.3M: This project will build upon an existing Department of Energy, California Energy Commission, and South Coast Air Quality Management District project with UPS for a fuel cell hybrid electric delivery van that will be demonstrated in delivery service in West Sacramento, California. CTE is seeking additional funding to leverage existing funding and build 15 additional vehicles based on the initial fuel cell hybrid electric delivery van design.

Project Clean Air, \$3.2M: Project involves the design, build and deployment of five zero-emission, all electric battery class 7 trucks with all electric transport refrigeration units for operation between orchard and packing house. Builds upon an existing off-road demonstration that received funding last year and is now getting underway.

Program goal

The movement of freight within, and through California's regional centers relies predominately on the use of diesel-fueled heavy-duty vehicles and a multitude of equipment types. Freight activity is a large source of GHG, criteria pollutant, and toxic air contaminant emissions. Since these vehicles and equipment types operate at ports, railyards and warehouse districts as part of their normal activities, large amounts of NOx and diesel particulate matter emissions significantly impact nearby communities. Reducing emissions from these activities is not only necessary to meet federally

imposed clean air standards but also to reduce adverse health effects from their emissions—especially in disadvantaged communities. The continued development and demonstration of zero-emission and near zero-emission technology is necessary in order to meet California’s long-term GHG emission reduction goals, protect public health, and reach attainment with increasingly more stringent federal air quality standards.

Selected projects are designed to demonstrate advanced technologies that will be able to provide a significant reduction in GHG emissions and improve air quality for many affected areas within the State when the technology is fully integrated into the marketplace. Projects should be a model to other such freight facilities to adopt demonstrated strategies and technologies magnifying the future emission reduction potential of wide scale adoption. One of the stated goals of the project is to act as a showcase for the technology and share lessons learned.

Status of program in reaching goal

All projects have their grant agreements executed, satisfying their California Environmental Quality Act (CEQA) requirements, and are now underway. Sub-agreements among the grantees and their project partners is completed for most projects and work has commenced. Demonstration and pilot projects, such as those funded by this program, typically require many months for project partners to manufacture and deploy advanced technology vehicles and equipment and to have their supporting infrastructure commissioned. It is expected that most of the projects that have been selected will have at least some of the funded vehicles and infrastructure in operation by the end of 2019 and all by the end of 2020.

One of the stated goals of the project is to act as a showcase for the technology and share lessons learned. Project partners are already sharing information with project teams on navigating utility engagement issues, and sharing lessons learned with companies that are not part of any of the funded projects.

Program lifetime numbers/statistics

The Zero and Near-Zero Emission Freight Facilities Project is funding many different vehicle and equipment types at a myriad of project locations throughout the State. Some projects have brought together operations across the State under one project fulfilling CARBs goal of having large-scale demonstration and pilot projects that can act as a showcase for other end-users. Many vehicles and pieces of equipment are being funded by the project, including:

- On-road:
 - 90 class-8 trucks of which 61 are zero-emission and the remaining 38 trucks are using low NOx engines with renewable natural gas
 - 25 zero-emission medium-heavy-duty trucks
- Off-road:

- o 44 zero-emission yard trucks
- o 91 pieces of zero-emission cargo handling equipment
- o 2 hydrogen refueling stations for heavy-duty trucks
- o 1 renewable natural gas refueling station
- o 1 zero-emission battery-electric locomotive
- o 2 ocean going vessels

Vehicles and equipment will be in operations within the next year and projects are scheduled to continue into 2021 and beyond.

I. Community Air Protection Incentives

Website: <https://www.arb.ca.gov/msprog/cap/capfunds.htm>

Program description

In 2017, the Governor signed into law AB 617, directing CARB in conjunction with the local air districts to establish the Community Air Protection Program. This program provides a new community-focused approach to improving air quality and reducing exposure to criteria air pollutants and toxic air contaminants in the communities most impacted by air pollution.

Through the budget process the Legislature and Governor have added an incentives component to AB 617: \$250 million in Community Air Protection incentives in FY2017-18, \$245 million in FY2018-19, and \$245 million in FY2019-20. First-year funds are being used for cleaner vehicles, equipment and infrastructure in the areas most affected by air pollution, especially disadvantaged and low-income communities, through Carl Moyer and Proposition 1B projects. Second-year funds may be used for similar projects, and also to reduce toxic and criteria emissions from smaller stationary sources, or for projects identified through AB 617 Community Emissions Reduction Programs. The Board added priority for zero-emission vehicles, equipment and infrastructure for first-year funds, and the Legislature did the same for second-year funds.

Community Air Protection incentives are administered by local air pollution control and air quality management districts. Projects must benefit disadvantaged and low-income communities such as those identified for monitoring and community emissions reduction programs as AB 617 is implemented. Communities are invited to help identify and support the projects needed to make a difference.

Program goals

- Listen to the project priorities identified by disadvantaged and low-income areas, especially in areas identified through AB 617 implementation. Reflect those priorities in program guidelines.

- Reduce criteria and toxic emissions to improve public health in pollution-burdened communities. For mobile sources, place priority on zero-emission vehicles, equipment, and infrastructure. For stationary sources, focus on specific emitters of air toxics affecting communities.
- Reduce greenhouse gas emissions and meet all requirements for greenhouse gas reduction funds.
- Implement projects as soon as possible. Complete expenditure of funds within three years of their allocation.

Status of program in reaching goals

The first program goal above has been met for first-year funds. Air districts conducted public meetings and workshops throughout 2018 to seek community guidance on priorities for first-year funding. Following joint CARB/district workshops in February 2018, the Board approved in April 2018 a supplement to the existing Moyer Program Guidelines to respond to comments received from communities. The Guidelines Supplement enables timely implementation of mobile source incentive projects and larger grants for zero-emission technologies. It expands program opportunities and adds flexibility for school bus projects.

Sixteen air districts received grants for the first-year funds and are now selecting projects in consultation with affected communities. In October 2018, the air districts formally reported their initial progress on spending the first-year funds. The three largest districts received the bulk of the funds, were the first to receive the grant awards, and as a result were able to report significant progress. Over \$156 million, more than half of the overall \$228.3 million available to the districts, excluding administrative funds, has been committed to projects.

CARB is coordinating with the local air districts to determine the distribution of the second-year funds. Key principles have been guiding the discussion to ensure the distribution reflects the goals of AB 617 and the Legislative intent of the funds:

- A significant portion of funds must go to AB 617 communities selected by the Board;
- An amount of funds consistent with the precedent set by the Legislature with the allocation of the first-year funds should go to the three largest air districts;
- Consideration should be given for funds to go to communities under consideration for future selection; and
- Funds should be made available for smaller air districts to participate in the program and address concerns from their own communities.

Program lifetime numbers/statistics

The program is in its initial stages of implementation. Initial reporting on projects completed or funds committed to date, including benefits to communities as a result of these projects, occurred in November 2018. Progress will be reported twice yearly thereafter, including information on zero-emission projects completed and program emissions benefits in disadvantaged and low-income areas. To date, approximately 93 percent of the committed funds have gone to projects located within and benefitting disadvantaged and low-income communities. Additionally, air districts have committed funds to a variety of zero-emission and other advanced technology projects, as well as projects to protect sensitive receptors such as children, including:

- 53 school buses replaced with zero-emission alternatives, and 99 school bus replacements total.
- 73 heavy-duty on-road vehicles replaced with zero-emission alternatives, and 45 off-road equipment replaced with zero-emission technology.

To guide the expenditure of second-year funds, CARB staff developed a new set of Guidelines to begin addressing the new categories of incentives called for by the Legislature. The Board adopted these new *Community Air Protection Funds 2019 Guidelines* on May 23, 2019. The Guidelines include new incentives to reduce hexavalent chromium emissions from chrome plating operations, as well as incentives to reduce air pollution in schools.

J. Volkswagen Mitigation Trust for California

Website: <https://ww2.arb.ca.gov/our-work/programs/volkswagen-environmental-mitigation-trust-california>

Program description

The Volkswagen (VW) Mitigation Trust is a component of partial settlements with VW resulting from its use of illegal emissions cheating software in certain diesel cars sold in California. The Trust provides funding opportunities for specified eligible actions to mitigate the excess NO_x emissions caused by the subject VW vehicles. The Trust is enumerated in the settlement's first Partial Consent Decree as Appendix D.

