



**2016 BIENNIAL REPORT TO THE LEGISLATURE ON THE
AB 118 AIR QUALITY IMPROVEMENT PROGRAM,
FISCAL YEARS 2014-15 and 2015-16**

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Acronyms

AB	Assembly Bill
APCD	Air Pollution Control District
AQIP	Air Quality Improvement Program
AQMD	Air Quality Management District
CARB or Board	California Air Resources Board
ARFVTP	Alternative and Renewable Fuel and Vehicle Technology Program
BAR	Bureau of Automotive Repair
BEV	Battery Electric Vehicle
CVRP	Clean Vehicle Rebate Project
EFMP	Enhanced Fleet Modernization Program
FCEV	Fuel Cell Electric Vehicle
FY	Fiscal Year
GHG	Greenhouse Gas
GGRF	Greenhouse Gas Reduction Fund
HSC	Health and Safety Code
HVIP	Hybrid and Zero Emission Truck and Bus Voucher Incentive Project
MTCO _{2e}	Metric Tons of Carbon Dioxide Equivalent
MSRP	Manufacturer Suggested Retail Price
NO _x	Oxides of Nitrogen
PHEV	Plug-in Hybrid Electric Vehicle
PM	Particulate Matter
SB	Senate Bill
SIP	State Implementation Plan
ZEV	Zero Emission Vehicle

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Executive Summary

This document provides the required biennial update on the implementation of the Air Quality Improvement Program (AQIP). Health and Safety Code Section 44274 requires the Air Resources Board (CARB) to submit to the Legislature a report containing details of projects funded, expected benefits of projects in promoting clean fuels and vehicle technologies, the impact that projects have on reaching air quality goals, and recommendations for future actions.

AQIP is a voluntary incentive program administered by CARB to reduce smog and diesel particulate pollution, with concurrent reductions in greenhouse gas (GHG) emissions. AQIP was created under the *California Alternative and Renewable Fuel, Vehicle Technology, Clean Air, and Carbon Reduction Act of 2007* (AB 118, Núñez, Chapter 750, Statutes of 2007). Funding for AQIP is provided through a dedicated revenue stream of smog abatement, vessel registration, and equipment identification plate fees. These sources have provided \$25 to \$30 million in annual funding for clean vehicle and equipment projects. Originally scheduled to sunset in 2015, the passage of AB 8 (Perea, Chapter 401, Statutes of 2013) extended the funding for AB 118 programs until January 1, 2024.

AQIP is one of three incentive programs created under AB 118. The other two programs include the Alternative and Renewable Fuel and Vehicle Technology Program (ARFVTP), administered by the California Energy Commission (Energy Commission or CEC) and the Enhanced Fleet Modernization Program (EFMP), administered by the Bureau of Automotive Repair (BAR). While AQIP focuses on clean vehicle and equipment demonstration and deployment, the Energy Commission's ARFVTP provides, among other things, critical support for fuels and fueling infrastructure. Together, these programs create a suite of technology advancing investments. Additionally, EFMP is aimed at achieving emission reductions through accelerated turnover of the existing light-duty vehicle fleet.

AQIP has invested approximately \$210 million in nine project categories from program inception in Fiscal Year (FY) 2008-09 through 2015-16. Specific funding categories have included financing for heavy-duty diesel trucks, incentives for clean cars, hybrid trucks, electric lawnmowers, zero emission agricultural work vehicles, and demonstration projects for cleaner marine and locomotive engines. All of the projects funded through AQIP have supported the expansion of advanced clean technologies in vehicles or equipment in the California marketplace.

AQIP funding has been augmented by \$53 million from CEC and \$40 million in appropriations enabled by the Legislature from the Vehicle Inspection Repair Fund. However, these funds have not fully covered consumer demand for the Clean Vehicle Rebate Project (CVRP), which provides rebates for light-duty vehicles, or the Hybrid and Zero-Emission Truck and Bus Voucher Incentive Project (HVIP), which provides vouchers for heavy-duty vehicles. The Legislature addressed this issue by appropriating monies for CVRP and HVIP from the Greenhouse Gas Reduction Fund, the repository for auction proceeds generated by CARB's Cap-and-Trade program.

Since FY 2013-2014, the Legislature has appropriated \$224 million from the Greenhouse Gas Reduction Fund for Low Carbon Transportation investments in CVRP and HVIP, simultaneously reducing greenhouse gas emissions, benefiting disadvantaged communities, and meeting established objectives of AQIP and Greenhouse Gas Reduction Fund programs.

Since AQIP's inception and including AQIP programs supported by all funding sources, CVRP has helped place over 150,000 advanced clean vehicles on California roads. HVIP has provided funding for approximately 2,600 advanced technology trucks and buses and helped to identify key deployment barriers that CARB and other stakeholders are working to overcome. The Truck Loan Assistance program, which allows small fleets affected by the Truck and Bus Regulation to secure financing to upgrade older vehicles in their fleets, has provided funding for over 11,000 cleaner trucks.

During this report's status update period covering FY 2014-15 and 2015-16, 64 percent of AQIP-specific funds were directed to the Truck Loan Assistance Program. Thirty percent supported CVRP and HVIP. Six percent went to two new AQIP project categories launched in FY 2015-16 that provide incentives for low oxides of nitrogen (NO_x) engines and an agricultural equipment trade-up pilot in the San Joaquin Valley.

Emission benefits¹ described in this report are attributable to AQIP-specific funds, which supported approximately 16,000 vehicles for CVRP, 180 vehicles for HVIP, and 5,700 trucks for the Truck Loan Assistance Program between July 1, 2014 and June 30, 2016. The deployment of these vehicles has resulted in emission reductions of approximately 7700 tons of NO_x, 32 tons of particulate matter (PM_{2.5}) and 650,000 metric tons of carbon dioxide equivalent (MTCO_{2e}).

Rebates and vouchers provided through AQIP have been successful in incentivizing purchasing decisions by partially offsetting the higher initial cost of advanced technologies. AQIP projects provide both immediate emission reductions from the vehicles directly funded, and more importantly, supplementary long-term impacts from accelerating the demonstration and deployment of advanced clean technologies for all vehicles and equipment sectors. AQIP investments provide a down payment on the technologies that are critical in helping California meet its air quality and climate goals. AQIP investments in advanced technologies have supported green job growth that will continue over the next decade.

AQIP's current emphasis (starting in FY 2013-14) is on providing financing assistance to small-business fleet owners for upgrading their heavy-duty trucks. This focus on the Truck Loan Assistance Program will continue in FY 2016-17 with the program receiving almost 90 percent of AQIP-specific funding, and the balance being used to fund the agricultural equipment trade-up in the San Joaquin Valley. These projects will reduce health risks from exposure to diesel PM, particularly in disadvantaged communities where exposures can be substantial. With the success and popularity of AQIP to date, CARB does not recommend any statutory changes to the program.

¹ See Table 1 for details.

I. Introduction

A. Background on Assembly Bill (AB) 118 and the Air Quality Improvement Program (AQIP)

AQIP is a voluntary, statewide incentive program created under the *California Alternative and Renewable Fuel, Vehicle Technology, Clean Air, and Carbon Reduction Act of 2007* (AB 118, Núñez, Chapter 750, Statutes of 2007). Originally scheduled to sunset in 2015, the passage of AB 8 (Perea, Chapter 401, Statutes of 2013) extended the funding for AQIP and other AB 118 programs until January 1, 2024. Administered by the California Air Resources Board (CARB), the program was created to support the demonstration and deployment of advanced clean technology vehicles and equipment. AQIP's focus has been improving air quality with concurrent reductions in greenhouse gas (GHG) emissions. AQIP provides funding between \$25 and \$30 million, subject to annual appropriations from the Legislature, via smog abatement, equipment registration, and vessel registration fees. AB 118 statute lists eight broad project types that are eligible for AQIP funding:

- On- and off-road equipment projects that are cost effective
- Projects to mitigate off-road gasoline exhaust and evaporative emissions
- Research on the air quality impact of alternative fuels
- University of California research to increase sustainable biofuels production and improve collection of biomass feedstock
- Lawn and garden equipment replacement
- Medium- and heavy-duty vehicle/equipment projects including lower emission school buses, electric or hybrid vehicles/equipment, and regional air quality programs in the most impacted parts of California
- Workforce training related to advanced technology to reduce air pollution
- Projects to identify and reduce emissions from high-emitting light-duty vehicles

AQIP is one of three incentives programs created under AB 118. The other programs include the Alternative and Renewable Fuel and Vehicle Technology Program (ARFVTP), administered by the California Energy Commission (CEC or Energy Commission), and the Enhanced Fleet Modernization Program (EFMP), administered by the Bureau of Automotive Repair (BAR).

