

California Environmental Protection Agency



**2010 BIENNIAL REPORT TO THE LEGISLATURE ON THE
AB 118 AIR QUALITY IMPROVEMENT PROGRAM**

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Executive Summary

The Air Quality Improvement Program (AQIP) is a voluntary incentive program administered by the Air Resources Board (ARB) to reduce smog and diesel particulate pollution with concurrent reductions in greenhouse gas emissions. AQIP was created under the *California Alternative and Renewable Fuel, Vehicle Technology, Clean Air, and Carbon Reduction Act of 2007* (AB 118, chapter 750, Statutes of 2007). It provides \$30-40 million per year (depending on revenues) in funding through 2015 for clean vehicle and equipment projects as well as air quality research and training. ARB is required to report to the Legislature biennially on its implementation of AQIP.

AQIP expands ARB's portfolio of air quality incentives, providing the opportunity to fund projects not covered by ARB's other incentive programs – the Carl Moyer Program, Goods Movement Emission Reduction Program, and Lower-Emission School Bus Program. These other programs focus on near-term emission reductions from fully commercialized emission control technologies. Statute provides broader flexibility for implementing AQIP, and with it, the ability to focus on longer-term air quality goals.

AQIP is ARB's only incentive program structured to allow for investments in technology advancing projects which also provide immediate emission reductions, and ARB is using AQIP funds for this purpose. AQIP investments support the deployment of hybrid-electric vehicles, zero-emission vehicles (ZEV), and other advanced technologies critical to meeting California's post-2020 State Implementation Plan and climate change emission reduction goals. California must start placing these zero- and near-zero emission vehicles on its roadways today to achieve large-scale emission reductions in future decades because of the time it takes for significant fleet turnover.

AQIP investments in advanced technologies also help position the State for green job growth over the next decade. Some of the vehicles or vehicle components funded under AQIP are manufactured in California, and these vehicles and equipment are distributed through extensive local dealership networks. As more of these vehicles enter the California fleet, there will be increasing demand for a well-trained workforce to design, build, service, and maintain these new engines.

Status Update

Fiscal year (FY) 2008-09 funds were directed by the Legislature to a focused truck financing program to support ARB's heavy-duty truck regulations because ARB was still developing the broader AQIP at that time. This report provides an update on the \$35 million truck loan programs ARB developed with this funding.

The FY 2009-10 State Budget appropriations provided the first full year of funding for AQIP projects. All available funding has been awarded, and the majority of those funds have already been expended. Project rollout is working as ARB envisioned. The FY 2009-10 project funding total of \$29 million was dictated by available revenues in the Air Quality Improvement Fund which were nearly 30 percent lower than the amount

appropriated in the State Budget. AQIP projects are presented in Table ES-1. These incentives are primarily in the form of streamlined consumer rebates and vouchers to reduce the purchase price of new vehicles and equipment.

Table ES-1: AQIP Projects Funded in FY2009-10

Project Description	Funding Level (in millions)
Deployment/Commercialization Projects	
Hybrid Truck and Bus Voucher Incentives	\$20.4
Zero-Emission Vehicle and Plug-In Hybrid Light-Duty Vehicle Rebates (Clean Vehicle Rebate Program)	\$4.1
Lawn and Garden Equipment Replacement	\$1.6
Zero-Emission Agricultural Work Vehicle Rebates	\$1.1
Advanced Technology Demonstration Projects	
Locomotive After-treatment Technology Demonstrations	\$1
Hybrid Marine Vessel Demonstration	\$1
TOTAL FUNDING AWARDED	\$29.2

The cornerstone of AQIP for FY 2009-10 is the \$20 million Hybrid Truck and Bus Voucher Incentive Project (HVIP). California’s large funding commitment for hybrid truck technology not only provides emission benefits today, but is likely to enable heavy-duty hybrids to become commonplace in the near future, much the way hybrid cars have become commonplace in the light-duty sector. Hybrid technology for trucks is near a tipping point, and the State’s investment over several years should help it become self-sustaining through production economies of scale.

HVIP proved to be very popular with California truck owners. All available HVIP voucher funding was committed to truck owners and fleets by August 2010, with vouchers issued to put 650 new hybrid trucks on California’s roadways this year. HVIP has garnered national recognition and was named as the nation’s top emerging energy efficiency program by the American Council for Energy Efficient Economy. The success of HVIP has led some local air districts to make corresponding investments in hybrid truck and bus voucher programs following ARB’s model, further leveraging the State’s investment. With this strong demand, ARB is continuing the HVIP for a second year and is in the process of awarding these additional funds.

AQIP is also funding vehicle purchaser incentives for other cleaner technologies – ZEV’s and plug-in hybrid cars, electric lawnmowers, and zero-emission agricultural work vehicles – and demonstration projects for cleaner marine and locomotive engines. These projects are on track as well. In nearly all cases, demand for funding is meeting or exceeding ARB’s expectations.

AQIP investments are an important first step in the fundamental transformation of the California fleet to zero- and near-zero emission vehicles critical to meeting California’s long-term air quality and climate change goals. With the success and popularity of AQIP to date, ARB does not recommend any Legislative changes to the program.

I. Introduction

A. Background on Assembly Bill (AB) 118 and AQIP

The Air Quality Improvement Program (AQIP) is a voluntary incentive program created under the *California Alternative and Renewable Fuel, Vehicle Technology, Clean Air, and Carbon Reduction Act of 2007* (AB 118, chapter 750, Statutes of 2007) to fund clean vehicle and equipment projects and air quality research and training. AQIP focuses on reducing smog and diesel particulate pollution with concurrent reductions in greenhouse gas emissions. AQIP provides \$30-40 million per year (depending on revenues) in funding through 2015, subject to annual appropriations from the Legislature, via increases to the smog abatement, equipment registration, and vessel registration fees. The Air Resources Board (ARB or Board) administers the program.

The AB 118 statute lists 8 broad project types which are eligible for AQIP funding:

- On- and off-road equipment projects.
- 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 1 of 3 incentives programs created under AB 118. The other 2 programs are the California Energy Commission (Energy Commission) Alternative and Renewable Fuel and Vehicle Technology Program and the Bureau of Automotive Repair (BAR) Enhanced Fleet Modernization Program. ARB is coordinating closely with the Energy Commission and BAR to implement these programs and ensure that they complement one another. For example, Energy Commission investments in fueling and charging infrastructure support the ARB's vehicle deployment investments.