As required by the Consent Decree, CARB developed a Beneficiary Mitigation Plan (Plan) through an extensive public process. The Plan describes the eligible mitigation actions from the list specified in the Consent Decree that will be funded from the State's allocation of the Trust. Most are scrap-and-replace projects for the heavy-duty sector, as required by the Consent Decree, including on-road freight trucks, transit and shuttle buses, school buses, and off-road equipment, as well as funding for light-duty zero-emission vehicle infrastructure. The projects identified in the Plan will fully mitigate the excess NO_x emissions in California caused by VW's actions. The Plan also commits to long-term goals by investing in zero-emission technologies. At least half of the total funding is expected to benefit low-income or disadvantaged communities.

Implementation of the Plan is in the early stages. The first funding availability, for zero-emission transit, school, and shuttle buses, launched in October 2019. Additional funding is expected to be available in early 2020.

Program goals

- Fully mitigate the past and future excess NO_x caused by VW's actions.
- Support early adoption of commercially available zero-emission technologies in the heavy-duty sector.
- Align with State priorities and help meet California's zero-emission vehicle and petroleum use reduction goals.
- Invest funds Statewide with a focus on benefiting disadvantaged or low-income communities.

Status of program in reaching goals

Funding for zero-emission transit, school, and shuttle buses, launched in October 2019. Solicitation for additional project categories is anticipated to begin in early 2020.

Program lifetime numbers/statistics

CARB will report semi-annually to the Trustee on eligible mitigation action implementation. SB 92²⁹ further directs CARB to report annually to the State Legislature on the proposed and actual expenditures from the Trust.

K. Innovative Clean Transit

Website: <https://www.arb.ca.gov/msprog/ict/ict.htm>

Program description

CARB continues to develop strategies to transition the heavy-duty mobile source sector to zero and near-zero emission technologies to meet air quality, climate, and public health protection goals. The Innovative Clean Transit (ICT) regulation, adopted in December 2018, requires all public transit agencies to gradually transition to a 100 percent zero-emission bus (ZEB) fleet. Beginning in 2029, 100 percent of new purchases by transit agencies must be ZEBs, with a goal for full transition of buses in service by 2040. It applies to all transit agencies that own, operate, or lease buses with a GVWR greater than 14,000 lbs. It includes standard, articulated, over-the-road, double-decker, and cutaway buses. The ICT regulation also encourages transit agencies to provide innovative first- and last-mile connectivity and improved mobility for transit riders. This regulation provides various exemptions and compliance options to safeguard against service cuts and provide flexibility for transit agencies through this transition.

²⁹ Committee on Budgets and Fiscal Review, Chapter 26, Statutes of 2017.

The Innovative Clean Transit regulation requires the transit agencies to come up with an agency-tailored Zero-Emission Bus Rollout Plan that is consistent with normal bus purchases with the goal of making a successful and strategic transition to a zero-emission bus fleet. The Rollout Plan must also identify how each transit agency will deploy zero-emission buses in disadvantaged communities and must include information on infrastructure build out schedule, funding sources and needs, and training plans that are critical to the success of zero-emission buses at the transit agency. Transit agencies are encouraged to apply for state, federal and local incentives to defray the increased cost of zero-emission technologies and related equipment. CARB's Innovative Clean Transit regulation and the associated incentives send a strong market signal to further support development and deployment of heavy-duty zero-emission technologies, create new jobs, and increase investments in California's clean air future.

Even though zero-emission bus technologies have advanced rapidly in recent years, continued improvements in zero-emission bus costs and performance are still needed to facilitate the full transition to zero-emission technologies. Therefore, the Innovative Clean Transit regulation provided some provisions to address barriers beyond transit agencies' control. In addition, the Board directed staff to provide a comprehensive review on costs, performance, reliability, and workforce training and development of zero-emission buses and corresponding infrastructure at least one year prior to the first zero-emission bus purchase requirements. This regulation also encourages innovative zero-emission mobility options with use of zero-emission cars, vans, bicycles, or scooters, or any combination of them in lieu of zero-emission bus purchases, if service is provided or contracted for by the transit agency. In addition, the Innovative Clean Transit regulation requires use of renewable fuels and low NO_x engines for conventional technologies during the long-term transition to zero-emission technologies.

Program goals

- Achieve a zero-emission transit system by 2040.
- Provide environmental benefits, especially in transit-dependent and disadvantaged communities.
- Support the near-term deployment of zero-emission buses where the economics are viable and where transit service can be maintained or expanded.
- Secure binding commitments from the State's transit providers for long-term vision for transitioning to zero-emission technologies across all transit modes.
- Partner with transit agencies to pilot innovative approaches to improve access to transit systems with zero-emissions first- and last-mile solutions.

Status of program in reaching goals

The Board unanimously approved the Innovative Clean Transit regulation in December, 2018. Implementation of the regulation starts in 2020.

Program lifetime numbers/statistics

The Innovative Clean Transit regulation is expected to cumulatively reduce GHG emissions relative to current conditions by 19 million metric tons of carbon dioxide equivalent (MMT CO_{2e}) from 2020 to 2050. For tailpipe emissions of NO_x and PM 2.5, the proposed Innovative Clean Transit regulation is estimated to result in cumulatively around 7,000 tons and 40 tons emission reductions, respectively, for the same time period. The majority of these benefits will be in the State's most populated and impacted areas where transit buses are most prevalent. These areas include the South Coast, Bay Area, San Joaquin Valley, San Diego, and the Sacramento Air Basins.

L. Zero-Emission Airport Shuttle

Website: <https://ww2.arb.ca.gov/our-work/programs/zero-emission-airport-shuttle>

Program description

The Zero-Emission Airport Shuttle regulation is part of a comprehensive suite of measures tasked to meet the ambitious, but achievable, goals set by Assembly Bill 32 and Senate Bill 32. Airport shuttles are a category of vehicles that is well-positioned to act as a mechanism for increasing the adoption of zero-emissions technology in a suitable market. This acceleration of the use of zero-emissions technology is necessary to provide cleaner air for all Californians to breathe, while slowing down the effects of climate change.

This regulation will require private and public airport shuttle fleet owners to transition their fleet to zero-emission shuttles. Currently, the draft proposal would require fleets to meet a 33 percent ZEV composition requirement in 2027, 66 percent ZEV in 2031 and 100 percent ZEV by 2035. There is also a ZEV replacement provision, beginning in 2023, to prevent fleets from reverting from ZEV to internal combustion technologies.

The phase-in structure of this proposed regulation will ensure successful adoption of ZEV technology and allow the requisite time needed to develop support infrastructure. These compliance benchmarks will also provide fleets maximum time to access the incentive funding opportunities available from a variety of sources, including both federal and state governments.

Program goal

The intent of Zero-Emission Airport Shuttle regulation is to increase the use of commercially available heavy-duty ZEVs in applications that are well-suited for their use while providing the emission benefits necessary to meet SIP mandated criteria pollutant and GHG reduction goals. Zero-Emission Airport Shuttle, in conjunction with

a suite of CARB heavy-duty ZEV regulations, matched with incentive funds, will stimulate a heavy-duty ZEV economy.

Status of program in reaching goal

The regulation was adopted by the Board in June 2019.

Program lifetime numbers/statistics

Airport shuttle fleet owners consist of public (i.e., airports) and private (i.e., hotels, and off-airport parking) fleets with nearly 1,000 airport shuttles combined. There are approximately 260 publicly-owned shuttles and 690 privately-owned shuttles.

Implementation would begin in 2022 with a reporting requirement, which would be followed by a ZEV replacement provision in 2023. Fleet requirements begin with 33 percent in 2027 and reach full implementation in 2035. CARB staff project a NO_x reduction of 138 tons by 2040 with implementation of this regulation, as well as a 90 percent reduction in GHG emissions associated with airport shuttles.

M. Zero-Emission Powertrain Certification Regulation

Website: <https://ww2.arb.ca.gov/our-work/programs/zero-emission-powertrain-certification>

Program description

The Zero-Emission Powertrain Certification Regulation (ZEP Cert) establishes an alternative certification process for heavy-duty electric and fuel-cell vehicles. The ZEP Cert process would include robust requirements that help ensure information regarding such vehicles and their powertrains are effectively and consistently communicated to purchasers, ensure such vehicles are well supported once deployed, and remove barriers to greater vehicle repairability.

While the certification pathway would be optional to manufacturers, it could be incorporated into other zero-emission measures, such as was done for the Zero-Emission Airport Shuttle Regulation. The ZEP Cert becomes available starting with model year 2021.