While AQIP focuses on clean vehicle and equipment deployment and demonstrations, the Energy Commission's ARFVTP supports electric and hydrogen infrastructure deployment, clean truck technology development, and biofuels production. Together they create a balanced suite of technology developing investments. CARB and the Energy Commission have developed a strong partnership in implementing AB 118. Together, CARB and the Energy Commission engage stakeholders for input to evaluate and assess funding needs moving forward and ensure that projects funded by both AQIP and ARFVTP complement each other. ARFVTP allocates roughly \$100 million a year toward a broad array of projects. More information about the Energy Commission's program can be found at: <http://www.energy.ca.gov/altfuels/>.

EFMP provides approximately \$30 million annually to accelerate the turnover of the existing light-duty fleet, which primarily consists of passenger cars and small pickup trucks. CARB developed the program in conjunction with BAR in 2009, and adopted amendments to the program in June 2014. The program consists of two elements: A vehicle retirement-only component administered by BAR in conjunction with the Consumer Assistance Program, and a Retire and Replace vehicle program administered by the San Joaquin Valley Air Pollution Control District (APCD) and South Coast Air Quality Management District (AQMD). CARB, BAR, and the air districts coordinate closely on the implementation of this program to ensure the incentives provided by the program are targeted to low-to-moderate income motorists and that much needed near-term emission reductions from the on-road light-duty fleet are realized. More information about BAR's program can be found at: <http://www.smogcheck.ca.gov/>.

B. The Purpose and Goals of AQIP

AQIP funds provide incentives to reduce emissions of criteria pollutants and toxic air contaminants with concurrent reductions in climate pollutants. California must reduce these emissions to meet State and federal mandates and reach multiple climate change, air quality, and public health goals. Incentive funding helps reduce emissions in the near term and accelerates the demonstration and deployment of the cleanest vehicle technologies for all vehicle and equipment sectors.

Pollutants of Concern

The federal and State governments have established ambient air quality standards for criteria air pollutants, representing levels above which health and welfare impacts may occur. Criteria air pollutants of primary interest in California due to their elevated levels are ground-level ozone, fine particulate matter (PM_{2.5}) and coarse particulate matter (PM₁₀). Some criteria pollutants, such as ozone, are formed in the atmosphere through a series of photochemical reactions between oxides of nitrogen (NO_x) and hydrocarbons (HC), which are therefore called precursor emissions for ozone formation. PM_{2.5} and PM₁₀ may be directly emitted, which is the case with diesel particulate matter or soot, or may be formed in the atmosphere by chemical reactions involving a number of precursors, including NO_x.

Toxic air contaminants may have health impacts at any level. Therefore, unlike criteria pollutants, the government does not set threshold levels that must be attained. Diesel particulate matter, also termed diesel PM, is a toxic air contaminant and is approximately 90 percent PM_{2.5} and 10 percent PM₁₀.

Climate Pollutants include black carbon (a type of PM_{2.5}) and greenhouse gases such as ground-level ozone (also a criteria pollutant); methane (CH₄); the fluorinated gases SF₆, HFCs, PFCs, NF₃; nitrous oxide (N₂O); and carbon dioxide (CO₂).

Project Impacts on Air Quality/Public Health Goals

CARB's *Mobile Source Strategy, First Update to the Climate Change Scoping Plan, 2012 Vision for Clean Air, and 2016 California Sustainable Freight Action Plan* all emphasize the need for zero and near-zero emission strategies to meet long-term GHG emission targets, federal health-based ozone standards, and petroleum use reduction goals. These plans identify near-term measures and actions to promote cleaner combustion in trucks, marine vessels, and off-road equipment as well as accelerated penetration of zero emission light-duty vehicles, trucks, buses, and equipment where the technologies are ready for the commercial market.

Aggressive strategies in the form of control measures and incentives are necessary for California to meet post-2020 federally mandated National Ambient Air Quality Standards (NAAQS) and State climate change goals. The South Coast and San Joaquin Valley air basins are the only two extreme ozone areas in the nation. Meeting NAAQS will require both these areas to reduce their NO_x emissions by around 80 percent from 2010 levels by 2023 and by almost 90 percent by 2032. Attainment in these two areas to meet the scheduled milestones will require the use of zero and near-zero emission technologies.

These same technologies are critical for California to meet the SB 32 (Pavley, Chapter 249, Statutes of 2016) requirement to reduce statewide GHG emissions to 40 percent below 1990 levels by 2030 and the goal set by Executive Order S-3-05 to reduce GHG emissions to 80 percent below 1990 levels by 2050. To meet this objective, near-zero and zero emission vehicles will need to make up a significant fraction of California's vehicle fleet, with electricity or hydrogen comprising 40 percent of California's transportation fuel in 2050². In January 2012, CARB made progress towards this goal with the approval of the Zero Emission Vehicle (ZEV) Regulation Amendments, which will require 1 out of every 7 new cars purchased in 2025 to be zero emission or plug-in hybrid. This was followed by the Governor's Executive Order B-16-2012 that establishes a 2050 target of 80 percent less than 1990 levels for GHG emission reductions from the transportation sector. The Executive Order also directed State agencies to establish benchmarks for expanding the ZEV market share to over 1.5 million ZEVs in California, provide easy access to infrastructure, and to displace at least 1.5 billion gallons of petroleum by 2025.

Minimizing exposure to diesel PM is a major air quality challenge faced by California. Heavy-duty diesel trucks have traditionally been the largest source of diesel PM emissions in the State. Risks are particularly high in urban areas and along busy roadways where trucks operate. To protect public health, the Board approved the Diesel Risk Reduction Plan (DRRP) in 2000, which set a target of an 85 percent reduction in statewide exposure to diesel PM by 2020. The Truck and Bus Regulation is a major part of achieving this goal. Cleaner trucks will help California meet mandated federal ozone and PM_{2.5} air quality standards, and will help reduce black carbon emissions, which contribute to climate change.

² <http://www.energy.ca.gov/2007publications/CEC-600-2007-011/CEC-600-2007-011-CMF.PDF>

Project Benefits of Promoting Clean Fuels and Vehicle Technologies

The Truck Loan Assistance Program helps achieve the objectives of the Truck and Bus regulation and DRRP by allowing small fleets to secure financing for upgrading their fleets with newer trucks or with diesel exhaust retrofits that reduce emissions. The Truck Loan Assistance Program leverages public funding with private funding from participating lending institutions. As of June 2016, about \$78 million in AQIP funding has been expended to provide about \$689 million in financing to small business truckers.

CVRP achieves both criteria pollutant and GHG emission reductions by providing rebates to consumers who purchase zero emission and plug-in hybrid vehicles in lieu of conventional gasoline vehicles. HVIP also provides both criteria pollutant and GHG emission reductions by providing vouchers for fleets to purchase clean trucks and buses.

Most of the emission benefits generated since the inception of AQIP have been derived from these three projects due to the large number of vehicles supported. Emission reductions help enable California to meet its health based air quality standards and climate change goals.

Table 1 identifies the emission benefits over the life of AQIP-funded projects.

Table 1: Statewide Criteria Pollutant, Precursor, and GHG Emission Reductions Attributable to AQIP¹

Funding Category	Time Period	AQIP Funding (millions)	NOx ² (tons)	HC ² (tons)	PM 2.5 ² (tons)	CO ₂ (MTCO _{2e}) ³
CVRP ⁴	FY 2014-15 and 15-16 ⁵	\$8	79	13	30	627,000
	Cumulative ⁶	\$67	248	41	105	3,017,000
HVIP ⁷	FY 2014-15 and 15-16 ⁵	\$5	10	2	2	22,500
	Cumulative ⁶	\$60	101	19	21	240,000
Truck Loan Assistance Program	FY 2014-15 and 15-16 ⁵	\$28	7,600	274	-- ⁸	--
	Cumulative ⁶	\$72	12,500	472	-- ⁸	--

¹ CVRP and HVIP have received funding from AQIP, LCT, and other appropriations. However, emission benefits have only been calculated for monies attributable to AQIP funding.

² Criteria pollutant emission reductions are calculated for exhaust emissions only.

³ Metric tons of carbon dioxide equivalent. GHG emission reductions are calculated on a well-to-wheel basis, which accounts for the emissions produced from the production, distribution and usage of the different fuel types, including electricity, as well as exhaust emissions.

⁴ Emission reductions for CVRP are calculated using a 2016 baseline vehicle, updated with the latest criteria emission factors and fuel economy values from EMFAC 2014 and the latest GHG emission factors from the Low Carbon Fuel Standard Regulation.

⁵ Emissions based on approximately 16,000 vehicles funded for CVRP, 180 vehicles for HVIP, and 5,700 trucks for the Truck Loan Assistance Program, between July 1, 2014 and June 30, 2016. Actual expenditure was less than allocated amount shown.

⁶ Cumulative through June 30, 2016. Actual expenditure less than allocated amount shown.

⁷ The HVIP methodology has been updated from previous years to reflect a 2016 diesel medium heavy-duty truck and an equal split of 2016 diesel and natural gas urban buses as the baseline vehicles. The methodology was also updated with the latest criteria pollutant emission factors and fuel economy values from EMFAC 2014 and the latest GHG emission factors from the Low Carbon Fuel Standard Regulation.