B. ARB's Goals for AQIP

AQIP expands ARB's portfolio of air quality incentives, providing the opportunity to fund projects not covered by ARB's other incentive programs – the Carl Moyer Program, Goods Movement Emission Reduction Program, and Lower-Emission School Bus Program. These other programs focus on near-term emission reductions from fully commercialized emission control technologies. Statute provides broader flexibility for implementing AQIP, and with it, the ability to focus on longer-term air quality goals. California must start investing now in the advanced technologies needed to meet our long-term air quality goals, so ARB is using AQIP funds for this purpose. Over

\$200 million annually is being invested by ARB for near-term emission reductions, but AQIP is the only ARB program structured to allow for investments in technology advancing projects.

AQIP funds are supporting the development and deployment of hybrid-electric vehicles, zero-emission vehicles (ZEV), and other advanced technologies which provide immediate emission reductions and are also critical to meeting California's post-2020 federally-mandated State Implementation Plan (SIP) emission reduction targets and climate change goals. With the time it takes for significant fleet turnover, California needs to start placing these zero- and near-zero emission vehicles on our roadways today to achieve large-scale emission reductions in future decades.

C. Development of AQIP

Prior to awarding funding for AQIP projects, ARB adopted regulations which establish the administrative procedures for implementing AQIP in order to ensure that the program is run efficiently, with transparency and public input.

As required in Health and Safety Code (HSC) Section 44274(a), the Board adopted regulatory guidelines in 2009 which 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. The funding plan is each year's blueprint for expending AQIP funds appropriated to the ARB in the annual State Budget: describing the projects ARB intends to fund, establishing funding targets for each project, and providing the justification for these decisions. AQIP guidelines also establish the rules and requirements for soliciting projects and awarding funds.

In addition, the Board adopted AB 118 Air Quality Guidelines as required in HSC Section 44271(b). This regulation, also known as the "anti-backsliding guidelines," ensures that ARB's and the Energy Commission's AB 118 programs complement California's existing air quality programs by maintaining or improving upon emission benefits in the SIP and California's clean fuels regulations.

In recognition that ARB would spend the 2008 fiscal year developing the regulatory guidance necessary to implement AQIP prior to funding projects, the Legislature directed that FY 2008-09 AQIP funds be used to establish a new financial assistance program to help smaller truck fleets affected by ARB's In-Use Truck and Bus Regulation and the Heavy-Duty Vehicle Greenhouse Gas Emission Reduction Regulation. (See HSC Section 44274.7) A status update on the truck loan programs developed with this funding is provided in Chapter II of this report.

D. Report Requirements

There are three separate reporting requirements for AQIP.

First, HSC Section 44274(d) requires ARB to submit a biennial report to the Legislature on the implementation of AQIP. The first report is due by January 1, 2011. The report is required to include a list of funded projects, the benefits of these projects, and recommendations for future actions.

Second, ARB's regulation for implementing AQIP requires ARB 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 ARB to report to the Legislature annually on the implementation of the truck loan program established in the FY 2008-09 State Budget with AQIP funds.

This report is intended to fulfill each of these requirements.

II. Status Update on Fiscal Year 2008-09 Truck Loan Program

Background

As part of the FY 2008-09 State Budget, the Legislature directed that FY 2008-09 AQIP funds be used to establish a truck loan program to assist smaller truck fleets affected by ARB's In-Use Truck and Bus Regulation and the Heavy-Duty Vehicle Greenhouse Gas Emission Reduction Regulation. About \$35 million in funding is available to implement the program, referred to as Providing Loan Assistance for California Equipment (PLACE). Since the program's inception in mid-2009, ARB has successfully implemented 2 distinct but complementary loan program components that have provided financing to eligible small business owners for the purchase of newer, cleaner trucks; diesel emission control devices such as particulate traps (exhaust retrofits); and SmartWay technologies certified by the United States Environmental Protection Agency (U.S. EPA) that improve vehicle aerodynamics to reduce greenhouse gas emissions.

The first program component is a loan guarantee program developed in partnership with the California Pollution Control Financing Authority (CPCFA) within the State Treasurer's Office, which launched in April 2009. Tailored to meet the specific needs of the trucking sector, this component builds on the CPCFA's highly successful California Capital Access Program (CalCAP), which provides a stable financing structure enabling eligible financial institutions to provide competitive-rate loans to small businesses that fall just outside of conventional underwriting standards.

Small trucking fleets and independent owner-operators often have faced severe challenges obtaining conventional loans from traditional banks, and these challenges have been magnified in the current economic environment and tighter credit market. At times, these truckers are charged interest rates of up to 30 percent. As a result of ARB working closely with CPCFA, statutory changes to CalCAP in late 2009 expanded lender eligibility to include additional lenders such as truck manufacturers' financing divisions. These changes increased the accessibility of the program for California's truckers. Consequently, demand for ARB's loan program increased substantially in early 2010 as shown in Figure II-1.

In the second program component, ARB successfully demonstrated a pilot revolving loan/lease-to-own program administered by Cascade Sierra Solutions (CSS), a non-profit organization dedicated to saving fuel and reducing emissions from heavy-duty diesel vehicles. The pilot launched in June 2009, and all funds were spent by mid 2010.

Program Performance

As shown in Table II-1, both program components leverage AQIP funds (at a minimum ratio of 7:1) to significantly increase the amount of funding available to fleet owners for financing eligible vehicles and equipment. Through October 2010, PLACE has provided \$32 million in financing for the purchase of nearly 500 trucks and over 300 exhaust

retrofits, with interest rates ranging from 6 to 18 percent and an average interest rate of about 10 percent.