Program goal

ZEP Cert is part of a suite of near-term strategies intended to accelerate the transition of California's heavy-duty and off-road fleets to zero-emission technology. It was developed primarily to help ensure the success of CARB's regulations and incentive programs targeting more-mature zero-emission technology applications in the heavy-duty space.

Status of program in reaching goal

The regulation was adopted by the Board in June 2019.

N. Advanced Clean Trucks

Website: <https://ww2.arb.ca.gov/our-work/programs/advanced-clean-trucks>

Program description

The Advanced Clean Truck regulation's purpose is to accelerate the market for zero-emission heavy-duty vehicles in applications that are well suited for their use. The proposed Advanced Clean Truck Regulation is part of a holistic approach to accelerate a large-scale transition of zero-emission medium-and heavy-duty vehicles from class 2B to class 8. The current proposed regulation has two components including a manufacturer sales requirement, and a reporting requirement:

Zero-emission truck sales: Manufacturers who certify class 2B-8 chassis or complete vehicles with combustion engines would be required to sell zero-emission trucks as an increasing percentage of their annual California sales from 2024 to 2030. By 2030, zero-emission truck/chassis sales would need to be 50% of class 4 – 8 straight trucks sales and 15% of all other truck sales.

Company and fleet reporting: Large employers including retailers, manufacturers, brokers and others would be required to report information about shipments and shuttle services. Fleet owners, with 100 or more trucks, would be required to report about their existing fleet operations. This information would help identify future strategies to ensure that fleets purchase available zero-emission trucks and place them in service where suitable to meet their needs.

Program goal

Goals for the Advanced Clean Trucks rulemaking include:

- Accelerate first wave of zero-emission truck deployments in best suited applications.
- Enable a large-scale transition to zero-emission technology.
- Maximize the total number of ZEVs deployed.
- Complement existing and future programs.
- Provide environmental benefits, especially in disadvantaged communities, as well as greenhouse gas reductions.
- Ensure requirements are technologically feasible and cost-effective.
- Foster a self-sustaining zero-emission truck market.

Status of program in reaching goal

In the last decade, the zero-emission truck market consisted of small manufacturers and start-ups producing small numbers of electric trucks, often being aftermarket conversions of conventional vehicles. These early demonstrations had varying success,

but most of these early electric trucks are no longer being supported and the start-ups producing them have shut down. To date, large manufacturers have experimented with small demonstrations, but have not committed to producing zero-emission trucks for commercial use. However, the market is beginning to develop as heavy-duty zero-emission technology continues to improve and costs continue to decline.

Large truck manufacturers have begun to explore the nascent zero-emission truck market and most are demonstrating zero-emission trucks in California. In addition, some truck manufacturers have begun launching products in other nations and most major truck manufacturers and several new entrants into the truck market have announced near-term plans to commercialize a wide range of heavy-duty zero-emission trucks in the United States. Several major truck engine and component suppliers are also developing electric drivetrains and components needed for truck electrification.

Fleets see potential benefits in using battery-electric or fuel cell electric trucks and vans including opportunities for potential operational cost savings due to lower fuel costs, decreased maintenance costs, and Low Carbon Fuel Standard credit revenue. However, incremental capital costs are high and there is no widespread refueling or recharging infrastructure. Concerns about range, weight, space, and towing capacity exist currently and are key factors in determining whether zero-emission trucks will meet a fleet's needs. There is general consensus that early markets are most likely centralized fleets that return to base daily where they can be refueled/recharged. Early adopter fleets are continuing to show strong interest and want to purchase vehicles that will have long term support from established manufacturers they have relationships with.

The Advanced Clean Trucks regulation will establish requirements on medium- and heavy-duty manufacturers to start producing electric trucks, and will lay the groundwork for fleet regulations by requiring them to report information to inform future fleet rules. More details on future fleet rules can be found in the next section.

[Program lifetime numbers/statistics](#)

Staff's initial proposal would require heavy-duty vehicle manufacturers to produce and sell zero-emission vehicles in California. Concepts workshopped to date would ramp up sales of zero-emission trucks in 2024 model year through the 2030 model year. The rule is being crafted to provide flexibility for manufacturers to choose which market segments to target while ensuring emission benefits regardless of the chosen compliance path. The general goal of this effort is to increase the number of zero-emission trucks on the road over the next decade and to use that experience in determining how heavy-duty vehicle electrification can further contribute to meeting

emission reduction targets beyond 2030. This proposal is currently scheduled to go before the Board in December 2019 with a final vote in 2020.

O. Zero-Emission Vehicle Truck Regulation

Website: <https://ww2.arb.ca.gov/our-work/programs/zero-emission-vehicle-fleet>

Program description

On August 1, 2018, Governor Brown directed CARB to begin working on fleet rules to convert public and private fleets to zero-emission to meet the state's climate change goals. As part of the directive, CARB was specifically asked to look at rental cars, large employers, delivery vehicles and transportation service fleets. CARB has held two public workshops in August and December of 2018 to begin the discussion of ZEV fleet rules, and during the April 2, 2019 Advanced Clean Trucks regulatory workshop, staff outlined the general plan for future heavy-duty ZEV fleet rules.

CARB staff is planning to develop zero-emission medium- and heavy-duty fleet rules for Board consideration in 2022 and implementation by 2024. The specifics of these fleet rules are to be determined, but generally staff will be looking at targeted regulations to focus on specific fleets as well as a potential broad, market based strategy to electrify fleets. Targeted fleet rules may include last-mile delivery, public fleets, utility fleets, refuse/recycling services, and others. A general framework for the market based mechanism would be to create a voluntary ZEV fleet certification program for fleets to establish that their fleet uses zero-emission trucks, and a mandatory requirement on large companies and shippers that their company fleet or fleets they contract with are certified under the ZEV fleet certification program.

Fleet rules will be focused on operations where ZEV duty cycles meet fleet operational needs, but more information is needed to determine which applications are best suited for electrification. To support these goals, staff is proposing a requirement for fleets to report information to inform staff on what vehicles are suitable for electrification. This requirement would be part of the Advanced Clean Truck rulemaking scheduled for board consideration in December 2019. Fleets will be reporting general information on the company and how much freight they move or contract to move, information about their vehicles and vehicle duty cycles, and location specific information to better understand infrastructure considerations.

Program goals

Overall principles for the heavy-duty ZEV fleet rule development include but are not limited to:

- Expand the zero-emission truck market to meet air quality and GHG goals.
- Provide benefits in disadvantaged communities.
- Maximize the total number of ZEVs deployed.

- Match vehicle capabilities with fleet operational needs.
 - Initially, urban, stop-and-go driving, return to base.
 - Support market expansion to other applications.
- Expand infrastructure availability to enable new markets.
- Ensure level playing field between types of fleet operators.
- Support and enable workforce training.

Status of program in reaching goal

Rule development will begin in early 2020 and Board consideration is expected in 2022. Implementation will begin in 2024 to match the timeline of the Advanced Clean Trucks manufacturer mandate.

Program lifetime numbers/statistics

Actual population numbers or emission reductions are unknown currently as the regulated fleets have not been identified yet. At a high level, the required numbers of ZEV purchases should be similar to the numbers required in the Advanced Clean Truck rulemaking, although fleet requirements may expand beyond manufacturer requirements.

P. Zero-Emission Transport Refrigeration Units Regulation

Website: <https://ww2.arb.ca.gov/our-work/programs/transport-refrigeration-unit>

Program description

CARB is developing a new regulation that may require all straight truck mounted transport refrigeration units (TRU) that operate in California to transition to 100 percent zero-emission operation. It would also limit the amount of time that internal combustion engine-driven trailer TRUs can operate while stationary at certain California facilities, and require those facilities to provide the infrastructure needed to support zero-emission operation on-site.

Program goal

This action could potentially achieve significant emission reductions of criteria, toxic, and greenhouse gas pollutants after full implementation. In addition to producing near-term emission reductions, the regulation could help to advance zero and near-zero-emission TRU commercialization by increasing the earlier penetration of infrastructure that will be needed for those technologies.

Status of program in reaching goal

Staff is currently engaging industry and other public stakeholders on regulatory concepts.