⁸ PM reductions are not included in the table as attributable to the Truck Loan Assistance Program because the In-Use Truck and Bus Regulation already requires PM reductions from trucks.

AQIP investments have been an important early step in accelerating demonstration and deployment of the cleanest feasible technologies for all vehicles and equipment sectors. AQIP funds support this transformation and provide a down payment on the technologies that are critical in helping California meet its air quality goals. AQIP projects provide both immediate emission reductions from the vehicles directly funded and, more importantly, supplementary long-term impacts from accelerating the demonstration and deployment of advanced clean technologies, such as: (1) reducing production costs of advanced technology vehicles by spurring higher, more efficient production volumes, (2) accelerating deployment of new, advanced vehicles and manufacturing advancements, and (3) accelerating consumer acceptance of new unfamiliar vehicle technologies through demonstrations. These longer-term program

benefits accrue primarily from overcoming deployment barriers and accelerating technology transfer to other sectors. Additionally, AQIP investments in advanced technology vehicles have been supported by the Energy Commission investments in infrastructure to ensure that necessary fueling networks are developed, thus reinforcing California's ongoing commitment to clean technologies. AQIP investments also help stimulate business and jobs growth in the State. Some of the vehicles and vehicle components funded under AQIP are developed and manufactured in California, and are distributed through extensive local dealership networks. In addition, AQIP's Advanced Technology Demonstration Projects have provided funding to small-business vehicle technology developers to demonstrate and commercialize the next generation of clean vehicles to California. As more advanced technology vehicles enter the California fleet, there will be increasing demand for a well-trained workforce to design, build, service, and maintain these new vehicles.

AQIP expands CARB's portfolio of air quality incentives, providing the opportunity to fund projects not covered by CARB's other incentive programs – the Carl Moyer Memorial Air Quality Standards Attainment Program, the Goods Movement Emission Reduction Program, and the Lower-Emission School Bus Program. These other programs augment compulsory regulatory programs by: (1) paying for the incremental cost of cleaner vehicles engines, and equipment, which is the consumers' extra cost above the cost of conventional technology, and (2) focusing on near-term emission reductions from fully commercialized and widely available emission control technologies. AB 118 provides CARB with broader flexibility for implementing AQIP, and with it, the ability to focus on longer-term air quality goals.

C. Implementation of AQIP

CARB adopted regulations that establish the administrative procedures for implementing AQIP in order to ensure that the program is administered efficiently, with transparency and public input. As required in Health and Safety Code (HSC) Section 44274(a), the Board adopted regulatory guidelines in 2009 that define the overall administrative requirements and policies and procedures for program implementation based on the framework established in statute. Central to the guidelines is the requirement for a Board-approved annual funding plan developed with public input.

Funding Plan

The funding plan is each year's blueprint for expending AQIP funds appropriated to CARB in the annual State Budget. The funding plan describes the projects CARB intends to fund, establishes funding targets for each project, and provides the justification for these decisions. The funding plan is updated and presented to the Board for its approval each year. CARB staff holds a series of workgroup meetings and public workshops during the development of each funding plan to solicit feedback and recommendations. Each funding plan is also released 30 days prior to Board consideration to garner public comments on the plan itself.

The process of developing the funding plan also serves as a mechanism for CARB to evaluate AQIP projects each year. As a result, during the development of each year's funding plan, staff performs the following tasks:

- Evaluate the projects funded under previous funding plans and consider whether the projects are over-subscribed or under-subscribed, whether continued funding should be proposed, and if so, whether modifications to project requirements are needed
- Reexamine the project categories not funded in previous funding plans and consider whether additional categories should be proposed for funding the following year
- Ensure new project categories comply with HSC Section 44274(c), which requires that the program be limited to competitive grants, revolving loans, loan guarantees, loans, and other appropriate funding measures for applicable projects that further the purposes of the program
- Reexamine opportunities to coordinate with other incentive programs such as Energy Commission's AB118 program or federal incentive programs

The passage of AB 8 (Perea, Chapter 401, Statutes of 2013) also refined the methodology CARB uses to evaluate and select AQIP projects for funding beginning in fiscal year (FY) 2014-15. AB 8 introduced the following evaluation criteria:

- The State board shall provide preference in awarding funding to those projects with higher benefit-cost scores that maximize the purposes and goals of the Air Quality Improvement Program³
- "Benefit-cost score" means the reasonably expected or potential criteria pollutant emission reductions achieved per dollar awarded by the board for the project⁴
- The State board also may give additional preference based on the following criteria, as applicable, in funding awards to projects:⁵
 1. Proposed or potential reduction of criteria or toxic air pollutants
 2. Contribution to regional air quality improvement
 3. Ability to promote the use of clean alternative fuels and vehicle technologies as determined by the state board, in coordination with the commission
 4. Ability to achieve climate change benefits in addition to criteria pollutant or air toxic emissions reductions
 5. Ability to support market transformation of California's vehicle or equipment fleet to utilize low-carbon or zero emission technologies
 6. Ability to leverage private capital investments

³ Health & Safety Code Section 44274(b)

⁴ Health & Safety Code Section 44270.3(e)(1)

⁵ Health & Safety Code Section 44274(b)

The refined project evaluation criteria have been utilized in assigning preference for AQIP funding to projects since FY 2014-15. Additional information on the new evaluation criteria is available in Appendix A of the FY 2014-15 Funding Plan.⁶

Air Quality Guidelines

The Board also adopted AB 118 Air Quality Guidelines as required in HSC Section 44271(b). This regulation, also known as the “anti-backsliding guidelines,” ensures that CARB and the Energy Commission’s AB 118 programs complement California’s existing air quality programs and maintain or improve upon the emission benefits achieved through these programs.

D. Funding Sources

Funding for AQIP comes primarily from the smog abatement fee assessed annually by the Department of Motor Vehicles (DMV) during a vehicle’s first six registration years in lieu of a biennial smog inspection. Of the \$20 collected for each vehicle at the time of annual registration, \$4 is allocated to CARB for AQIP. A small portion of AQIP funding comes from two additional sources: an initial registration fee for new watercraft and a special equipment identification plate fee for certain types of equipment. The fees identified above generate approximately \$25-\$30 million on an annual basis.

In addition to the fees above, AQIP has received \$93 million in additional funding from other sources since program inception to support the growing demand of AQIP projects. Specifically, the Energy Commission has augmented the funds directly appropriated to CARB by providing \$53 million in various fiscal years from its ARFVTP to help meet the consumer demand of CVRP and HVIP programs. Additional funding also includes \$10 million appropriated to the Truck Loan Assistance Program in FY 2013-14 as a loan from the Vehicle Inspection and Repair Fund (VIRF) per SB 359 (Corbett, Chapter 415, Statutes of 2013) and \$30 million transferred by the Legislature from VIRF to support CVRP per SB 852 (Leno, Chapter 25, Statutes of 2014) and SB 862 (Committee on Budget and Fiscal Review, Chapter 36, Statutes of 2014).

AQIP has provided funding for CVRP, HVIP, and demonstration projects for advanced emission reduction vehicle technologies since 2009. However, beginning in FY 2013-14, funds from the Greenhouse Gas Reduction Fund were appropriated by the Legislature for Low Carbon Transportation (LCT) investments in CVRP and HVIP. Since then, CVRP and HVIP have been primarily funded with LCT appropriations, which totaled \$224 million. The scale of CVRP and HVIP has grown to a point where their funding needs cannot be sustained by AQIP, which only has an annual outlay of \$25 million. CVRP alone requires more than \$100 million in annual funding. The majority of AQIP funds are now directed to the Truck Loan Assistance Program for helping small business truckers affected by the In-Use Truck and Bus Regulation to secure financing for clean trucks and diesel exhaust retrofits. This program can only use AQIP funds because its primary objective is to reduce criteria and toxic air contaminant emissions, rather than GHG emissions.

⁶ https://www.arb.ca.gov/msprog/aqip/fundplan/final_fy1415_aqip_ggrf_fundingplan.pdf

LCT investments support clean transportation technologies that meet the same goals as AQIP and CARB is implementing the two funding programs in a coordinated manner.

E. Reporting Requirements

There are three separate reporting requirements for AQIP.

First, HSC Section 44274(d) requires CARB to submit a biennial report to the Legislature on the implementation of AQIP. The report is required to include a list of funded projects, the benefits of these projects, and recommendations for future actions.

Second, CARB's regulation for implementing AQIP requires CARB staff to report to the Board biennially on progress in implementing the program. The regulation provides that this report may be combined with the required report to the Legislature. (Title 13, Chapter 8.2, California Code of Regulations Section 2358.)

Third, HSC Section 44274.7(f) requires CARB to report to the Legislature annually on the implementation of the Truck Loan Assistance Program established in the FY 2008-09 State Budget with AQIP funds.

This report is intended to fulfill all of these requirements. Project status update information provided in this report covers current AQIP projects funded in FY 2014-15 and 2015-16. A list of past projects is also included.