Figure II-1: Loans Financed through CPCFA Loan Guarantee Program By Quarter

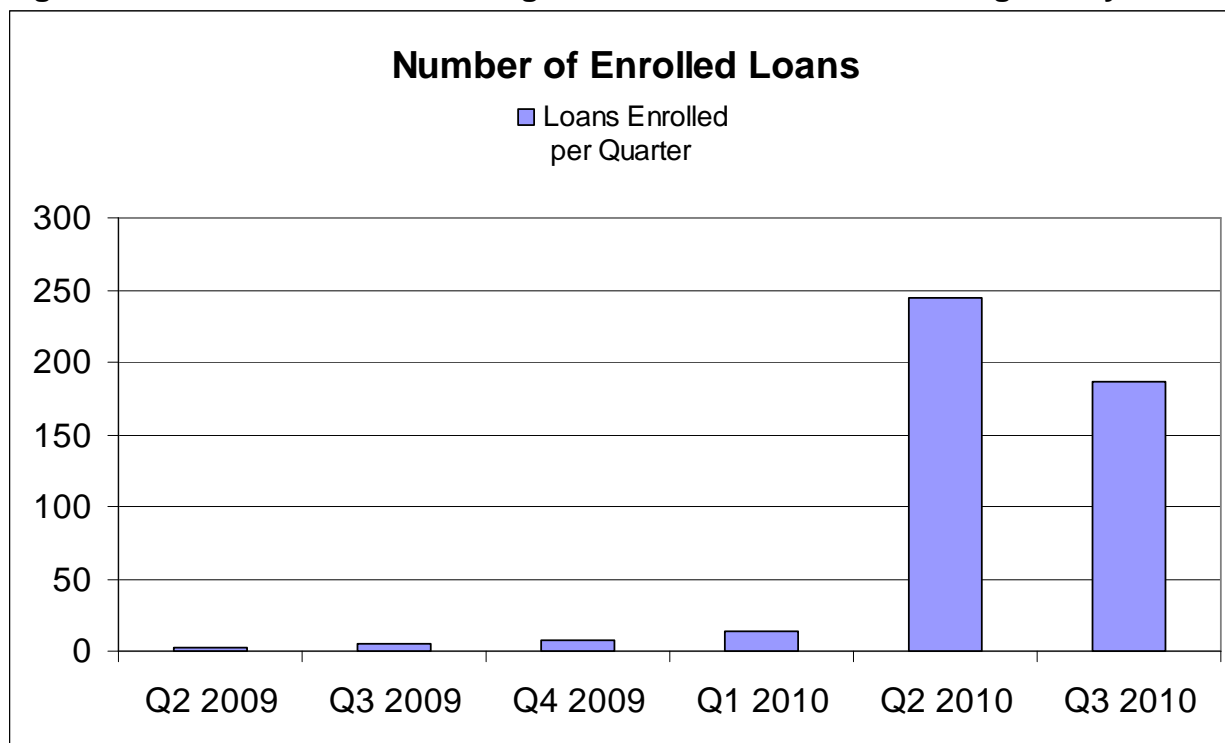


Table II-1: Vehicles/Equipment Financed through PLACE

Program	Number of Loans Issued	Number of Projects Financed	Project Type	Project Location	AQIP Funds Spent ¹ (\$ Million)	Total Financed ¹ (\$ Million)
CPCFA Loan Guarantee	486	412	New/Used Truck	Statewide	\$3.54	\$25.1
		1	Trailer			
		158	Exhaust Retrofit			
CSS Pilot	228	64	New truck	Southern California	\$0.71 ²	\$6.9
		164	Exhaust Retrofit			
Total	714	799			\$4.25	\$32

¹Total as of October 31, 2010.

²All available funding for this program component has been spent.

In ARB's evaluation, financial assistance programs that support regulatory measures are traditionally slow to ramp up but generally become over-subscribed as regulatory deadlines approach. The slow ramp up in the loan guarantee program component has been beneficial in providing ARB with additional time to evaluate and refine both program implementation and program criteria to best serve the needs of the targeted

trucking fleets. However, with the aforementioned statutory changes to CalCAP, loan guarantee activity has risen significantly due to the expansion in the participating lender base, which is more aligned to cater to the trucking sector. ARB anticipates another activity surge as regulatory deadlines near.

A Look Ahead to Future Years

CPCFA loan guarantee program will continue to be a core component of ARB's PLACE program. However, ARB is currently evaluating different mechanisms to augment PLACE in order to improve our ability to meet the needs of California's truck owners in light of potential changes to regulatory compliance deadlines. Based on the success of the CSS pilot program and its ability to quickly get cleaner trucks on the road, a direct loan/lease program using a portion of the remaining PLACE funds may be a significant financial assistance tool to serve small fleets in the trucking sector that are unable to obtain competitive-rate financing elsewhere. ARB is considering a program structure that utilizes a fund manager to implement the program, but that provides ARB direct control in setting competitive interest rates and other loan terms. Loan repayments would be used to sustain and grow the loan fund thereby increasing ARB's ability to financially assist truckers.

III. Status Update on Fiscal Year 2009-10 AQIP Projects

ARB has awarded the entire \$29 million available for AQIP projects in FY 2009-10. This project funding total reflects the FY 2009-10 revenues in the Air Quality Improvement Fund after accounting for ARB's budgeted costs for administering the program. The State Budget for FY 2009-10 included a \$44 million appropriation to ARB for the AQIP.¹ However, revenues into the fund (which come primarily from smog abatement fees on newer cars) were nearly 30 percent lower than this appropriated amount, so ARB had to scale back its AQIP project funding accordingly. This chapter provides a summary of the projects funded in FY 2009-10.

A. Funding Plan for Fiscal Year 2009-10

In April 2009, the Board approved the *AB 118 Air Quality Improvement Program Funding Plan for Fiscal Year 2009-10*. This funding plan establishes ARB's guiding principles and funding priorities for AQIP, lists the projects to be funded, and establishes funding targets for each project. The funding plan also includes contingency provisions allowing for mid-year refinements if necessary. ARB used these contingency provisions to revise project funding levels in response to the lower revenues.

The advanced technologies ARB is promoting through AQIP – hybrid trucks and ZEVs among others – will help meet multiple long-term air quality goals. For example, hybrid trucks are included as one of the measures in ARB's *Climate Change Scoping Plan*, and consumer rebates for ZEVs are a critical early step to help ensure the success of ARB's ZEV regulation. Both hybrids and ZEVs are identified as technologies to help meet ARB's post-2020 advanced technology SIP commitments for attaining the federal air quality standards.

These projects provide both immediate emission reductions from the vehicles directly funded and, more importantly, set the stage for greater, indirect reductions in the future by accelerating large-scale penetration of these advanced technologies. These indirect longer-term program benefits accrue from:

- Reducing production costs through economies of scale so the technologies become more cost-competitive and self-sustaining in the future.
- Accelerating technology transfer to other sectors, such as promoting the transfer of zero-emission and hybrid technologies from on-road vehicles to off-road equipment and marine vessels.
- Promoting consumer acceptance so that advanced technologies become mainstream consumer choices.

¹Budget appropriation reflects \$2 million redirection from the Air Quality Improvement Fund for local assistance to the Oakland Unified School District for air quality projects. [Senate Bill (SB) X3 1 (2009)]

AQIP has a different focus than the Carl Moyer Program and the Goods Movement Emission Reduction Program, whose main objectives are near-term emission reductions with the ancillary benefit of technology advancement. ARB's main objective for AQIP is long-term emission reductions through technology advancement with corresponding smaller-scale near-term emission reductions. These technology advancing projects are generally not as cost-effective as fully commercialized technologies when only the direct, near-term emission reductions are measured. However, the full benefit of AQIP comes from the harder-to-quantify long-term, multiplier benefits resulting from accelerating the deployment of these cleanest technologies into the California fleet.