Q. Zero-Emission Drayage Truck Regulation

Website: <https://ww2.arb.ca.gov/our-work/programs/drayage-trucks-seaports-and-railyards>

Program description

CARB is developing a concept that could amend the existing Drayage Truck Regulation, or adopt a new regulation, to direct a transition to zero-emission operations. CARB's current Truck and Bus regulation contains requirements for existing trucks to have an engine meeting 2010 or newer emissions standards, with full implementation in 2023. The new drayage truck regulation would establish a schedule for phasing in the use of zero-emission technology. Options to be considered include, but are not limited to, requirements for full zero-emission technology (e.g., a battery or fuel-cell electric short-haul truck) and zero-emission mile capability (e.g., a natural gas-electric hybrid that could drive interstate but switch to zero-emission electric mode while operating in impacted communities).

Program goal

This action could achieve moderate reductions in toxic and criteria pollutant emissions. Drayage truck fleets may choose to invest early in technology for long-term compliance (likely motivated by port rate structures and incentives), with significant reductions of toxic, criteria, and greenhouse gas pollutants expected after full implementation. These reductions would provide critical benefits to reduce community health risk, fulfill State Implementation Plan commitments to attain federal air quality standards, and meet greenhouse gas targets.

Status of program in reaching goal

Staff is currently in the early development stage for this regulatory concept.

4. Programs Spanning Light- and Heavy-Duty ZEVs

A. Low Carbon Fuel Standard

Website: <https://www.arb.ca.gov/fuels/lcfs/lcfs.htm>

Program description

The Low Carbon Fuel Standard (LCFS) is designed to encourage the use and production of cleaner low-carbon fuels in California and reduce GHG emissions from the transportation sector. The LCFS standards are expressed in terms of the carbon intensity of gasoline and diesel fuel and their respective substitutes. Fuel carbon intensity reduction is achieved by creating a carbon intensity reduction target that acts as a benchmark in a given year. Regulated parties that provide fuel for use in California that falls above the target generate deficits (that must be matched with credits), and parties that bring fuel into California below the benchmark generate credits, that may be sold on the market.

The Board approved the LCFS regulation in 2009 and began implementation on January 1, 2011. The Board approved some amendments to the LCFS in December 2011, which were implemented on January 1, 2013. In 2015, the Board re-adopted the LCFS to address procedural issues, with subsequent implementation on January 1, 2016. In 2018, the Board approved amendments to the regulation, which included strengthening and smoothing the carbon intensity benchmarks through 2030 in-line with California's 2030 GHG target enacted through SB 32. The effective date of the most recent Amendments is January 4, 2019.

Program goal

The LCFS program is designed to diversify the transportation fuel mix by providing an investment signal for the development and deployment of lower carbon fuels. The most recent amendments are designed to reduce the carbon intensity by 20 percent from 2010 levels by 2030.

Status of program in reaching goal

Regulated parties as a whole have complied with the regulation and have banked excess credits that can be used for future compliance obligations. The goal of carbon intensity reduction is on track, with all parties achieving their compliance obligation through 2018.

Beyond adding a 2030 target, the 2018 LCFS Amendments substantially expanded the program's support for zero-emission vehicles:

- Additional crediting opportunities were created for residential charging applications. These provisions allow load-serving entities, automobile manufacturers, and other parties that are able to meter residential electric

vehicle charging to be able to claim credits for reducing the carbon intensity of the electricity used to charge these vehicles.

- The amendments also allow infrastructure credits to be generated by DC Fast Charging Station owners and Hydrogen Fueling Station Owners based on the capacity of the station to deliver fuel minus any actual fuel dispensed. Infrastructure credits will decrease as a station reaches full utilization, until it is only generating credits for its dispensed fuel. In this way, the provision is designed to be “self-sunsetting.”
- Utilities and vehicle manufacturers are working to develop a point-of-purchase Clean Fuel Reward program for new EVs, using LCFS credit value with a maximum estimated incentive of approximately \$1,500 to \$2,000 per vehicle. This point-of-purchase incentive scales with battery capacity. This is “money on the hood” at the time of lease or purchase.
- The amendments increase Energy Economy Ratio for heavy-duty EVs, and add a number of new credit generating categories covering freight transportation applications such as Electric Transport Refrigeration Units, Electric Cargo Handling Equipment, and Electric Power for Ocean-going Vessels, as well as electric motorcycles, and a new provision to allow entities to submit a Tier 2 pathway to obtain EER certification for other electric transport applications not directly written into the regulation (one example could include micromobility, such as electric bikes and scooters).
- In addition, the LCFS Amendments promote the use of low-carbon electricity for transportation applications by allowing matching of low-carbon electricity generation to EV charging through flexible mechanisms (such as book-and-claim accounting), and by allowing entities to earn credit by charging at times of the day when the carbon intensity of grid electricity is lower (smart charging).

Program lifetime numbers/statistics

Before the LCFS, the only alternative fuels for transportation with any significant market share were natural gas and ethanol. Between the first year of LCFS compliance (2011) and 2018, a wide variety of low carbon fuels proved their commercial feasibility and began to be deployed in large volumes, including electricity, which already contributes to about 15 percent of total LCFS credits in the most recent LCFS quarterly reporting.³⁰

³⁰ CARB, 2019. “LCFS Quarterly Summary 04/30/19.”

https://www.arb.ca.gov/fuels/lcfs/dashboard/quarterlysummary/quarterlysummary_043019.xlsx.

Over 13 million LCFS credits were sold or traded in approximately 1,725 transactions in 2018 with an average credit price of \$160/metric ton carbon dioxide equivalent, demonstrating a robust credit market.

B. Clean Mobility in Schools

Website: <https://ww2.arb.ca.gov/our-work/programs/low-carbon-transportation-investments-and-air-quality-improvement-program/low>

Program description

The Clean Mobility in Schools Pilot Project was first included as a project in the FY 2018-19 Funding Plan for Clean Transportation Incentives for Low Carbon Transportation Investments and the Air Quality Improvement Program. CARB allocated additional funding in its FY 2019-Funding Plan. This new equity project has a total allocation of \$15 million to provide funding to one or two public school districts, charter schools, or County Offices of Education that operate kindergarten through twelfth grade (K-12) schools located in a disadvantaged community. The pilot project will focus on creating an overall transformation of the entire school transportation system, showcasing a variety of clean mobility options through deploying and demonstrating GHG emission reduction techniques, helping to facilitate 'greening' the school, and eventually leading to a larger Statewide project.

This project supports the statutory goals of SB 1275³¹ and SB 350 recommendations³² by prioritizing funds for clean light-duty and heavy-duty transportation transformation by: encouraging carsharing and bike sharing, increasing access to zero-emission vehicles in disadvantaged communities, and increasing awareness of clean transportation and mobility options by educating the K-12 students, parents, school employees, and others in the surrounding community. Outreach to other schools may include sharing or loaning the newly acquired advanced technology vehicles and equipment.

Clean mobility projects could include both light-duty and heavy-duty zero-emission vehicles, charging infrastructure, and other mobility options. Examples include, but are not limited to:

- Zero-emission school buses,
- Zero-emission white fleet vehicles (non-school bus),
- Light-duty and heavy-duty vehicle charging infrastructure,

³¹ De León, Chapter 530, Statutes of 2014.

³² CARB, 2018. February 21, 2019. "Low-Income Barriers Study, Part B: Overcoming Barriers to Clean Transportation Access for Low-Income Residents." https://ww2.arb.ca.gov/sites/default/files/2018-08/sb350_final_guidance_document_022118.pdf.

- Zero-emission passenger cars for staff to share on a rotating basis thereby familiarizing staff and students with the technology and getting emission reductions by parking the conventional vehicle that would otherwise be driven,
- Active transportation projects (such as bicycle sharing),
- Additional synergistic GHG emission reductions could come from zero-emission lawn and garden equipment; installation of solar and battery back-up; and other technologies or techniques.

This pilot project provides the opportunity to reduce GHG and other air pollution emissions, meet zero-emission vehicle deployment goals, and provide familiarity to zero-emission vehicle technology and other advanced mobility options to the next generation.

Program goal

The goal of this new grant is to deploy synergistic GHG emission reduction techniques that can be emulated on school campuses statewide. This funding provides for the electrification of the transportation fleets, including vehicles, infrastructure, and education and awareness, and other efforts to encourage clean mobility in and around schools. Partnerships with other State and local agencies are encouraged to implement and fund other green technologies and practices along with additional outreach about these efforts.

All projects could include classroom instruction and community outreach about the vehicle technologies and other GHG emission reduction ideas.