II. AQIP Projects Funded in FY 2014-15 and 2015-16

Overview

AQIP projects support the demonstration and deployment of near-zero and zero emission vehicles and equipment, and other advanced technologies that provide emission reductions and are critical to meeting California's longer-term air quality and climate change goals. Five categories have received AQIP funding during the status update period of FY 2014-15 and 2015-16.

Table 2 provides a summary of the funding (from AQIP, LCT, and other appropriations) provided to the above categories starting from inception in FY 2008-09 through FY 2015-16 along with key project outcomes. This is followed by an overview of individual projects with project benefits, current status (as of June 30, 2016), and future direction. Emission benefits shown in this report have only been calculated for monies attributable to AQIP funding.

Table 2: AQIP Project Funding (millions)

Project Category	Funding Source	Prior Years						Status Update Period		Cumulative through June 30, 2016	Comments
		08-09	09-10	10-11	11-12	12-13	13-14	14-15	15-16		
Truck Loan Assistance Program	AQIP	\$30	--	--	--	\$4	\$10	\$10	\$18	\$72	-Launched April 2009 -Over 10,400 loans issued -AQIP component
	Other	--	--	--	--	--	\$10	--	--	\$10	\$22 million in FY 16-17
CVRP	AQIP	--	\$4	\$5	\$16	\$24	\$10	\$5	\$3	\$67	-Launched March 2010.
	LCT	--	--	--	--	--	\$20	\$109	\$75	\$204	-A total of \$350 million spent through FY15-16
	Other	--	--	\$2	--	\$12	\$60	\$5	--	\$79	-157,000 rebates issued
HVIP	AQIP	--	\$20	\$19	\$11	--	\$5	\$5	--	\$60	-Launched Feb 2010
	LCT	--	--	--	--	--	\$10	\$5	\$5	\$20	-A total of \$84 million spent through FY15-16
	Other	--	--	\$4	--	--	--	--	--	\$4	-2,600 vouchers issued
Low NOx Engine Incentives	AQIP	--	--	--	--	--	--	--	\$2	\$2	-Launched in FY 2015-16
	LCT	--	--	--	--	--	--	--	--	--	
Ag Equipment Trade Up in the San Joaquin Valley	AQIP	--	--	--	--	--	--	--	\$0.5	\$0.5	-Launched in FY 2015-16 -AQIP component \$3 million in FY 16-17

Details of proposed funding for FY 2016-17 Low Carbon Transportation Investments and the Air Quality Improvement Program can be found at https://www.arb.ca.gov/msprog/aqip/fundplan/proposed_fy16-17_fundingplan_full.pdf.

1. Truck Loan Assistance Program

Overview

Launched in 2009, the Truck Loan Assistance Program utilizes AQIP funds to help small-business fleet owners affected by ARB's In-Use Truck and Bus Regulation to secure financing for upgrading their fleets with newer trucks or with diesel exhaust retrofits. This program is an on-going and successful incentive option that leverages public funding with private investments from participating lending institutions.

Implemented in partnership with the California Pollution Control Financing Authority (CPCFA) through its California Capital Access Program, the Truck Loan Assistance Program creates financing opportunities for truck owners who fall below conventional lending criteria and are unable to qualify for traditional financing. The program is available for small fleets with 10 or fewer trucks at the time of application. In the current program, AQIP funds are set aside (based on a percentage of each enrolled loan amount) in each participating lender's loan loss reserve account to cover potential losses resulting from loan defaults. The interest rate is capped at 20 percent. However, the average interest rate for issued loans is about 13 percent.

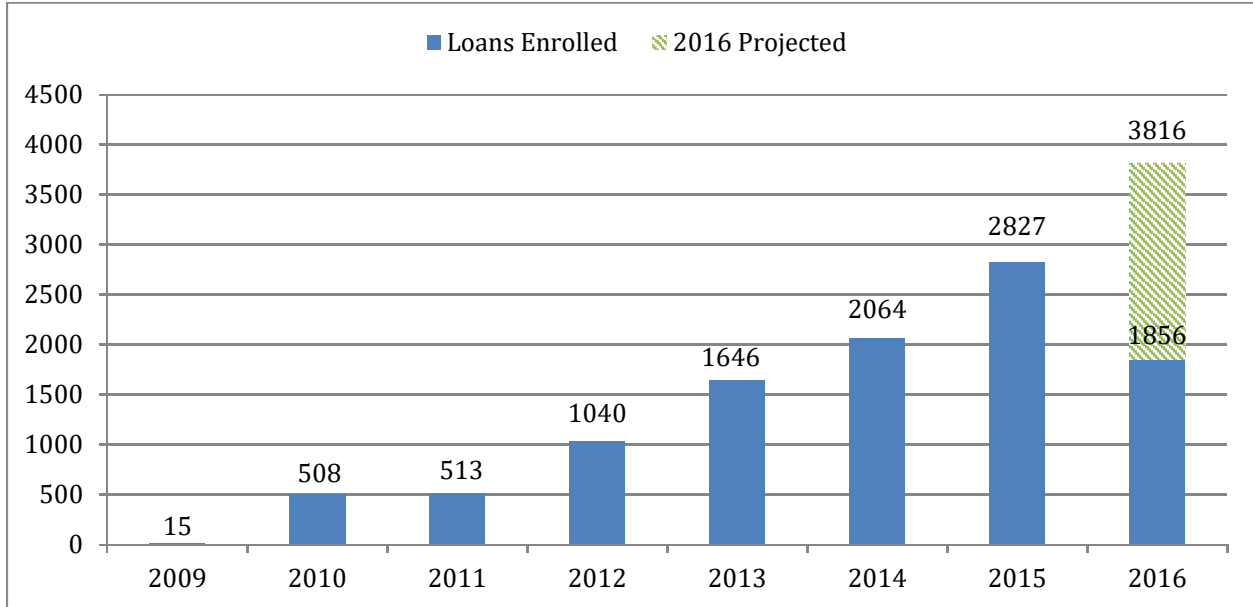
Project Benefits

This program primarily reduces criteria and toxic air contaminant emissions by helping small business truckers secure financing to purchase newer trucks or retrofits to comply with the In-Use Truck and Bus Regulation. The cleaner trucks reduce health risks from exposure to diesel PM (a toxic air contaminant), particularly in disadvantaged communities where exposure can be substantial.

Project Status as of June 30, 2016

Approximately \$78 million allocated to the project has been leveraged to provide nearly \$689 million in financing for the purchase of over 11,000 cleaner trucks, exhaust retrofits, and trailers. Demand by truck owners continues to increase each year as shown in Figure 1. Program growth has been driven by increased lender and borrower awareness and utilization of the program, increased cost of new diesel trucks, and increased enforcement of the In-Use Truck and Bus Regulation.

Figure 1: Loan Activity by Calendar Year



To meet consumer demand, CARB increased the original FY 2015-16 AQIP allocation of \$15 million by \$3 million to ensure that the program would remain fully funded through the entire fiscal year.

Table 3 summarizes financing provided to date. Nearly 60 percent of enrolled loans have been issued to owner operators with one truck, and nearly 95 percent of enrolled loans have been issued to fleet owners with 10 or fewer employees. The Truck Loan Assistance Program is not subject to disadvantaged community investment requirements. However, it is worth noting that over 80 percent of the loans to date have been issued for trucks registered in ZIP codes that are defined as disadvantaged communities, thus providing emission reduction benefits for those communities.

Table 3: Truck Loan Assistance Program Status – Vehicles/Equipment Financed

Program	Number of Loans Issued	Number of Projects Financed	Project Type	\$ Spent	Total Amount Financed
Truck Loan Assistance Program	10,469	10,720	Truck Purchases	\$78M	\$689M
		598	Exhaust Retrofits		
		159	Trailers		