AQIP investments in advanced technologies also help position the State for green job growth over the next decade. Some of the vehicles or vehicle components funded under AQIP are manufactured in California, and these vehicles and equipment are distributed through extensive local dealership networks. As more of these vehicles enter the California fleet, there will be increasing demand for a well-trained workforce to design, build, service, and maintain these new engines. The Energy Commission is investing \$15 million in workforce training through its AB 118 program. ARB is working closely with the Energy Commission to ensure that these training investments support the technologies ARB is funding through AQIP. ARB will consider its own investments in workforce training in future years.

B. Overview of Projects

ARB chose to focus AQIP funds on a few key projects rather than providing a small amount of funding across many categories. By taking this approach, ARB expects AQIP will have a larger impact in helping advance these key technologies. Table III-1 presents a list of the project categories selected for funding in FY 2009-10. ARB gave priority to technologies ready for immediate on-the-ground deployment.

Table III-1: AQIP Projects Funded in FY2009-10

Project Description	Funding Level (in millions)
Deployment/Commercialization Projects	
Hybrid Truck and Bus Voucher Incentives	\$20.4
Zero-Emission Vehicle and Plug-In Hybrid Light-Duty Vehicle Rebates (Clean Vehicle Rebate Program)	\$4.1
Lawn and Garden Equipment Replacement	\$1.6
Zero-Emission Agricultural Work Vehicle Rebates	\$1.1
Advanced Technology Demonstration Projects	
Locomotive After-treatment Technology Demonstrations	\$1
Hybrid Marine Vessel Demonstration	\$1
TOTAL FUNDING AWARDED	\$29.2

The cornerstone of AQIP for FY 2009-10 is the \$20 million Hybrid Truck and Bus Voucher Incentive Project (HVIP), aimed at getting about 650 new hybrid medium- and

heavy-duty vehicles on California's roadways this year. California's large funding commitment for hybrid truck technology will not only help it become established in the market, but hopefully become commonplace in the near future, much the way hybrid cars have become commonplace in the light-duty sector. Hybrid technology for trucks is near a tipping point, and the State's investment over several years should help it become self-sustaining through production economies of scale.

Complementing the hybrid truck and bus incentives, AQIP is also funding vehicle purchaser incentives for other cleaner technologies – ZEVs and plug-in hybrid cars, electric lawnmowers, and zero-emission agricultural work vehicles – and demonstration projects for cleaner marine and locomotive engines.

The remainder of this chapter provides a summary of each of the funded projects.

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

For FY 2009-10, AQIP provides about \$20 million for vouchers to reduce the purchase price of new hybrid trucks and buses for California fleets. A hybrid-electric vehicle typically uses an electrical motor and a gasoline- or diesel-powered engine, which work in tandem to reduce emissions and fuel consumption. Hybrid vehicle technology significantly reduces criteria pollutant, air toxic, and greenhouse gas emissions – particularly in urban delivery vehicles, refuse trucks, work trucks, buses, and other vehicles with high stop-and-go or idling duty cycles. Hybrid vehicles also provide significant fuel economy benefits and fuel cost savings to the fleet owner and therefore have the potential to be self-sustaining with some reductions in the upfront vehicle cost.

Significant market penetration of hybrid trucks and buses will help California meet its long-term SIP and climate change goals. One of the measures in ARB's *Climate Change Scoping Plan* calls for increased use of hybrid trucks in California by 2020. The State's investment in HVIP at this time is intended to accelerate the introduction of hybrid technology into California's truck fleet, bringing down vehicle costs, so larger-scale market penetration can occur. At the federal level, U.S. EPA and the National Highway Traffic Safety Administration have proposed national greenhouse gas and fuel efficiency standards for heavy-duty trucks for the first time, providing further impetus for investments in hybrid truck technology.

ARB partnered with the non-profit CALSTART, selected via competitive solicitation, to implement the HVIP in FY 2009-10. HVIP is the nation's first program to directly reduce the up-front cost of a hybrid truck or bus, with fleets able to secure a voucher through their dealer as part of their vehicle purchase order. The voucher covers approximately half of the cost difference between a hybrid vehicle and a comparable, conventional diesel model. This streamlined approach – with eligible vehicles and preset voucher amounts available on a first-come, first-served basis – has proven popular with vehicle dealers, manufacturers, and California fleets. The program launched in February 2010, and all available voucher funds were allocated to truck purchasers by August 2010 with a total of 653 vouchers issued at an average voucher amount of about \$30,000. It

generally takes several months for vehicles to be delivered, so ARB expects most of the vehicles will be delivered and on the road by the end of 2010.

The program has garnered national recognition and was named as the nation’s top emerging energy efficiency program by the American Council for Energy Efficient Economy. The success of ARB’s program has led some local air districts to make corresponding investments in hybrid voucher programs following ARB’s model. The South Coast Air Quality Management District is providing an additional \$1.4 million – implemented through HVIP – to help fleets purchase hybrid trucks and buses in the South Coast region. The Sacramento Metropolitan Air Quality Management District has started a \$500,000 program to fund hybrid trucks and buses using HVIP voucher amounts and vehicle eligibility list. These local investments further leverage the State’s investment and will bring additional hybrid vehicles to California.

Table III-2 summarizes the types of vehicles funded in the first year of HVIP. The majority of vehicles purchased are urban delivery vehicles. These applications, with a lot of starting, stopping, and idling, are most suited to hybrid technology at this time.

Table III-2: Types of Vehicles Funded

Vehicle Type	Number of Vouchers Issued
Beverage Delivery	302
Parcel Delivery	122
Uniform and Linen Delivery	111
Food Distribution	42
Bus	27
Propane Pick-up and Delivery	22
Other	27
TOTAL	653

Table III-3 shows the distribution of vehicle vouchers by California region. As expected, demand for the vehicles was greatest in California’s largest urban areas with the highest number of delivery vehicles and urban buses.