Status of program in reaching goal

CARB held a competitive solicitation to award funding. The solicitation closed in October 2019. CARB anticipates awarding funding in early 2020.

5. Supporting Programs

A. California Green Building Standards Code

Website: <https://www.arb.ca.gov/cc/greenbuildings/standards.htm>

Program description

Originally published in 2008, the California Green Building Standards Code, commonly known as the “CALGreen Code,” was a first-in-the-nation state-adopted green building code developed to support Statewide climate goals. CALGreen applies to the planning, design, operation, construction, use, and occupancy of all newly-constructed buildings as well as additions and alterations to existing buildings. It includes both mandatory and voluntary measures related to planning and design, energy efficiency, water conservation, resource efficiency, and indoor environmental quality. During each code cycle, CARB staff provides technical and cost analysis to suggest revisions to the CALGreen Code.

One of the key mandatory provisions in the CALGreen Code includes electric vehicle (EV) charging infrastructure to support future installation of charging stations in order to make buildings “EV Capable.” This infrastructure includes the raceway—the conduit or pipe that future wiring can be pulled through—and panel capacity to support future installation of a Level 2 charger on a dedicated 40-amp, 208/240-volt branch circuit. In addition, these buildings must be identified as “EV Capable” on the site plan. Providing this basic EV charging infrastructure in new buildings gives flexibility to building owners to install the charger of their choice. It also prevents significant retrofit costs in the future.

In 2012, EV charging infrastructure provisions were introduced in the CALGreen Code as voluntary building standards. By 2015, mandatory “EV Capable” provisions were adopted for all building types. All new one- and two-family dwellings and townhouses with attached private garages must be “EV Capable”. Over the last two code cycles, mandatory “EV Capable” provisions have been updated for both nonresidential and multifamily buildings. Effective January 1, 2017, new nonresidential buildings with 10 or more parking spaces must install “EV Capable” infrastructure in 6 percent of parking. Effective January 1, 2020, all new multifamily dwellings regardless of size must install EV Capable infrastructure in 10 percent of parking spots.

The CALGreen Code also includes voluntary provisions for EV charging infrastructure to serve as model code language for local governments that plan to go beyond the statewide minimum standards.

Program goal

- Provide adequate basic EV charging infrastructure to reduce GHG emissions by supporting state short-term and long-term EV charging needs.

- By 2025, California expects 1.5 million ZEVs to be on California roads.
- By 2030, California has a target for 5 million ZEVs.
- By 2050, California plans to achieve a 100 percent ZEV sales rate.

Status of program in reaching goal

One hundred percent of new single-family, duplex, and townhomes with attached private garages must be EV Capable. This provision ensures that new homes are equipped to meet long-term 2050 ZEV goals. Multifamily housing provisions for EV charging infrastructure are on track to advance over the next two code cycles. By 2026, 20 percent of parking in new multifamily housing should be required to install EV charging infrastructure including at least one Level 2 charger. Updating the building standards at this rate will account for the exponential increase in vehicle adoption rates expected, which will more than triple in the five-year time frame between 2025 and 2030.

Program lifetime numbers/statistics

The proposed revisions to the multifamily codes and current nonresidential codes together are expected to result in the installation of approximately 210,000 to 250,000 EV Capable parking spaces in public, workplace, and multifamily housing by 2025. If all of these spaces are converted to electric vehicle charging stations, they will provide infrastructure to support EV deployments that will avoid an estimated 1.3 to 1.5 million metric tons of GHG annually by 2025.

B. Assembly Bill 8 Hydrogen Fueling Infrastructure

Website: <https://ww2.arb.ca.gov/our-work/programs/hydrogen-fueling-infrastructure>
<https://www.energy.ca.gov/transportation/altfueltech/hydrogen.html>

Program description

AB 8³³ established funding for hydrogen fueling stations through the Clean Transportation Program (also known as the Alternative and Renewable Fuel and Vehicle Technology Program, or ARFVTP). ARFVTP provides funds for several low- and zero-emission transportation programs through the imposition of a fee on California vehicle registrations, typically around \$100 million per year. AB 8 recognized that establishing a consumer light-duty Fuel Cell Electric Vehicle (FCEV) market in California critically relied on the coordinated development of a supporting hydrogen fueling network and related infrastructure. The financial sustainability of this fueling infrastructure is then likewise dependent on successful deployment of FCEVs to generate sufficient fuel sales revenue. AB 8 resolved the apparent conflict in this mutual dependence by utilizing ARFVTP funds to establish and support the early operations of a hydrogen fueling network ahead of FCEV deployment.

³³ Perea, Chapter 201, Statutes of 2013.

Through AB 8, up to 20 percent (not to exceed \$20 million) of each fiscal year's ARFVTP funds are available to co-fund the development of retail hydrogen fueling stations. This funding is in effect until January 1, 2024. In addition, the program is required to maintain funding until at least 100 retail hydrogen fueling stations are operating in the State, or the hydrogen fueling station network is found to be financially self-sufficient. Funding programs are developed and managed by the California Energy Commission (Energy Commission), per the provisions of the statute. CARB provides support to this program through analysis of the hydrogen fueling network and current and projected FCEV deployment. Through the completion of these analyses, CARB makes recommendations to the Energy Commission for various aspects of its funding program.

These recommendations are primarily captured by the development of CARB's Annual Evaluations, as required by AB 8. By June 30 of every year, CARB delivers a finalized report to the Energy Commission, and later makes the report available to the broader public. The report covers several topics, including:

- Updates to the current on-the-road light-duty FCEV count in California.
- Updates to the development status of the funded hydrogen fueling network.
- Projections of future on-the-road light-duty FCEV counts, based on annual confidential surveys distributed to auto manufacturers.
- Analysis of current and future needs for hydrogen fueling station development, based on the metrics of network and local coverage and fueling capacity.
- Recommendations for locations and appropriate hydrogen fueling capacity to receive focus in future Energy Commission funding.
- Recommendations of technical and performance requirements for stations funded by the Energy Commission.
- Recommended amount of the available \$20 million per year to be utilized in future funding efforts.

CARB provides these required analyses each year and also discusses major developments and analyses that have transpired in the year prior to the report. Additional topics have included the need for expanding in-state hydrogen production, alternative funding mechanisms, long-term public-private goals for industry development, and technical review of tools and methods developed for CARB's analyses. CARB and the Energy Commission also collaborate on an annual, publicly released Joint Agency Staff Report. This report is due by December 31 of every year and focuses on the status and progress of the funding program, the evolving cost and time to establish hydrogen fueling stations, and the utilization metrics of the open hydrogen fueling network.

To date, the Energy Commission has utilized the AB 8 funds for two types of grants supporting retail hydrogen fueling stations: 1) grants to provide capital expense cost-share that enables the initiation of hydrogen fueling station development projects, and 2) grants to provide operations and maintenance funding for a defined number of years. The operations and maintenance grants have been instrumental to ensure continued operation of hydrogen fueling stations in early years of the program, when the FCEV market is first starting to be deployed.

Beyond the explicitly-stated requirements of AB 8, CARB and the Energy Commission collaborate extensively on other aspects of the hydrogen fueling industry to ensure a holistic program can be achieved. The two agencies, in partnership with other State and federal organizations as well as industry partners, have established a number of programs and devices that ensure safe, reliable, and convenient fueling experiences for customers. Funding for these efforts is outside of the annual \$20 million allocation provided by AB 8. These efforts include ensuring hydrogen quality (purity), accurate measurement of dispensed hydrogen, and conformance of hydrogen dispenser filling procedures with industry-developed protocols and standards. Both agencies also participate in public-private partnerships and other collaborative environments to ensure the active participation in the evolving challenges and efforts of the still-developing hydrogen and FCEV industries.

Program goal

The program's main goal is the establishment of at least 100 retail hydrogen fueling stations in California by January 1, 2024. Underlying this goal is for the program to act as an enabler for the initiation and expansion of a consumer light-duty FCEV market in the state. Therefore, the program also assesses other metrics of the hydrogen fueling network. With regard to stations, it is important to ensure that they are located in areas that will most effectively spur FCEV adoption and that they are also appropriately sized to support the needs of the potential local FCEV market. In addition, AB 8 requires CARB and the Energy Commission to develop an understanding of the potential costs and timing to develop a hydrogen fueling industry that could be financially self-sustaining, separate from any State funding assistance. AB 8 does not require achieving this goal, but developing an analysis to provide this insight. The agencies are in process of developing and validating this analysis, and have reported on the progress over the past two years.