Figure 2: Truck Loans by Air District

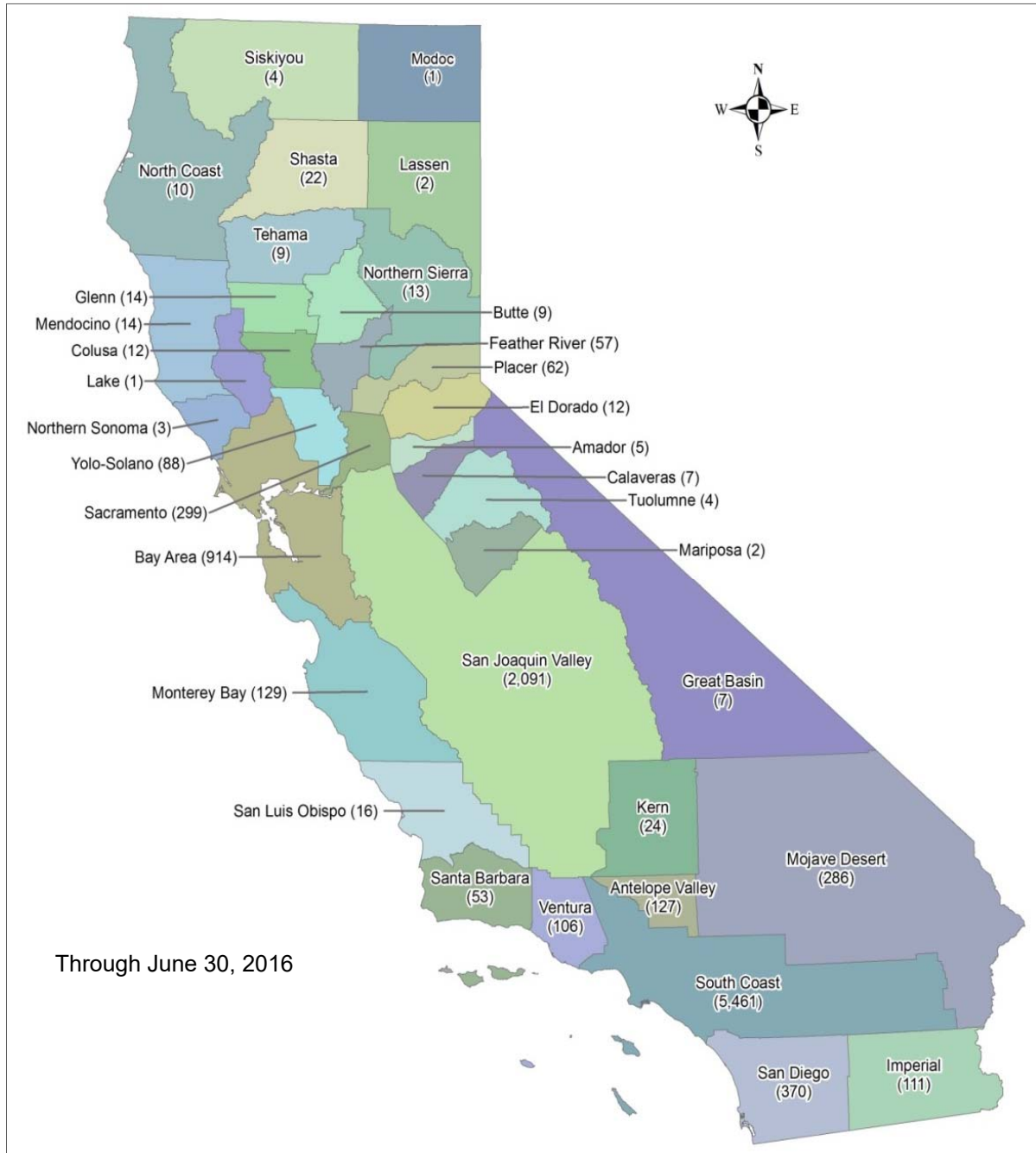


Figure 2 shows the number of truck loans issued within each air district through June 2016. The program has broad statewide appeal, including rural regions.

Emission Benefits

AQIP funds have been used to finance the retrofit of trucks with CARB-verified diesel emission control devices or the replacement of trucks with model year 2007 or newer engines. Emission reductions are achieved because the retrofitted trucks and the air pollution controls installed by manufacturers on new engines have lower emissions. PM reductions are not included in the table below because the In-Use Truck and Bus Regulation already requires PM reductions from trucks. Table 4 shows emission benefits of the Truck Loan Assistance Program based on 10,500 cleaner trucks supported by this program through FY 2015-2016.

Table 4: Statewide Truck Loan Assistance Program Criteria Pollutant and Precursor Emission Reductions

Time Period	Estimated trucks funded	NOx ¹ (tons)	HC ¹ (tons)
FY 2014-15 and 15-16	5,700	7,600	274
Cumulative ²	10,500	12,500	472

¹ Emission reductions are calculated for exhaust, or “tailpipe” emissions only.

² Cumulative through June 30, 2016

Future Direction

The Board has approved an allocation of \$22 million from AQIP for the Truck Loan Assistance Program to meet expected demand for FY 2016-17. CARB remains committed to meet the growing demand of small fleets as they take steps to meet the ongoing compliance requirements of the Truck and Bus Regulation. To ensure the sustainability of the program and continuous availability of funding to participating lenders, CARB staff is working with the CPCFA to examine potential program modifications to maximize leverage and address cash flow. CARB contribution rates have already been adjusted as of January 1, 2016. The CARB contribution rate for lenders with loan loss reserve accounts exceeding \$1.5 million was reduced from 10 to 4 percent. In addition, the rate for lenders with accounts between \$500,000 and \$1.5 million was reduced from 10 to 7 percent. This will increase the leverage and slow the rate of the expenditure of AQIP funding. Recapture of funds in the lenders’ loan loss reserve accounts from matured loans is another avenue being pursued by CARB and CPCFA to maximize program usage.

2. Clean Vehicle Rebate Project (CVRP)

Overview

CVRP offers vehicle rebates on a first-come, first-served basis for light-duty ZEVs, plug-in hybrid electric vehicles (PHEVs), zero emission motorcycles, and neighborhood electric vehicles. CVRP helps get the cleanest vehicles on the road in California by providing consumer rebates to partially offset the higher initial cost of these advanced technologies. Currently, the base CVRP rebate amounts are \$5,000 for fuel cell electric vehicles, \$2,500 for battery electric vehicles (BEVs), \$1,500 for PHEVs, and \$900 for zero emission motorcycles. In March 2016, rebate amounts increased for lower income consumers (household incomes of less than or equal to 300 percent of the federal poverty level) by \$1,500 for each car category. An income cap was also instituted to exclude higher-income consumers in March 2016 as required by SB 1275 (De León, Chapter 530, Statutes of 2014.) The cap, which will apply to vehicle sales and leases after November 1, 2016, restricts rebates to applicants whose gross annual income does not exceed \$150,000 for single filers, \$204,000 for head-of-household filers, and \$300,000 for joint filers.

AQIP funding plans have been developed to provide flexibility to respond to market conditions. As a result, CARB has used a number of different strategies, such as reducing rebate amounts, shifting funds from other programs, and instituting a waiting list to help CVRP continue without interruptions to satisfy increasing demand. A grantee is selected via competitive solicitation to implement CVRP. The Center for Sustainable Energy, a non-profit organization based in California, has been the grantee since project inception with the primary responsibility of processing rebates.

Project Benefits

The early investment in support of rebates for clean vehicle technologies will prime the market for the larger number of vehicles needed over the next decade and beyond to meet the State's air quality standards and climate change goals.

CVRP is intended to:

- Support the goal of 1.5 million ZEVs by 2025, consistent with California ZEV regulations and the Governor's Executive Order B-16-2012
- Support CARB's ZEV Regulation, which will require 1 out of every 7 new cars purchased in 2025 to be zero emission or plug-in hybrid electric vehicles
- Accelerate production economies of scale; and encourage co-investment in infrastructure and workforce training

As ZEV and PHEV technologies improve and manufacturers begin to produce more vehicles to meet the Governor's Executive Order and CARB's ZEV Regulation, CVRP helps increase consumer demand for the advanced clean vehicles. CVRP plays an important role in educating consumers and incentivizing the purchase of ZEVs to help

manufacturers build volumes that will bring down vehicle costs over time. Finally, the CVRP investments – coupled with corresponding investments in vehicle charging and fueling infrastructure by the Energy Commission, regional governments, and the federal government – provides a signal to manufacturers that there is a demand for clean vehicle technologies and supports manufacturers who focus investments on advanced technology vehicle development and deployment.

CVRP has supported the maturation of a diverse and competitive clean light-duty vehicle market. During the first two years of the project, only four passenger vehicle models were eligible. That has grown to more than 35 models of eligible vehicles now available to consumers, with more vehicle introductions planned in the current and upcoming years. As the clean vehicle market grows, consumer choices in vehicle price and range options continue to expand.

Program Status as of June 30, 2016

Since the project's consumer launch in March 2010, rebates for over 157,000 vehicles totaling over \$350 million have been issued. Of this total, AQIP funding is responsible for funding approximately 54,000 vehicles. About 60 percent of rebates have been issued for BEVs and 40 percent for PHEVs to date, while only a small number of rebates have been issued for fuel cell electric vehicles, neighborhood electric vehicles, and zero emission motorcycles. Historically, the majority of rebates have been issued to consumers in the South Coast, Bay Area, and San Diego air districts. These urbanized areas are naturally suited to early ZEV adoption due to population density and driving patterns. About 96 percent of the rebates have been issued to individual consumers, with the remainder going to businesses, non-profit organizations, or government fleets.

The CVRP webpage, at <https://cleanvehiclerebate.org/eng> provides a real-time accounting of rebate funds available to consumers, a downloadable rebate application and instructions, list of eligible vehicles, an online tutorial, and other project information.

Outreach and public education play a key role in helping to expand the clean vehicle market in California. The Center for Sustainable Energy (CSE) implements a comprehensive outreach plan, developed in coordination with CARB, to raise consumers' awareness of these vehicles and associated incentives with an increasing focus in disadvantaged communities. CSE focuses outreach efforts on three target audiences – new car buyers in general, new car dealers, and consumers in disadvantaged communities.