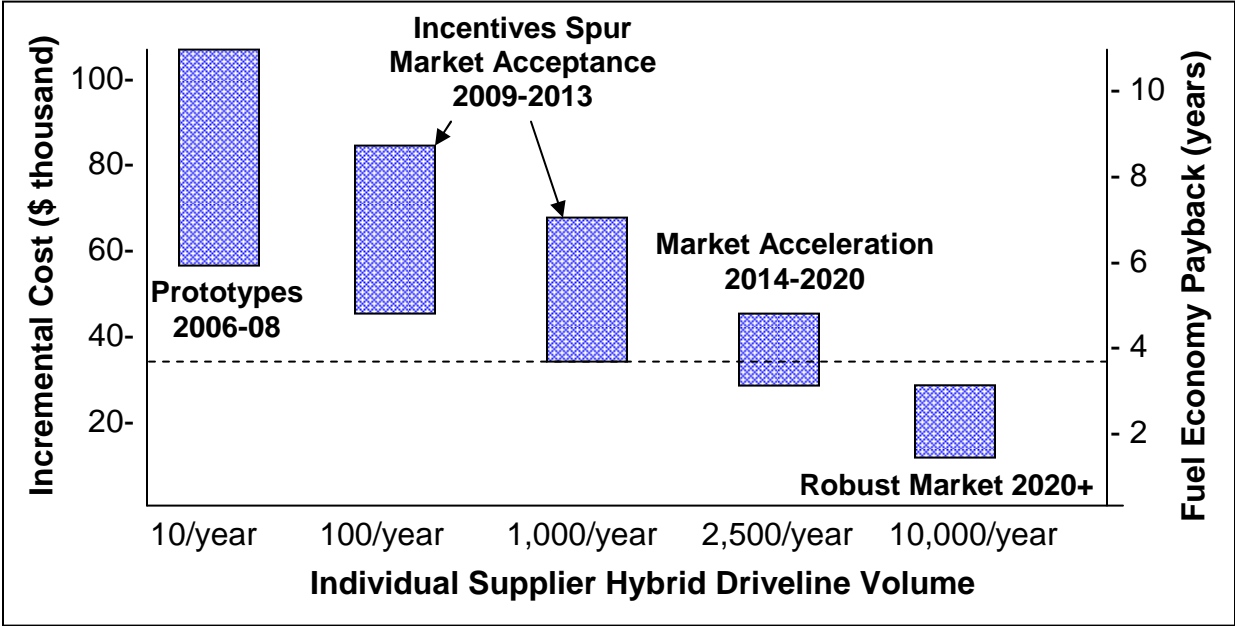
Table III-3: Regional Distribution of Vehicles Funded

Region	Number of Vouchers Issued
South Coast	309
Bay Area	232
Sacramento	44
San Joaquin Valley	32
San Diego	22
Other	14
TOTAL	653

Role of HVIP and Economies of Scale

HVIP plays a critical role in accelerating early market penetration of hybrid technology with the goal of significant fleet penetration of these vehicles into California by 2020. Production capacity has significant growth potential, but current low production volumes result in a \$30,000 to \$70,000 hybrid vehicle cost premium. ARB expects production costs to decline significantly as hybrid driveline production volumes reach 2,500 to 5,000 annually per manufacturer as shown in Figure III-1. When this occurs, the fuel economy payback period should shorten to the point where a hybrid truck purchase is economical without incentives and the technology is self-sustaining.

Figure III-1: Development of Hybrid Market – Cost Vs. Production Volume



ARB envisions HVIP as a 3-or-4 year project, funding 500-1,000 vehicles per year, to bridge this gap. Incentives for hybrid truck purchases in other states and at the federal level complement ARB’s investment, helping increase the production volumes to the levels needed for self-sustainability.

The cost of the batteries used in hybrid systems is one of the potential barriers to cost-competitiveness. Accordingly, development of more efficient, more durable, and lower cost batteries is a priority both for California and nationally. The federal government is investing significant funding toward reducing battery costs and increasing battery manufacturing capacity in the United States. The United States Department of Energy anticipates these investments will help increase battery range while halving their costs by 2013. Federal investments in battery technology dovetail with both ARB’s heavy-duty hybrid and light-duty electric vehicle programs.

Also complementing ARB’s effort to increase the use of hybrid trucks in California is the California Hybrid, Efficient and Advanced Truck (CalHEAT) Research Center funded by

the Energy Commission, which has the goal of making trucks 50 percent more efficient in 10 years. The center serves as a California-based resource for research, development, demonstration, and commercialization of advanced, efficient truck technologies and systems. As part of this effort, the center is developing an overall research and a market transformation plan for hybrid technologies. This plan will build on the success of HVIP.

HVIP Emission Benefits

Accelerating the large-scale penetration of hybrid trucks and buses will have significant long-term air quality benefits beyond the immediate benefits from AQIP-funded vehicles. As noted earlier in this report, HVIP has a different focus than ARB's other air quality incentive programs (such as the Carl Moyer Program) which focus on directly quantifiable, near-term emission reductions. HVIP complements these existing programs by targeting longer-term benefits of accelerating deployment of hybrid truck and bus technology at this initial commercialization stage. The indirect "multiplier" benefits of a successful HVIP include higher production volumes yielding lower vehicle costs, acceleration of hybrid technology research and investment, and increased consumer acceptance. These long-term benefits of HVIP are real and necessary for a robust hybrid truck market, but they are also difficult to quantify.

The emission benefits of hybrid technology can vary widely, depending upon factors such as vehicle configuration, load, vocation, mileage, duty cycle, and even driver performance. In estimating the direct emission benefits of the 653 vehicles funded by HVIP in FY 2009-10, ARB assumes a 25 percent oxides of nitrogen (NO_x) and carbon dioxide (CO₂) reduction for a hybrid truck relative to a comparable 2010 model year diesel truck. ARB also assumes a conservative 10 year vehicle life. These vehicles will achieve lifetime benefits of 100 tons of NO_x and 0.1 million metric tons of CO₂ reductions. When the hybrid vehicle market becomes self-sustaining, ARB expects annual hybrid truck and bus sales in California first in the thousands and then in tens of thousands. This will result in benefits several orders of magnitude larger than those estimated for the 653 vehicles funded by HVIP this year.

A Look Ahead to FY 2010-11 and Future Years

ARB envisions HVIP as a 3 or 4 year project to bridge the gap until the market is self-sustaining without incentives. In June 2010, the Board approved the *AQIP Funding Plan for FY 2010-11* which includes a funding target of up to \$25 million to continue HVIP for a second year. ARB is again projecting lower AQIP revenues than the amount appropriated in the State Budget based on the first several months of the fiscal year, so ARB will initially provide \$19 million for HVIP with the provision to increase funding if there is sufficient revenue by the end of the fiscal year.