Status of program in reaching goal

The program is currently in progress, but as of June 4, 2019, there are 40 open retail hydrogen fueling stations throughout California, with an additional 24 in various stages of development. All stations currently in development are expected to open for retail operations in 2019 or 2020. The stations are spread across major FCEV first-adopter markets in California. These stations are therefore concentrated in the San Francisco

Bay Area and Los Angeles and Orange Counties. However, there are also stations serving developing markets in the Sacramento region, in San Diego County, and in Riverside and San Bernardino Counties. The program has also funded the establishment of a station in Coalinga, at Harris Ranch. As the midpoint between Los Angeles and the San Francisco Bay Area, this station has a critical role as a long-distance connector and enables FCEV drivers to take advantage of the long range afforded by their vehicles. Finally, the program has also established stations that serve popular vacation and destination travel in the Lake Tahoe region and Santa Barbara. CARB estimates approximately 6,000 FCEVs are currently on the road with active registrations, due to the development of these stations.

Program lifetime numbers/statistics

In its 2019-2020 Investment Plan Update for the ARFVTP, the Energy Commission reported that \$140.6 million has been awarded to date through grant programs for the 64 retail hydrogen fueling stations. In addition, the ARFVTP has provided \$7.9 million for two renewable hydrogen production facilities (these funds have a source separate from the annual \$20 million provided for hydrogen fueling stations). In its 2018 Annual Evaluation, CARB found that the network of 64 funded hydrogen fueling stations provides fueling coverage of at least one station to 41.2 percent of the state's population. Of that 41.2 percent, 8.7 percent are populations that live within a Disadvantaged Community as defined by the CalEnviroScreen 3.0 tool;³⁴ therefore, 21 percent of the populations provided fueling coverage by the network are within a Disadvantaged Community. The funded hydrogen fueling station network thereby provides benefits to communities matching well to the overall proportion of Disadvantaged Community populations in the State. Approximately 3.2 million residents of Disadvantaged Communities, or 35 percent of this group, have coverage from the funded station network. Twelve of the stations are also themselves located directly within a Disadvantaged Community.

CARB has also determined that the currently funded hydrogen fueling network will source 38 percent of its dispensed hydrogen from renewable resources, once all stations are open for retail sales. In the 2018 Joint Agency Staff Report, the agencies reported that the average network utilization (the ratio of fuel throughput to capacity) has grown from approximately 16 percent at the end of 2017 to nearly 38 percent in the third quarter of 2018.³⁵ The same report also found that the hydrogen fueling network enabled avoidance of 9,393 metric tons of GHG emissions in 2018 due to the operation of FCEVs utilizing the network. Up to 76,202 metric tons per year of GHG

³⁴ California Office of Environmental Health Hazard Assessment, 2018. "CalEnviroScreen 3.0." <https://oehha.ca.gov/calenviroscreen/report/calenviroscreen-30>. Accessed August 15, 2019.

³⁵ CEC and CARB, 2018. December 2018. "Joint Agency Staff Report on Assembly Bill 8: 2018 Annual Assessment of Time and Cost Needed to Attain 100 Hydrogen Refueling Stations in California." <https://ww2.energy.ca.gov/2018publications/CEC-600-2018-008/CEC-600-2018-008.pdf>.

emissions per year could be avoided by 2024, based on a projected light-duty FCEV market over 47,000 vehicles. It was also estimated that in 2018, the hydrogen fueling network enabled the avoidance of approximately 6,000 kg of NO_x and 100 kg of PM 2.5. All of these emission reductions are expected to increase significantly in the future as the FCEV market grows with the expanding hydrogen fueling network.

C. Volkswagen Zero-Emission Vehicle Investment Commitment

Website: <https://ww2.arb.ca.gov/our-work/programs/volkswagen-zero-emission-vehicle-zev-investment-commitment>

Program description

The Volkswagen (VW) ZEV Investment Commitment is a component of the 2.0- and 3.0-Liter Partial Consent Decrees—partial settlements between CARB, the United States Department of Justice, and VW. The ZEV Investment Commitment is intended to function as injunctive relief that complements the punitive portions of the settlements by addressing the impact to California’s ZEV market resulting from VW’s sale of approximately 70,000 2.0-liter diesel vehicles in California that were marketed as clean vehicles but equipped with emissions defeat devices. The terms of the ZEV Investment Commitment are described in Appendix C of the 2.0-Liter Partial Consent Decree³⁶ and in the California-only portion of the 3.0-Liter Partial Consent Decree.³⁷

Under the terms of the ZEV Investment Commitment, VW, through its subsidiary Electrify America, must invest \$800 million in California over a 10-year period—in four consecutive \$200 million, 30-month, ZEV Investment Plan cycles—to support the increased use and availability of ZEVs in the State. There are four areas of qualified investments: ZEV infrastructure (including developing and maintaining ZEV charging stations), ZEV public awareness, increased ZEV access, and Green City demonstration projects.³⁸

While Electrify America is responsible for implementing this commitment, CARB is responsible for vetting proposed ZEV Investment Plans during an extensive public process that included the development of a State priorities guidance document, workshops, and Board hearings. Additionally, SB 92³⁹ directs CARB to strive to ensure that to the maximum extent allowable under the 2.0-Liter Partial Consent Decree: 1) when approving ZEV Investment Plans, at least 35 percent of Plan funds benefit low-income or disadvantaged communities disproportionately affected by air pollution, and

³⁶ <https://www.cand.uscourts.gov/filelibrary/2869/Order-Granting-Entry-of-Consent-Decree.pdf>.

³⁷ <https://www.cand.uscourts.gov/filelibrary/3072/3226-Order-Granting-California-s-Motion-for-En.pdf>.

³⁸ The 2.0-Liter Partial Consent Decree provided for a “Green City” initiative in one city. The California-only portion of the 3.0-Liter Partial Consent Decree adds a second Green City demonstration project to be located in a city with a population of about 500,000 and consisting primarily of disadvantaged communities.

³⁹ Committee on Budgets and Fiscal Review, Chapter 26, Statutes of 2017.

2) VW or its subsidiary periodically submit progress reports to CARB on Plan implementation.

CARB has now approved the Cycle 1 (July 2017) and Cycle 2 (December 2018) ZEV Investment Plans. The Cycle 1 Plan commits \$120 million to ZEV infrastructure, \$44 million to a Green City demonstration project in Sacramento, \$20 million to ZEV awareness and education, and \$16 million for operational expenses. The Cycle 2 Plan commits \$153 million to ZEV infrastructure, \$17 million to ZEV awareness and education, \$10 million to boosting charging station utilization, and \$20 million for operational expenses.

Program goals

- Align with the State's: 1) transportation electrification priorities, 2) Governor Brown's 2025 and 2030 ZEV goals, and 3) statutory climate pollutant goals.
- Serve as an incubator for demonstrating new access and mobility programs like ZEV carshare and shuttle/transit buses, particularly in low-income and disadvantaged communities.
- Invest funds Statewide with a focus on benefiting disadvantaged or low-income communities.

Status of program in reaching goals

CARB, as part of the vetting process for approving proposed ZEV Investment Plans, has determined that both the Cycle 1 and Cycle 2 Plans align with the prescribed program goals.

Program lifetime numbers/statistics

As of December 31, 2018, Electrify America had spent approximately \$33 million on the Cycle 1 ZEV Investment Plan. As of their first quarter 2019 report, Electrify America had:

- Executed site agreements on 152 of 157 sites for fast charging stations and 62 of the sites have permits and are either complete or in construction.
- Executed site agreements on 239 of 245 workplace and multi-unit dwelling Level 2 sites and 75 of the sites are operational.
- Installed charging stations and activated round trip carshare services at 17 Sacramento multi-unit dwelling property sites, 82 percent of which were in a disadvantaged or low-income community under the auspices of Envoy Car Share's Green City activities.
- Launched a free-float car-share service in beta testing mode with 100 vehicles under the auspices of GIG Car Share's Green City activities.

- Collaborated in a joint marketing campaign—Sac-to-Zero—with the City of Sacramento, GIG Car Share, and Envoy, that builds awareness of Green City services.
- Signed agreements with Sacramento Regional Transit and Yolo County Transportation District to operate zero-emission shuttle and transit buses once the buses are delivered.
- Conducted education and awareness efforts that included a brand-neutral TV spot, radio, paid search campaign in all California media markets, and a bilingual website (www.plugintothepresent.com) that provides an overview of the benefits of both battery electric and hydrogen fuel cell electric ZEVs.