Emission Benefits

CVRP achieves both criteria pollutant and GHG emission reductions. The funding for CVRP shifted from AQIP to LCT investments beginning in FY 2013-14. Table 5 identifies the emission benefits from CVRP over the life of funded projects attributable to AQIP funding.

**Table 5: Statewide CVRP Criteria Pollutant and GHG
Emission Reductions Attributable to AQIP**

Time Period	Estimated vehicles funded	NOx (tons)	HC (tons)	PM 2.5 (tons)	CO ₂ (MTCO ₂ e)
FY 2014-15 and 15-16	16,000	79	13	30	627,000
Cumulative to June 30, 2016	54,000	248	41	105	3,017,000

Future Direction

In recent years, CVRP has been primarily funded from the LCT appropriations because demand has exceeded AQIP's budget. For FY 2016-17, no AQIP funds will be used towards this program.

CVRP's allocation of \$133 million for FY 2016-17 will be funded entirely with LCT appropriations. CARB staff will continue to monitor this program over the course of the year to evaluate the effectiveness of investments and the status of the ZEV market. After the funding is expended, CARB will report on the number of rebates issued, emission reductions achieved, and disadvantaged community benefits as part of future Annual Reports to the Legislature on California Climate Investments.

3. Hybrid Truck and Bus Voucher Incentive Project (HVIP)

Overview

HVIP is the nation's first program to directly reduce the up-front cost of hybrid or zero emission trucks and buses, with fleets able to secure a voucher through their local participating dealership as part of their vehicle purchase order. HVIP is intended to encourage and accelerate the deployment of zero emission and hybrid trucks and buses, as well as heavy-duty vehicles using engines that meet the optional low NOx standard, which were added to the project beginning with FY 2015-16.

A grantee is selected via competitive solicitation every three years to administer HVIP. The California-based non-profit transportation consortium CalSTART has been the grantee since project inception and is responsible for processing voucher applications. The current voucher amount is up to \$95,000 per vehicle for purchasers and lessees of zero emission trucks and buses, and up to \$30,000 per vehicle for eligible hybrid trucks and buses. In addition, increased incentives are available for vehicles that provide benefits to disadvantaged communities. These fleets qualify for vouchers up to \$110,000 for zero emission trucks and buses. On average, HVIP vouchers typically cover approximately 30 percent of the purchase price for the advanced clean heavy-duty vehicle. HVIP offers vouchers on a first-come, first-served basis. This streamlined approach, with eligible vehicles and preset voucher amounts, has proven popular with vehicle dealers, manufacturers, and California fleets.

HVIP is also structured to enable leveraging of local, State (such as Carl Moyer Program and Proposition 1B), and federal funding by allowing HVIP vouchers to be combined with other incentives. In the past, these sources have provided voucher enhancements that make additional discounts available to help accelerate fleet demand for hybrid and zero emission trucks and buses. By combining with HVIP, these investments enable air districts to accelerate advanced technology deployment within their region, and utilizing the streamlined, statewide HVIP structure needed to drive production economies of scale and accelerate market growth.

Project Benefits

HVIP incentives drive manufacturing production and fleet acceptance of the advanced heavy-duty vehicle technologies California must deploy to meet its long-term air quality and climate goals. HVIP is an integral part of the successful introduction the first wave of hybrid electric and battery electric trucks to California and the nation.

The project has also helped to identify a number of deployment challenges for these vehicles. Vehicle technology costs, vehicle charging infrastructure costs, demand charges for peak electricity use, fuel economy uncertainties, and the lack of long-term vehicle performance and benefits data are some of the critical barriers facing truck fleets that wish to utilize advanced technology trucks and buses. However, incentives play a significant role in addressing some of these barriers along with ongoing project

refinements. HVIP continues to assist with achieving widespread commercialization of advanced technologies in medium- and heavy-duty vehicles. Due to the success of HVIP, the project is currently being duplicated in other parts of the nation.

Program Status as of June 30, 2016

Since the project’s launch in February 2010, HVIP has provided over \$84 million to help California fleets purchase about 500 zero emission trucks and buses and over 2,100 hybrid trucks. In terms of vehicle vocation, parcel delivery trucks account for approximately 41 percent of vouchers issued to date. Approximately 57 percent of the vouchers have been issued for vehicles in the 14,001 – 19,500 pounds gross vehicle weight range (Class 5 trucks). Almost half of the vouchers have been issued to businesses in the South Coast air district. Bay Area (20 percent) and San Joaquin Valley (10 percent) air districts account for a large portion of the balance of funding activity. The San Joaquin Valley APCD has invested \$2 million to enhance voucher amounts and further the acceleration of hybrid and zero emission trucks in the Valley.

The HVIP webpage, at <http://www.californiahvip.org/>, provides a real-time accounting of voucher funds remaining, on-line application, list of eligible vehicles, training, and other project information.

Emission Benefits

HVIP provides both criteria pollutant and GHG benefits because the deployed vehicles reduce or eliminate the use of diesel. Like CVRP, the funding for HVIP has shifted from AQIP to LCT over the last few years. In FY 2015-16, HVIP was primarily supported with Greenhouse Gas Reduction Fund monies appropriated to LCT for that purpose. Table 6 identifies the emission benefits from HVIP over the life of funded projects based on vouchers funded only by AQIP monies.

Table 6: Statewide HVIP Criteria Pollutant and GHG Emission Reductions Attributable to AQIP

Time Period	NOx (tons)	HC (tons)	PM 2.5 (tons)	CO ₂ (MTCO _{2e})
Status Update Period ¹ FY 2014-15 and 15-16	10	2	2	22,500
Program Cumulative ² to June 30, 2016	101	19	21	240,000

¹Based on approximately 180 vehicles funded.

²Based on approximately 1,900 vehicles funded.

Future Direction

In recent years, HVIP has been primarily funded from the LCT appropriations because demand has exceeded AQIP's budget. For FY 2016-17, no AQIP funds will be used towards this program.

HVIP's allocation of \$18 million for FY 2016-17 will be funded entirely with LCT appropriations. After the funding is expended, CARB will report on the number of vouchers issued, emission reductions achieved, and disadvantaged community benefits as part of future Annual Reports to the Legislature on California Climate Investments.

4. Low NOx Engine Incentives

Overview

CARB's optional low NOx standards allow manufacturers the ability to certify heavy-duty vehicle engines to NOx emission levels that are up to 90 percent lower than today's mandatory diesel emission standards. This project is intended to fund the incremental cost of a heavy-duty vehicle engine above the purchase and installation costs of a conventional heavy-duty vehicle engine with the same fuel type and other characteristics. The incentivized engine must be used in a bus or truck greater than 14,000 pounds gross vehicle weight rating (GVWR). Both engine repowers and new vehicle purchases would be eligible. The project would continue to be implemented through HVIP on a streamlined first-come, first-served, statewide basis with fleets able to secure a voucher through their local participating dealership as part of their engine repower or vehicle purchase order.

Project Benefits

Incentivizing deployment of these engines coupled with renewable fuels is an important strategy for achieving near-term reductions of GHG and criteria pollutant emissions in the heavy-duty sector.

Project Status as of June 30, 2016

The Low NOx Engine Incentives project was introduced in the FY 2015-16 Funding Plan and received an initial allocation of \$2 million. In September 2015, CARB certified the first low NOx heavy-duty engine: the Cummins 8.9 liter natural gas engine for both bus and truck duty cycles. The engine was certified to the lowest NOx level (0.02 grams per brake horsepower-hour (g/bhp-hr)) of the three optional low NOx standards. These engines are now available for purchase.

Future Direction

Incentive funding for low NOx heavy-duty vehicles is expected to continue for several years. However, no AQIP funds will be used towards this program for FY 2016-17.

For FY 2016-17, this program will receive an allocation of \$23 million which will be funded entirely with LCT appropriations. As more engines are certified and introduced into the market, the amount of incentive funding is expected to increase and will be based on engine availability and demand. Staff will monitor market conditions and adjust funding eligibility, incentive amounts, and funding levels to support continued growth in the commercial deployment of vehicles with low NOx engines.

5. Agricultural Equipment Trade Up in the San Joaquin Valley

Overview

The Agricultural Equipment Trade-Up Pilot Project provides CARB an opportunity to evaluate the feasibility of a new incentive model for mobile agricultural equipment intended for owners of high-emitting equipment. These owners have traditionally not been well served by existing incentive programs that only provide funding for new equipment purchases. The trade-up concept is a two-step transaction in which the owner of equipment with a Tier 0 (uncertified) or Tier 1 certified diesel engine agrees to scrap that equipment in exchange for a previously used and reconditioned piece of equipment with a certified Tier 2 or Tier 3 engine at little or no out-of-pocket cost. This used equipment comes from another owner that relinquishes it for an incentive to purchase brand new equipment that employs the cleanest engine technology (Tier 4 Interim or Tier 4 Final certification).

This is a new concept and was introduced in FY 2015-16 with \$500,000 of AQIP funding.