HVIP is working as envisioned, so ARB plans only minor refinements to the program for the second year. For example, voucher amounts for the most popular vehicle classes are being reduced in recognition that the incremental cost of the hybrids are projected to

come down as production volumes increase. ARB issued a competitive solicitation to select a grantee to implement the second year of HVIP once the Governor signed the State Budget in October 2010. ARB expects voucher funds will be available to vehicle purchasers starting in January 2011.

2. Clean Vehicle Rebate Project (CVRP) for Zero-Emission and Plug-In Hybrid Light-Duty Vehicles

For FY 2009-10, AQIP provides \$4.1 million in consumer rebates for light-duty zero-emission and plug-in hybrid vehicles and zero-emission commercial trucks being introduced in California in 2010 and 2011. Rebates serve to offset a portion of the higher cost of these advanced automotive technologies. Zero- and near-zero emission vehicles are a key element of California's plan for meeting health based air quality standards and climate change goals. The vehicle fleet will need to be fundamentally transformed to meet California's 2050 greenhouse gas emission reduction goals, with zero-emission and hybrid vehicles making up a significant fraction of the light-duty fleet. Specifically, the 2007 *State Alternative Fuels Plan* envisions a 2050 vehicle fleet where 40 percent of California's transportation fuel is electricity or hydrogen.

The State's early investment in zero-emission and plug-in hybrid technologies will prime the market for the larger number of vehicles needed over the next decade and beyond to meet these ambitious targets as well as ensure the success of ARB's ZEV regulation. The Board envisioned the need for consumer rebates in the early years of the ZEV rollout because consumer acceptance is a critical early step towards widespread commercialization. The State's investment through the CVRP – coupled with corresponding investments in vehicle charging and fueling infrastructure by the California Energy Commission and federal government – is bringing more of these vehicles to California because manufacturers are choosing to focus early vehicle deployment in the regions with greatest local investments.

ARB has partnered with the non-profit California Center for Sustainable Energy, selected via competitive solicitation, to implement the CVRP statewide. The program launched in March 2010. The CVRP offers vehicle rebates on a first-come, first-served basis for light-duty ZEVs, commercial ZEVs (such as electric delivery trucks), zero-emission motorcycles, and neighborhood electric vehicles. About 20 different vehicle models are currently eligible, the majority of which are neighborhood vehicles. Additional vehicles are routinely added as manufacturers bring new models to market. Rebate amounts range from \$1,500 for motorcycles and neighborhood vehicles to \$5,000 for full functioning ZEVs and \$20,000 for heavy-duty commercial electric trucks.

ARB anticipated a slow initial launch to the CVRP because vehicle choice is currently limited, but wanted the consumer rebates in place before vehicle production increases to send a strong signal to manufacturers and consumers about California's commitment to support the ZEV roll out. Demand will pick up substantially as more full-functioning ZEVs (such as the Nissan Leaf) and plug-in hybrid vehicles hit the market in late 2010

and in 2011. Nissan has announced that the Leaf will be available for purchase in December 2010 and is already taking vehicle reservations from consumers. ARB expects about 2,000 Leafs to be sold in California by the end of 2011, and other eligible vehicles are expected to be introduced in 2011. We expect the FY 2009-10 CVRP funds to be fully expended by the second quarter of 2011 and anticipate that demand for funding will soon exceed levels that AQIP can meet, as discussed below. Table III-4 summarizes the rebates issued through October 2010. 113 rebates, totaling just over \$500,000 or 13 percent of the available funding, have been awarded.

Table III-4: Summary of CVRP Rebates

Vehicle Type	Rebates Issued¹	Total Rebate Amount¹
Zero-Emission Motorcycles	37	\$55,500
Neighborhood Electric Vehicles	9	\$11,800
Light-Duty ZEVs	58	\$290,000
Commercial ZEVs (trucks)	9	\$180,000
TOTAL	113	\$537,300

¹Total as of October 31, 2010.

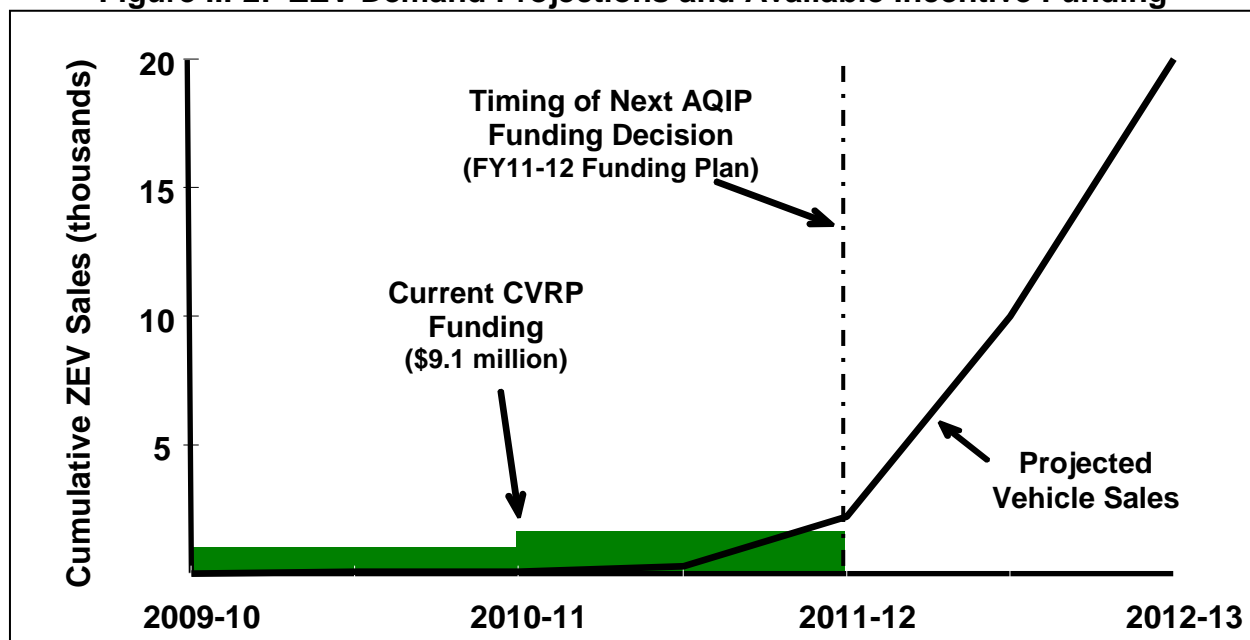
A Look Ahead to FY 2010-11 and Future Years

The Board-approved *AQIP Funding Plan for FY 2010-11* includes a funding target of \$5 million to continue the CVRP for a second year. In establishing this funding target, ARB took into account that most of the FY 2009-10 CVRP funds are still available. The 2-year \$9 million funding total is sufficient to provide \$5,000 consumer rebates for about 1,600 full function ZEVs (after deducting administrative costs). Based on discussions with manufacturers on projected vehicle roll out schedules and volumes, ARB believes this funding level will sustain the CVRP through the middle of 2011, at which time future funding will be evaluated as part of the next AQIP Funding Plan.