Since the Cycle 2 ZEV Investment Plan only commenced on July 1, 2019, there are no status updates for it yet.

As mentioned previously, Electrify America provides CARB quarterly and annual progress reports. CARB makes these reports available to the public and additionally reports annually to the State Legislature on the progress of implementation of the approved ZEV Investment Plans.⁴⁰

D. PEV Collaborative/Veloz

Website: www.veloz.org

Program description

The California Plug-In Electric Vehicle Collaborative (PEV Collaborative) was a public/private organization comprised of 47 members that included key electric vehicle stakeholders all working together to move the light-duty electric vehicle market forward in California. The PEV Collaborative sunsetted in 2017 and a new California-based nonprofit, Veloz, was established that same year to support a brand-neutral statewide consumer education campaign, similar to California's "got milk" campaign. A major objective of Veloz is to get more people talking, testing, driving, riding and excited about electric cars.

The PEV Collaborative was established soon after the publication of the 2010 Strategic Plan, *Taking Charge*.⁴¹ The PEV Collaborative served a vital role in the development of the electric vehicle market in California by providing a forum for industry leaders, government and non-governmental organizations to plan for, discuss, and strategize the acceleration of electric vehicle deployment in California in a non-regulatory environment. The PEV Collaborative was led by an Executive Director and Chair and included employees on loan from CARB to serve as staff. In addition to convening several meetings a year, the PEV Collaborative focused on key areas such as promoting

⁴⁰ Available at: <https://ww2.arb.ca.gov/resources/documents/electrify-america-reports>.

⁴¹ Taking Charge, Establishing California Leadership in the Plug-in Electric Vehicle Marketplace, by the Plug-in Hybrid & Electric Vehicle (PH&EV) Research Center, December 2010.

electric vehicles in workplaces and multi-unit dwellings as demonstrated in its “Drive the Dream” event with Governor Brown and company CEOs as well as webinars on relevant topics and several publications and fact sheets. The PEV Collaborative also held numerous ride and drive events throughout California to educate consumers on the benefits and performance aspects of driving electric.

Veloz is a nonprofit organization made up of members from the private sector, public agencies and nonprofits. Its goal is to accelerate the shift to electric cars through public-private collaboration, public engagement and policy education innovation. It has several initiatives in development including an education and awareness campaign called “Electric For All” to address the needs of California’s population of which more than half still do not consider an electric car for their driving needs. The first phase of “Electric For All” is completed and the next phase is in progress. It is also conducting webinars, planning for ride and drive events, and hosts three forums each year.⁴²

Program goal

The PEVC strategic plan laid out the vision, based on achieving six goals for light-duty PEV market success by 2020. They were:

- Consumers' experiences with PEVs are positive.
- Ownership costs of PEVs are competitive with conventional vehicles.
- PEV charging integrates smoothly into an increasingly clean, efficient, reliable and safe electricity grid.
- PEVs advance energy security, air quality, climate change and public health goals.
- The PEV market helps create jobs and benefits California's economy.
- The PEV market moves beyond early adopters to mainstream consumers.

The primary goal at Veloz is to quickly accelerate the uptake of electric cars in California through increased visibility and engaging the mainstream market in a new way. Veloz expresses its vision and mission as follows:

Vision: The urgency of this moment in history requires a fast transition to electric cars. Pollution from cars and trucks poses a critical threat to public health, planet and profits. Veloz will spark a virtuous cycle of desire, demand, more makes, models and charging stations to make electric for all a reality.

Mission: Veloz means fast because we have to move quickly. The world's cars are going electric, but not fast enough. A movement is needed and Veloz aims to create

⁴² See Electricforall.org to learn more about electric cars, charging and fueling electric cars and the benefits of driving electric.

it. Barriers exist and Veloz intends to overcome them. We will inspire, educate and empower Californians to drive electric.

Status of program in reaching goals

The PEV Collaborative has been an instrumental part of increasing light-duty PEV uptake in California. The 2010 strategic plan set forth a roadmap for the State and industry to take action and lead to many successful initiatives.

Some of the accomplishments of the PEVC include:

- Conducted two Drive the Dream corporate engagement events with Governor Brown. The first, in 2013 highlighted 40 California businesses including The Coca-Cola Company, Google, Walgreens and AT&T, whose executives announced substantial investments in new workplace charging, employee purchase incentives and fleet electrification. Drive the Dream 2015 engaged the U.S. Navy, NBC Universal, CBRE and others that committed to expanding their organization engagement in the electric car space.
- Hosted working groups to focus on key topics such as charging at workplace and multi-unit dwellings and developed resources for each topic.
- Held over eight Plug-in Electric Vehicle 101 webinars as well as outreach events to stakeholders.
- Conducted the Best. Drive. EVer! electric car ride-and-drive series. There were over 250,000 Californians exposed to electric vehicles and 4,344 test drives at the events throughout California. Follow-up surveys revealed that between 9 percent and 15 percent of the respondents purchased or leased a PEV.

To date, Veloz has focused on getting established as a nonprofit entity, developed a business plan, branding, and strategy for a public outreach campaign and website. Over the next year and beyond, Veloz will carry out its campaign and collect data and feedback on its effectiveness.

Program lifetime numbers/statistics

The PEV Collaborative has been instrumental since its creation as a convening group for industry, government and stakeholders to provide a foundation for the acceleration of transportation electrification in California. It has contributed to the development of statewide action plans, consumer education and outreach, strategies on the deployment of ZEV infrastructure and other collaborative initiatives. It has helped California achieve growth in the number of light-duty ZEVs to over 556,344 in early 2019 and as Veloz gets off the ground with its public outreach campaign, many more consumers will become aware of the benefits of driving ZEVs, leading to 5 million ZEVs or more on the road by 2030.

E. California Fuel Cell Partnership

Website: <https://cafcp.org>

Program description

Founded in 1999, the California Fuel Cell Partnership (CaFCP) is a unique collaborative of vehicle manufacturers, energy companies, fuel cell technology companies, and government agencies. Its main objective is to expand the market for light- and heavy-duty fuel cell electric vehicles powered by hydrogen to help create a cleaner, more energy-diverse future with zero-emission vehicles. CaFCP members collaborate on activities that advance the technology as well as educate the public and first responders. CARB participates in the CaFCP meetings and advises members on hydrogen fueling stations and deployment strategy.

CaFCP and members' activities fall within three main strategic directions:

1. Support hydrogen station and vehicle deployment to enable commercial market launch
2. Show feasibility and a clear value proposition to consumers, businesses, and communities
3. Focus existing resources, engage new groups, and pursue innovative concepts to overcome early market challenges

CaFCP engages with the gas station industry by participating in trade groups and leading discussions between traditional and hydrogen station developers. Working groups and project teams collaborate to improve customer experience, identify priority locations for new stations, and provide consensus input to funding mechanisms and grant development

CaFCP focuses outreach to generate interest and acceptance of fuel cell electric vehicles and hydrogen stations. CaFCP participates in events ranging from community events to international conferences, meets with elected officials in the Capitol and in their districts, and conducts a highly visible online engagement through websites and social media.

Program goal

The goal of the Fuel Cell Vehicle Partnership is to expand the market for hydrogen-powered fuel cell electric vehicles by supporting the rollout of vehicles and stations through collaboration of its members.

Activities include:

- Decreasing the time and cost to build currently funded hydrogen stations.
- Identifying challenges and solutions to completing the early station network in California.

- Defining the actions needed to accelerate the FCEV market in and beyond California.
- Implementing CaFCP’s hydrogen station database software, the Station Operational Status System.
- Sharing lessons learned and experience nationally and internationally.
- Leading outreach and education to the general public, authorities having jurisdictions, government, and non-profit organizations.
- Increasing the deployment of fuel cell buses at California’s transit agencies.
- Beginning deployment of fuel cell trucks.
- Facilitating frank, open, and honest dialogue among CaFCP member organizations.

Status of program in reaching goal

The CaFCP has provided a forum for its members to develop a roadmap and vision for the deployment of fuel cell electric vehicles and hydrogen fueling stations throughout California. To date, there are over 6,000 light-duty fuel cell electric vehicles on California’s roads with many more expected. These cars are fueled by a network of 40 open retail hydrogen stations with 24 more in development and a total of 200 planned by 2025.