Project Benefits

Emissions from mobile off-road agricultural equipment are among a number of significant sources of air pollution in the San Joaquin Valley. Incentive programs and regulations are already reducing emissions from a wide variety of diesel engines in the region; however, a continuing transition to the cleanest technologies is needed to meet federal ozone standards in 2023 and 2032. Targeting this investment in the San Joaquin Valley aids in accelerating needed adoption of cleaner diesel engine technologies in mobile agricultural equipment and in reducing the legacy fleet of high-emitting equipment in this heavily agricultural, non-attainment air basin.

Project Status as of June 30, 2016

CARB selected the San Joaquin Valley APCD, via competitive solicitation, to administer this project with FY 2015-16 funds. Project goals include determining the project's cost-effectiveness, developing implementation guidelines that would enable emission reductions resulting from trade-up transactions to be creditable under the State Implementation Plan (SIP)⁷, and assessing the owner/user experience and acceptance of incentivized equipment. This project was launched in June 2016.

Future Direction

CARB staff has allocated \$3 million of AQIP funding as a continuing commitment to the Agricultural Equipment Trade-Up Pilot Project for FY 2016-17. The proposed allocation for the Agricultural Equipment Trade-Up Pilot Project is expected to fund about 40 to 60

⁷ The State Implementation Plan (SIP) is California's blueprint to meet the federally mandated National Ambient Air Quality Standards as required by the Clean Air Act

equipment transactions, providing an estimated 190 tons of weighted criteria pollutant emission reductions. The proposed allocation would enable testing the feasibility of the trade-up concept at a larger scale, including streamlining methods for matching eligible growers with eligible equipment. Building upon last year's \$500,000 project, an incrementally larger project is a crucial next step in evaluating the regional viability of a trade-up program as a potentially new incentive type in the San Joaquin Valley. Since 2009, approximately 3,000 high-emitting tractors have been replaced under existing incentives, however 55,000 Tier 0 and Tier 1 engine tractors remain in operation in the San Joaquin Valley. Owners of high emitting equipment may not be in a position to buy new equipment and are therefore not well served by existing incentives. A new incentive for incrementally cleaner, reconditioned equipment would further accelerate turnover of high emitting equipment.

While disadvantaged community benefits are not a specific requirement of AQIP funding, the project area encompasses underserved communities and is intended to benefit growers not well served by existing incentives that only cover new equipment purchases.

CARB will conduct a competitive solicitation to select a grantee to administer the Agricultural Equipment Trade-Up Project. The solicitation will contain a match funding requirement and will be open to California-based public agencies, which may subcontract with public, private, or California-based non-profit organizations.

III. Projects Receiving AQIP Funding Prior to FY 2014-15

Four project categories received a total of \$10.9 million in AQIP funding between FY 2009-10 and FY 2012-13. These projects are complete and did not receive additional AQIP funding during the status update period of FY 2014-15 and 2015-16.

Table 7 provides a summary of the funding provided to the above categories. This is followed by an overview of individual projects. Because of competing priorities and availability of other funding, these projects did not receive AQIP funding in subsequent years.

Table 7: Summary of AQIP Projects (FY 2008-09 to FY 2015-16)

Project Category	Funding Source	Fiscal Years (in \$ million)									Comments
		08-09	09-10	10-11	11-12	12-13	13-14	14-15	15-16	16-17	
Advanced Technology Demonstrations	AQIP	--	1.9	1.7	1.6	1	--	--	--	--	Project will be funded from LCT appropriations in FY 2016-17
	LCT	--	--	--	--	--	--	49	--	34	
Lawn & Garden Equipment Replacement	AQIP	--	1.6	1	--	--	--	--	--	--	No funding subsequent to FY 2010-11
Hybrid Off-Road Equipment Pilot	AQIP	--	--	2	--	--	--	--	--	--	No funding subsequent to FY 2010-11
Zero-Emission Agricultural Utility Terrain Vehicle Rebates	AQIP	--	0.1	--	--	--	--	--	--	--	No funding subsequent to FY 2009-10

1. Advanced Technology Demonstration Projects

Overview

The primary goal of Advanced Technology Demonstration Projects is to accelerate the introduction of pre-commercial technologies into the California marketplace. A public investment in these technologies helps to achieve significant emission reductions of criteria pollutants and toxic air contaminants sooner than would be possible otherwise. Funding Advanced Technology Demonstration Projects carries inherent complexities such as schedule delays and engineering challenges. CARB mitigates this potential by requiring a competitive selection process to award funding to the most promising technologies, requiring a significant cost share from the technology demonstrator, and requiring that the project applicant be a California-based public agency with expertise in the project category. Grants are awarded to public agencies to manage 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 other agencies are eligible. The team concept for demonstration projects, with technology demonstrators partnering with a local public agency and one or more end-users, has proven to be effective, and is planned to continue for future projects.

Project Benefits

Advanced Technology Demonstration projects are a critical component for achieving long-term emission reduction and climate change goals. The acceleration of advanced technologies into the marketplace and into different sectors is necessary for California to meet its reduction goals for GHG and criteria pollutant emissions. The movement toward near-zero or zero emission technologies in on-road, off-road, locomotive and other categories is supported by a strong financial commitment made by the State. This signals to vehicle and equipment manufacturers as well as end-users of such equipment that their investments in advanced technologies will provide a return, reducing the costs to manufacture advanced equipment and reducing operation costs, while providing an overall benefit to California.

Program Status as of June 30, 2016

AQIP has funded 13 separate projects totaling \$5.4 million (Table 8) under the Advanced Technology Demonstration Projects umbrella. AQIP funds were allocated from FY 2009-10 through FY 2012-13. This investment has leveraged approximately \$6 million in match funding from grantee and technology demonstrators resulting in a total of over \$11 million in combined demonstration funding.

Table 8: AQIP Advanced Technology Demonstration Projects

Advanced Technology Demonstration Projects					
Fiscal Year	Grantee	Project Category	Project Title	Award Amount	Status
2012-2013	Port of Los Angeles and Port of Long Beach	Zero emission Off-Road Equipment	Electric Yard Truck Demonstration (EYTD)	\$1,000,000	Project Complete
2011-2012	San Diego County APCD	School Bus	Economical Electric School Bus Project	\$503,304	Project Complete
	Kings Canyon Unified School District		Central Valley Electric/Hybrid School Bus Demonstration	\$421,661	Project Complete
2010-2011	San Joaquin Valley APCD	Zero emission Commercial Lawn and Garden Equipment	Cordless Zero emission Commercial Lawn and Garden Equipment Demonstration	\$250,000	Project Complete
	Mojave Desert AQMD		Can Green Take the Heat?	\$15,000	Project Complete
	South Coast AQMD		Demonstration of Cordless Zero emission Lawn and Garden Equipment for Commercial Use	\$51,667	Project Complete
	Bay Area AQMD	Locomotive	Tier-4 NREC Genset Switcher	\$508,466	Project Complete
	Bay Area AQMD		DPF Retrofit of a Genset Switcher: GTE Device	\$229,830	Project Complete
	Bay Area AQMD	Marine	Wind Assist Marine Demonstration Project for Ferry Districts on San Francisco Bay	\$164,250	Project Complete
	South Coast AQMD		Retrofit a Tugboat with Hug Nauticlean DPF/SCR System	\$439,000	Project Complete
2009-2010	Sacramento Metropolitan AQMD	Locomotive	EMD Line-Haul DPF Retrofit	\$502,865	Project Complete
	Port of Los Angeles		Tier-4 PM Retrofit System for a Genset Switcher: Johnson Matthey Device	\$346,178	Project Complete
	Port of Long Beach	Marine	Hybrid Tugboat Retrofit	\$1,000,000	Project Complete

AQIP Advanced Technology Demonstration Projects have provided funding to support the demonstration of advanced pre-commercial technologies in the following categories:

- Locomotive
- Marine
- School Bus
- Zero emission Off-Road Equipment
- Zero emission Commercial Lawn and Garden Equipment

Final reports from completed projects are located on the AQIP Advanced Technology Demonstration Projects webpage: <https://www.arb.ca.gov/msprog/aqip/demo.htm>.

Future Direction

This category has not received any AQIP funding since FY 2013-14. The FY 2016-17 Funding Plan has allocated \$34 million from LCT investments to support demonstrations of advanced technologies, with a requirement that projects benefit disadvantaged communities.

2. Lawn and Garden Equipment Replacement (LGER) Project

Overview

The Lawn and Garden Equipment Replacement Project replaces gasoline-powered residential lawn and garden equipment with cordless, zero emission equipment, encouraging further development and deployment of this technology. AQIP's Lawn and Garden Equipment Replacement Project augmented local air district programs that proved successful in reducing criteria pollutant emissions cost-effectively, but were limited in scope partially due to deficient funding. Funding was awarded to local air districts to administer the program and disburse funding to consumers for the purchase of zero emission lawn and garden equipment.

Past Project Activity

In FY 2009-10, AQIP awarded \$1.6 million in funding to the Lawn and Garden Equipment Replacement Project, with an additional \$1 million in FY 2010-11. A total of 12,893 mowers were replaced with AQIP funds (Table 9). The nine local air districts that participated in the program also provided funding to match AQIP funds, doubling the available funding which resulted in the replacement of approximately 12,000 additional lawn mowers.