ARB is making only minor refinements to the CVRP for the second year because the project is working as envisioned. Rebate amounts remain unchanged. One notable change is that ARB shifted the commercial zero-emission truck category from CVRP to HVIP. This change will make it easier for truck purchasers to access funds because the process for purchasing commercial ZEVs more closely reflects that of hybrid trucks. ARB issued a competitive solicitation to select a grantee to implement the second year of the CVRP once the Governor signed the State Budget in October 2010, and expects to select a grantee by December 2010. ARB will not expend any of the FY 2010-11 CVRP rebate funds until the previous year's funding is exhausted.

Demand for ZEVs and plug-in hybrids is expected to increase to tens of thousands of vehicles over the next several years as more models come to market. Figure III-2 shows a graph of expected demand for ZEVs in California through 2013 based on the milestones in the ZEV regulation and discussions with vehicle manufacturers.

Figure III-2: ZEV Demand Projections and Available Incentive Funding



The figure shows that ARB expects its available incentive funds should meet consumer demand through the middle of 2011. However, as manufacturers ramp up ZEV and plug-in hybrid production in the 2012-2014 timeframe, the CVRP will not be able to keep pace. There will not be enough funding to meet the demand at current rebate levels. At this point, ARB will need to revamp the CVRP. Changes may include reducing rebate amounts, revising vehicle eligibility criteria, and partnering with other agencies to expand funding. This redesign of the CVRP will be a major focus of the FY 2011-12 AQIP Funding Plan.

3. Lawn and Garden Equipment Replacement (LGER) Project

For FY 2009-10, AQIP provides \$1.6 million in rebates for consumers who scrap old gasoline powered lawn mowers and replace them with zero-emission models. The LGER funds are being used to expand local air districts' lawn mower replacement programs. These district programs have been popular with consumers and successful in reducing emissions, but limited in scope due in part to lack of local funding. The LGER project provides significant State funding for lawn and garden equipment for the first time; this equipment has not been part of the Carl Moyer Program or other ARB incentive programs. Reducing emissions from lawn and garden equipment is one of the emission sources specifically identified as eligible for funding in the AB 118 statute. ARB believes this funding will also encourage development of zero-emission technology in the commercial lawn and garden equipment sector in addition to the residential equipment currently available.

The LGER project is open to any air district designated as non-attainment for the federal eight-hour ozone standard, with a focus on those districts with the worst air quality and

highest population. ARB requires each district to match AQIP funding with an equal amount of local funding to ensure that State funds are used to expand air districts' own programs not merely shift the funding source.

In early 2010, ARB awarded funding via competitive solicitation to 8 local air districts to augment their existing lawn mower exchange programs. Air districts started holding AQIP-funded lawn mower exchange events for consumers in March 2010, with events continuing through the summer and fall. Table III-5 lists the districts that received funding and summarizes their implementation progress. Consumer demand has been strong, and most air districts have fully expended their funding. Consumers have replaced nearly 8,000 mowers to date with an average discount of \$190 for each new mower purchased. These new zero-emission mowers will reduce smog forming and particulate emissions by 3.3 tons per year or 17 tons over a 5 year life. As shown in Table III-5, over 95 percent of the total funding has been spent to date. A number of districts plan to spend these funds over 2 years, so the remaining funding will be spent in 2011.

Table III-5: LGER Project Status

Air District	AQIP Funds Awarded	AQIP Funds Spent To Date¹	Mowers Replaced To Date¹
South Coast	\$816,000	\$816,000	4,690
San Joaquin Valley	\$464,000	\$464,000	1,670
San Diego ²	\$150,000	\$96,854	393
Sacramento	\$75,000	\$75,000	682
Ventura County	\$50,000	\$50,000	242
Yolo/Solano ²	\$25,000	\$14,652	136
Antelope Valley	\$10,000	\$10,000	50
Mojave	\$10,000	\$9,600	48
TOTAL	\$1,600,000	\$1,536,106	7,911

¹Total as of November 15, 2010.

²District plans to spend funds over two years.

A Look Ahead to FY 2010-11 and Future Years

The Board-approved *AQIP Funding Plan for FY 2010-11* includes a funding target of \$1 million to continue the LGER project for a second year. The LGER exchange events have been quite popular with consumers, and the project is working as envisioned, so no major changes in program design are planned for the second year.

For future years, ARB is considering shifting zero-emission lawn mower replacement projects from AQIP to the Carl Moyer Program in part based on the success of the LGER project. However, ARB is still interested in using AQIP to support the expansion of zero-emission technology from residential equipment to the commercial sector. Zero-emission commercial lawn and garden equipment is not yet to the commercialization stage, and ARB may consider AQIP demonstration projects for advanced zero-emission commercial lawn and garden equipment to help bring them to market quickly.

4. Zero-Emission Agricultural Utility Terrain Vehicle Rebate Project

For FY 2009-10, AQIP provides \$1.1 million in rebates for purchases of new, zero-emission utility terrain vehicles (UTV or work vehicles) used in the agricultural industry. This is a first step in bringing advanced technology equipment into the agricultural sector. The number of UTVs used in the California agricultural industry is second only to the number of agricultural tractors. These vehicles are used extensively to inspect crops and livestock, inspect and repair irrigation systems and fence lines, fertilize and apply chemicals, supervise field crews, herd livestock, transport dirt, and perform other work-related activities. Immediate emission reductions of criteria pollutants and greenhouse gases can be achieved from these sources by switching to zero-emission technology. While electric UTVs are commercially available, the cost premium for these vehicles can be a deterrent to purchase.

ARB has partnered with the San Joaquin Valley Unified Air Pollution Control District, selected via competitive solicitation, to implement the statewide Agricultural UTV Rebate Project. The project launched for consumers in April 2010. A total of 28 vehicle models from 6 different manufacturers are currently available. Only vehicles used in the agricultural industry are eligible for funding; recreational vehicles are not eligible. In its initial design, the rebates were available for 15 percent of the manufacturer's suggested retail price, up to a maximum of \$2,500, which corresponds to about half the incremental cost between an electric vehicle and a corresponding, conventionally fueled model.