Program lifetime numbers/statistics

Each year, CARB in coordination with the California Energy Commission is required, pursuant to AB 8,⁴³ to publish an “Annual Evaluation of Fuel Cell Electric Vehicle Deployment & Hydrogen Fuel Stations Network Development.”⁴⁴ The July 2018 Annual Evaluation provides estimates of fuel cell electric vehicle fleet size and the basis for evaluating California’s hydrogen fueling network coverage. CARB analyzes Department of Motor Vehicles fuel cell electric vehicle registrations along with auto manufacturer survey responses to guide future hydrogen station locations. In addition, the CaFCP recently published “*The California Fuel Cell Revolution, A Vision for Advancing Economic, Social and Environmental Priorities*,”⁴⁵ which envisions a future where 1 million light- and heavy-duty fuel cell electric vehicles are deployed by 2030 and fueled by 1,000 light-duty hydrogen fueling stations.

In 2017, CARB stated that the California fuel cell electric vehicle and hydrogen fueling markets had made the transition from pre-commercial to the early commercial market

⁴³ Perea, Chapter 201, Statutes of 2013.

⁴⁴ CARB, 2018. July 2018. “2018 Annual Evaluation of Fuel Cell Electric Vehicle Deployment & Hydrogen Fuel Station Network Development.” https://ww3.arb.ca.gov/msprog/zevprog/ab8/ab8_report_2018_print.pdf.

⁴⁵ California Fuel Cell Partnership, 2018. July 2018. “The California Fuel Cell Revolution: A Vision for Advancing Economic, Social, and Environmental Priorities.” <https://cafcpc.org/sites/default/files/CAFCR.pdf>.

phase.⁴⁶ This success is due largely to public-private partnerships as well as interagency coordination between CARB and the California Energy Commission through innovative State co-funding program. The CaFCP will continue to provide support as the fuel cell electric vehicle market advances and scales up to meet Governor Brown's 2025 hydrogen fueling station goal of 200 stations and the 2030 Vision.

F. Multi-State ZEV Task Force

Website: <https://www.zevstates.us/>

Program description

In October 2013, California signed a Memorandum of Understanding (MOU) with Connecticut, Massachusetts, Maryland, New York, Oregon, Rhode Island and Vermont to collaborate on strategies for transforming the transportation sector through 2025. The Multi-State ZEV Task Force comprised of members from each state coordinated by the Northeast States for Coordinated Air Use Management (NESCAUM) along with California, released a Multi-State ZEV Action Plan in 2014.⁴⁷ The decision to form a collaborative multi-state initiative arose from the states' recognition that regulations alone would not be sufficient to achieve rapid expansion of the electric vehicle market. A primary goal of the 2014 plan is to attain 3.3 million light-duty ZEVs by 2025 in the member states. The plan identified 11 key actions for the partners to take to build the market, provide consistent building codes, standards and tracking, and improve the ZEV driver's experience.

In 2018, the MOU States developed an updated ZEV Action Plan and added New Jersey as a member. The 2018 Multi-State ZEV Action Plan builds on early successes and establishes additional priorities for 2018 through 2021. The plan recommends up to 80 actions in five core areas: 1) consumer education and outreach; 2) charging and hydrogen fueling infrastructure; 3) consumer purchase incentives; 4) light-duty fleets; and 5) dealerships.

Program goal

The main goal of the Multi-State ZEV Task Force is to attain 3.3 million ZEVs by 2025 in member states.

Status of program in reaching goal

The MOU States have implemented many of the 2014 initiatives, and collectively they have helped to build consumer awareness, ZEV affordability and ZEV sales. Total cumulative light-duty ZEV registrations in all nine states in 2017 were 458,121.

⁴⁶ CARB, 2017. August 2017. "2017 Annual Evaluation of Fuel Cell Electric Vehicle Deployment and Hydrogen Fuel Station Network Development." https://ww2.arb.ca.gov/sites/default/files/2018-12/ab8_report_2017.pdf.

⁴⁷ ZEV Program Implementation Task Force, 2014. May 2014. "Multi-State ZEV Action Plan." <https://www.nescaum.org/documents/multi-state-zev-action-plan.pdf/>.

Program lifetime numbers/statistics

All nine states have short-, medium-, and long-term GHG emissions targets. Since light-duty vehicles represent 24 percent of the contributions to GHG emissions in the states, it is critical that the states attain the goals and actions in the ZEV Action Plan to enable the transition to ZEVs. Applying California's ZEV target proportionally to the eight other Task Force states based on vehicle sales would equate to around 12 light-duty million cumulative ZEVs on the road by 2030, or a sales share of 35 percent.⁴⁸

G. International ZEV Alliance

Website: <http://www.zevalliance.org/>

Program description

In December 2015, the International ZEV Alliance (IZA) announced its ambitious vision to transition to all ZEV sales in the light- and heavy-duty sectors as quickly as possible. The IZA is a collaboration of 17 members of which five are European jurisdictions (Germany, Baden-Wurtemberg, Netherlands, Norway and United Kingdom) and twelve are North American jurisdictions (British Columbia, California, Connecticut, Maryland, Massachusetts, New Jersey, New York, Oregon, Quebec, Rhode Island, Vermont and Washington). The IZA represents about 40 percent of global ZEV sales.

The purpose of the group is to accelerate the transition to electric-drive vehicles within their markets through collective action. To achieve their vision, the IZA uses fiscal policy, invests in charging infrastructure, increases consumer awareness, implements policy requirements, and deploys technology in public sector fleets to promote ZEV technology as appropriate for each jurisdiction. The collaboration includes sharing of data, best practices, and lessons learned as well as coordinating on action plans and long-term targets to help achieve its ZEV deployment goals.

The International Council on Clean Transportation serves as the IZA Secretariat and conducts monthly meetings and webinars, and prepares ZEV focus area white papers.

Program goal

The purpose of the 17-member International ZEV Alliance is to accelerate the transition to electric-drive vehicles within their markets through collective action, and no later than 2050. ZEV Alliance members have committed to the adoption of tens of millions of ZEVs and as appropriate for each jurisdiction will:

- Provide incentives to encourage the purchase of ZEVs and use fiscal policy on vehicles to aid environmental objectives.
- Plan for and invest in growing ZEV infrastructure.

⁴⁸ ZEV Task Force, 2018. "Multi-State ZEV Action Plan: Accelerating the Adoption of Zero-Emission Vehicles 2018-2021." page 8. <https://www.zevstates.us/wp-content/uploads/2018/07/2018-zev-action-plan.pdf>.

- Perform public outreach to increase consumer awareness and acceptance.
- Remove any government barriers to ZEVs.
- Implement policies that require the deployment of ZEVs.
- Lead by example through the inclusion of ZEVs in government and public sector fleets.
- Deploy ZEVs when possible in medium and heavy-duty transportation, including public transit.
- Perform and commission research and development in ZEV technology and social science.

California, including CARB, is an active participant in the Alliance and contributes significantly to the mission of the group by participating in monthly meetings, contributing to white papers, engaging in webinars and sharing lessons learned with other members.

Status of program in reaching goal

- The ZEV Alliance members have seen steady growth in ZEV sales, with the United States, the United Kingdom, Norway, and Canada each seeing year-on-year ZEV sales increases of 20-200 percent from 2015 to 2018. In aggregate, these six countries saw growth of over 60 percent from 2017 to 2018.
- The ZEV Alliance has accelerated policy learning among progressive ZEV markets through regular monthly collaborations, periodic meetings with other international groups, original research for ZEV Alliance members and broader outreach.
- The ZEV Alliance published several focus papers including, "*Principles for effective electric vehicle incentive design*," "*Assessment of next-generation of electric vehicle technologies*," and "*Evolution of incentives to sustain the transition to a global electric vehicle fleet*."

Program lifetime numbers/statistics

ZEVs are sold in markets where there is policy to overcome the prevailing consumer adoption barriers of model availability, cost, infrastructure and convenience, and consumer awareness. The International ZEV Alliance governments demonstrate how a comprehensive policy package of vehicle and emissions regulations, fiscal and non-fiscal incentives, infrastructure, consumer awareness, and various local actions are overcoming the key adoption barriers. The goal of the International ZEV Alliance is for all member jurisdictions to transition their transportation sector to zero-emission by 2050. If progress continues on the current trajectory of ZEV sales increases, this objective can be achieved.