Comments

The rebates in this category were able to meet Carl Moyer Memorial Air Quality Standards Attainment Program cost-effectiveness requirements. Therefore, in FY 2011-12, CARB shifted zero emission lawn mower replacement projects to the Carl Moyer Memorial Air Quality Standards Attainment Program. This category is no longer funded by AQIP funds but continues under the Carl Moyer Program.

Table 9: Lawn and Garden Equipment Replacement Project Summary¹

District	Fiscal Year	Grant Award	Mowers Replaced
Antelope Valley AQMD	2009-10	\$ 10,000	50
	2010-11	\$ 10,000	50
Bay Area AQMD	2010-11	\$ 46,180	206
Mojave Desert AQMD	2009-10	\$ 10,000	50
	2010-11	\$ 50,000	221
South Coast AQMD	2009-10	\$ 816,000	4,690
	2010-11	\$ 494,314	2,713
San Diego APCD	2009-10	\$ 150,000	648
San Joaquin Valley APCD	2009-10	\$ 464,000	1,671
	2010-11	\$ 183,661	735
Sacramento Metropolitan AQMD	2009-10	\$ 75,000	682
	2010-11	\$ 57,198	538
Ventura County APCD	2009-10	\$ 50,000	225
Yolo-Solano AQMD	2009-10	\$ 25,000	234
	2010-11	\$ 18,990	180
Total		\$2,600,000	12,893

¹ Excludes equipment replaced with match funding provided by air districts

3. Hybrid Off-Road Equipment Pilot

Overview

The goal of the Hybrid Off-Road Equipment Pilot Project was to accelerate the deployment of commercialized hybrid construction equipment while evaluating the emission benefits in real world applications. The deployment element of the project provided funding for up to half of the incremental cost of fully commercialized hybrid off-road equipment. This project was designed to help provide the foundation for growth in the hybrid off-road equipment fleet by spurring initial deployment of commercially available (but more expensive) hybrid equipment and to provide fleets with experience using and maintaining the new technology.

Hybrid equipment in the demonstration phase of commercialization was not eligible for this project. Two equipment makes/models were commercially available for California purchase in early 2011 – the Caterpillar D7E dozer and the Komatsu HB215-LC-1 excavator. The dozer's and excavator's respective \$73,000 and \$28,500 voucher amounts reflect approximately half of the hybrid equipment's incremental cost.

Project Benefits

The project provided data that were used to determine NO_x, PM, total hydrocarbon, carbon monoxide, and carbon dioxide emission benefits of funded equipment relative to its conventional counterpart. Equipment characterization and emissions testing were conducted on three hybrid Komatsu HB215-LC-1 excavators and three hybrid Caterpillar D7E dozers in a variety of typical vocations.

While the results showed a consistent decrease in carbon dioxide emissions for the hybrid equipment, NO_x emission increases were observed based on the type of work being performed. The data suggest that the next generation of hybrid construction equipment will need additional technological advances to ensure it continues to achieve substantial GHG benefits while also delivering NO_x emission reductions across all duty cycles.

Project Status

CE-CERT was competitively selected in 2011 to administer both the voucher distribution and emission testing elements of the Hybrid Off-Road Equipment Pilot Project. CE-CERT completed the project and final report in June 2013⁸. Vouchers for 16 pieces of equipment totaling over \$900,000 were issued. The deployment element of this project was completed in March 2013. Tables 10 and 11 provide a cumulative summary of vouchers issued by eligible equipment type and voucher distribution by air district. Table 12 provides the amount of vouchers and funding distributed by California fleets participating in the Hybrid Off-Road Equipment Pilot Project.

⁸ https://www.arb.ca.gov/msprog/aqip/off-road%20hybrid/offrd_hybrid_final_report.pdf

Table 10: Vouchers Issued By Equipment Make/Model

Vehicle Type	Vouchers Issued	Total Voucher Funds	Average Voucher Amount	Average Equipment Purchase Price
Caterpillar Hybrid D7E Dozer	10	\$730,578	\$73,000	\$552,943
Komatsu Hybrid HB215-LC-1 Excavator	6	\$171,000	\$28,500	\$288,239
Total	16	\$901,578	--	--

Table 11: Voucher Distribution by Air District

Location of Participating Fleet	Number of Vouchers	Total Funding
South Coast AQMD	5	\$375,000
San Diego County APCD	4	\$207,000
Bay Area AQMD	2	\$150,000
Sacramento Metropolitan AQMD	2	\$57,000
San Joaquin Valley APCD	1	\$28,500
Shasta County AQMD	1	\$28,500
Antelope Valley AQMD	1	\$55,578
Total	16	\$901,578

Table 12: Voucher Distribution by Fleet

Purchasing Fleet	Number of Vouchers	Total Funding
Hybrid Caterpillar D7E Dozer		
Waste Management	2	\$130,578
Orange County Water District	2	\$150,000
Republic Services, Incorporated	5	\$375,000
Riverside County	1	\$75,000
Hybrid Komatsu Excavator		
Road Machinery, Limited Liability Corporation	4	\$114,000
Clairemont Equipment	2	\$57,000
Total	16	\$901,578

Comments

Additional AQIP funding has not been allocated for this project category since FY 2010-11.

4. Zero-Emission Agricultural Utility Terrain Vehicle Rebate Project

Overview

In FY 2009-2010, AQIP allocated \$1.1 million to the Zero-Emission Agricultural Utility Terrain Vehicle Rebate Project with the purpose of accelerating the deployment of zero emission work vehicles for use in California agricultural operations. As a first step in introducing zero emission technology into the off-road and agricultural sectors, all-terrain vehicles and utility terrain vehicles were selected for funding support as they are used extensively in the agricultural industry. The equipment population of these vehicles in the California agricultural industry is second only to that of agricultural tractors. Eligible vehicles included zero emission all-terrain and utility vehicles that satisfied specified horsepower, vehicle weight, payload limit, and tow capacity criteria. Initially, the project provided rebates for 15 percent of the manufacturer suggested retail price (MSRP), up to \$2,500 per vehicle (which corresponded to about half of the vehicle incremental cost) to qualified individuals and entities.

However, demand for rebates was low from the start of the project. CARB responded by increasing the rebate amount from 15 percent to 25 percent of MSRP in September 2010 to further spur demand. Over the course of the project, 41 vehicle models were approved for rebates, ranging from \$1,374 to \$5,250 per vehicle. However, even with the increased rebate amount, the project did not provide enough money to encourage more agricultural operators to consider purchasing a zero emission utility terrain vehicle. The San Joaquin Valley APCD, the project's grantee, suggested that the biggest hurdle was the amount of the incentive since the rebate was less than the incremental cost.

Project Status

Between February 1, 2010 and December 31, 2011, 56 rebates totaling \$134,509 were issued. As a result of insufficient consumer interest and expenditure deadlines, the project closed on December 31, 2011, and remaining funds were reallocated to other AQIP projects.

Comments

No funding has been made available for this type of project since FY 2009-10.

IV. Recommendations for Future Action

AQIP is working as CARB envisioned. In nearly all cases, demand for funding is meeting or exceeding CARB's expectations.

The technology advancing projects funded through AQIP mark an important step in bringing the next generation of vehicles such as hybrid-electric trucks and ZEVs to California's roadways today. AQIP investments are helping start the fundamental transformation of the California fleet to zero and near-zero emission vehicles that will be needed to meet California's post-2020 SIP commitments and 2020, 2030 and 2050 climate change goals. These investments also help position the State for green job growth.

With the success and popularity of AQIP to date, CARB does not recommend any legislative changes to the program at this time. CARB will continue implementing the program under the existing statutory framework. CARB has designed AQIP as a targeted program focusing on a few key technologies; significantly larger investments will be needed to meet California's overall long-term air quality goals.

While there is a cost-premium for these new, cleaner technologies in their initial roll out, there are also cost savings over their lifetime in many cases in the form of fuel savings and reduced maintenance costs. One of CARB's goals for AQIP is helping reduce the future costs of these new technologies through economies of scale and promoting consumer acceptance, so these advanced vehicles and equipment become mainstream purchasing choices over the next decade without the need for incentives.

AQIP has provided funding for CVRP, HVIP, and demonstrations for advanced emission reduction vehicle technologies since 2009. However, demand for advanced technology demonstration and deployment funding has far exceeded AQIP's budget. Fortunately, the availability of LCT appropriations since FY 2013-14 has allowed the CVRP and HVIP programs to be primarily funded from this source. The majority of AQIP funds are now directed to cleaning up the diesel fleet through the Truck Loan Assistance Program. The focus is helping small-business fleet owners affected by CARB's In-Use Truck and Bus Regulation secure financing for upgrading their fleets with newer and cleaner trucks or with diesel exhaust retrofits. This focus will continue in FY 2016-17 with the Truck Loan Assistance Program receiving almost 90 percent of the funding.