Initial demand for rebates has been slow, with 15 rebates issued as of October 31, 2010, accounting for less than 5 percent of the available funding. Infrastructure requirements, battery range and recharge time, combined with unfamiliar technology and higher purchase costs are likely deterring purchases. After monitoring demand for the project's first 5 months and discussing options with stakeholders, ARB increased the rebate amount to 25 percent in September 2010 consistent with Board-approved contingency provisions in the AQIP Funding Plan. ARB expects demand to increase now that a larger incentive is available, but will continue to closely monitor progress.

A Look Ahead to FY 2010-11 and Future Years

The Board-approved *AQIP Funding Plan for FY 2010-11* includes a funding target of up to \$500,000 to continue the Agricultural UTV Rebate Project for a second year. ARB included potential second year funding to send a signal to manufacturers and stakeholders about its strong support for zero-emission technology in agricultural applications. However, ARB will not release this additional funding unless current year demand increases. The Funding Plan includes contingency provisions to redirect funding to other categories if warranted.

ARB may also consider other approaches to encourage the use of zero-emission work vehicles for agricultural operations such as a demonstration program which would allow users to field-test these vehicles on a short-term basis to become more familiar with the technology and evaluate whether it meets their needs.

5. Advanced Technology Demonstration Projects

The majority of AQIP funds are being directed to deploy advanced technology vehicles and equipment which have just reached the commercialized stage of their development. However, ARB believes it is important to also direct some funding to demonstrate technologies that are not yet commercialized in order to help accelerate their development. Successful demonstration projects from the early years of AQIP may well become deployment projects in later years because ARB is focusing its demonstration funding on technologies within three years of commercialization.

For FY 2009-10, AQIP provides \$2 million for demonstration projects. This funding is available for local air districts and other public agencies to demonstrate promising emission reduction technologies in partnership with technology providers. ARB had planned a larger allocation for demonstration projects, but scaled back due to the lower than anticipated AQIP revenues. ARB prioritized the locomotive and marine categories for funding this year and deferred the remaining potential demonstration project categories from the Funding Plan (off-road equipment, agricultural equipment, and transit or school bus projects) until FY 2010-11. ARB requires a cost-share of at least 50 percent by the grantees for demonstration projects to ensure a local buy-in and leverage AQIP funds.

Locomotive Demonstration Projects

In June 2010, ARB awarded \$1 million via competitive solicitation to demonstrate advanced after-treatment emission retrofits (particulate filters) on medium-horsepower locomotives. ARB identified this technology as a high priority in its August 2009 *Technical Options to Achieve Additional Emissions and Risk Reductions from California Railroads*. Awards were made for three separate projects:

- \$500,000 to the Sacramento Metropolitan Air Quality Management District to demonstrate a particulate filter on a locomotive that operates in regional service between Oakland and Roseville.
- \$350,000 to the Port of Los Angeles to demonstrate a particulate filter on a multiple engine switcher locomotive operating at an intermodal container transfer facility servicing the ports of Los Angeles and Long Beach.
- \$150,000 to the South Coast Air Quality Management District to demonstrate a particulate filter on a switcher locomotive operating at the ports of Los Angeles and Long Beach.

These retrofits have the potential to reduce diesel particulate emissions by up to 85 percent. If successful, the retrofitted engines would be the cleanest currently available. These locomotive projects are scheduled to begin their operational demonstration phase in the summer of 2011 with final testing and an evaluation report completed by mid-2012.

At the end of the demonstration period, each technology provider is expected to continue toward ARB verification of their retrofit devices if the projects are successful. With ARB verification, Carl Moyer Program funds may be available to fund future retrofits of a sizable population of locomotives operating in and around California communities as these projects are expected to meet the Carl Moyer Program cost-effectiveness limits.

Marine Engine Demonstration Project

In June 2010, ARB awarded \$1 million via competitive solicitation to the Port of Long Beach to demonstrate the use of hybrid technology to reduce emissions from marine vessels by converting an existing diesel tugboat to operate with a diesel-electric hybrid engine. The hybrid engine has the potential to reduce NO_x emissions by 50 percent and fuel use by 20 percent compared to a conventional diesel engine. This project supports ARB's goals of demonstrating hybrid technology in off-road applications and providing an alternative compliance mechanism for ARB's harbor craft regulation.

The tugboat project will begin operational testing at the ports of Long Beach and Los Angeles in the summer of 2011, with project completion by mid-2012. If successful, the converted tugboat is expected to remain in service at the ports beyond the scheduled demonstration period, and the technology provider intends to formally validate the emission reductions which would allow these types of project to be funded through the Carl Moyer Program.

A Look Ahead to FY 2010-11 and Future Years

The Board-approved *AQIP Funding Plan for FY 2010-11* includes a funding target of \$5.5 million for advanced technology demonstration projects in the locomotive, marine, off-road and agriculture, and transit and school bus categories. Priority will be given to projects deferred from the previous funding plan due to revenue constraints.

The FY 2010-11 Funding Plan also includes up to \$3 million in funding for a hybrid off-road equipment pilot project to encourage development and deployment of hybrid off-road construction equipment in California. With the success of HVIP for on-road trucks, ARB is interested in extending AQIP hybrid funding to off-road equipment. This pilot project will help ARB evaluate near-term viability of this technology in various off-road vocations, and the corresponding emission benefits and fuel savings. If successful, this pilot project could provide the foundation for a more comprehensive hybrid equipment voucher project in future AQIP funding years. This category had originally been

considered for demonstration funding. However, two manufacturers have introduced commercially available hybrid construction equipment models over the past year, so ARB believes this technology has progressed past the demonstration phase and is ready for incentive funding to increase its use in California.

IV. Conclusions

AQIP is working as ARB envisioned. HVIP, the largest part of AQIP at about 70 percent of the total available FY 2010-11 funding, proved to be very popular with California truck owners. All available HVIP funding was committed by August 2010 with vouchers issued to bring 650 new hybrid trucks to California's roadways. The other AQIP project awards in this first year are on track as well. In nearly all cases, demand for funding is meeting or exceeding ARB's expectations.

The technology advancing projects funded through AQIP mark an important first 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 2050 climate change goals. These investments also help position the State for green job growth.

With the success and popularity of AQIP to date, ARB does not recommend any legislative changes to the program at this time. ARB will continue implementing the program under the existing statutory framework. ARB anticipates that the AQIP will continue to be popular with consumers as California vehicle and equipment owners embrace new technologies which reduce emissions. Demand for advanced technology demonstration and deployment funding is expected to outpace the available AQIP funds, so ARB will need to decide how to best invest these limited resources. ARB 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 ARB'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.