

FINAL APPROVED  
FISCAL YEAR 2014-15  
FUNDING PLAN  
FOR THE  
AIR QUALITY IMPROVEMENT PROGRAM  
AND  
LOW CARBON TRANSPORTATION  
GREENHOUSE GAS REDUCTION FUND INVESTMENTS

Approved: June 26, 2014



# ACRONYMS

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AB	Assembly Bill
APCD	Air Pollution Control District
AQIP	Air Quality Improvement Program
AQMD	Air Quality Management District
ARB or Board	Air Resources Board
BAR	Bureau of Automotive Repair
BEV	Battery Electric Vehicles
Cal/EPA	California Environmental Protection Agency
CVRP	Clean Vehicle Rebate Project
Energy Commission	California Energy Commission
EFMP	Enhanced Fleet Modernization Program
FCEV	Fuel Cell Electric Vehicle
FY	Fiscal Year
GHG	Greenhouse Gases
GGRF	Greenhouse Gas Reduction Fund
HC	Hydrocarbons
HHD	Heavy-Heavy Duty
HVIP	Hybrid and Zero Emission Truck and Bus Voucher Incentive Project
LD	Light-Duty
MHD	Medium-Heavy Duty
MTCO <sub>2e</sub>	Metric Tons of Carbon Dioxide Equivalent
MSRP	Manufacturer Suggested Retail Price
NHTSA	National Highway Traffic Safety Administration
NO <sub>x</sub>	Oxides of Nitrogen
OBD	On-Board Diagnostics
PEV	Plug-in Electric Vehicle
PHEV	Plug-in Hybrid Electric Vehicle
PM	Particulate Matter
SB	Senate Bill
SIP	State Implementation Plan
U.S. EPA	United States Environmental Protection Agency
ZEV	Zero-Emission Vehicle

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# ADDENDUM TO PROPOSED FUNDING PLAN

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## *Update to Reflect June 26, 2014 Board Action*

On June 26, 2014, the Board approved the *Fiscal Year 2014-15 Funding Plan for Air Quality Improvement Program and Low Carbon Transportation Greenhouse Gas Reduction Fund Investments* (Funding Plan). The Board-approved Funding Plan includes two modifications to the Clean Vehicle Rebate Project relative to the proposed Funding Plan released on June 23, 2014. These changes are listed below:

- Clean Vehicle Rebate Project Rebate Levels: The Board left per vehicle rebate levels for battery electric vehicles and plug-in hybrid electric vehicles unchanged at \$2,500 and \$1,500, respectively.
- Clean Vehicle Rebate Project Contingency Provisions: The Board removed a proposed contingency provision for the Clean Vehicle Rebate Project that would have given the Executive Officer the ability to reduce or eliminate rebates for some plug-in hybrid electric vehicles based on all-electric range, if necessary, to help align expected demand with remaining budgetary constraints.

# EXECUTIVE SUMMARY

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The Air Quality Improvement Program (AQIP) is designed to support development and commercialization of advanced technologies that are necessary to meet California's air quality and climate goals. Established through the Alternative and Renewable Fuel, Vehicle Technology, Clean Air, and Carbon Reduction Act of 2007 (AB 118; Núñez, Chapter 750, Statutes of 2007), the program focuses on reducing criteria pollutant and diesel particulate pollution with concurrent reductions in greenhouse gas emissions. Originally funded at around \$30 million per year, the program almost tripled in funding last year to about \$90 million dollars, with nearly \$60 million of that to support CVRP, which provides incentives for the purchases of zero and near-zero emissions passenger vehicles. Because of the program's success, AQIP continues to expand.

The Governor's FY 2014-15 proposed budget identifies \$200 million from the State's share of auction proceeds under ARB's Cap-and-Trade program to be spent on Low Carbon Transportation projects that reduce GHG emissions primarily in disadvantaged communities. Because the Governor's goals for the investment of Cap-and-Trade proceeds are consistent with the established objectives of the AQIP program, and because of the past success of the AQIP program structure, this year staff is combining the two funding sources (AQIP and Low Carbon Transportation Investments) into one funding plan.

This FY 2014-15 AQIP Funding Plan was developed in close coordination with interested stakeholders, public agencies, and other interested members of the public. The Funding Plan contains ARB staff's recommendations for allocating AQIP and Low Carbon Transportation funding based on the best available data and research.

In developing this year's Funding Plan, ARB staff continues to recognize the need for a long-term vision to guide the AQIP, the importance of developing and refining metrics to gauge AQIP success, and determining the most valuable methods of providing incentive funding to achieve programmatic objectives. Achieving a transition from current technologies to zero and near-zero technologies is a challenge economically and technologically. Incentive programs help bridge gaps economically by increasing advanced technology production volumes to drive down costs and demonstrating projects to foster consumer acceptance of these new technologies, and technologically by supporting the private sector in the development and refinement of the technologies. AQIP supports all of these long-term objectives.

Staff is proposing three broad categories for funding: light duty incentives, heavy-duty incentives, and loan programs. Table ES-1 below outlines the specific funding allocations for projects identified under these three categories.

**Table ES-1. FY 2014-15 Proposed Funding Plan Allocations (in millions)\***

	AQIP Allocations	Low Carbon Transportation Allocations	
		Total	Percentage of Total Proposed to Benefit Disadvantaged Communities
<b>Light-Duty Vehicle Projects – up to \$125</b>			
• Classic CVRP	\$5	\$111	10% = \$11
• Pilot Projects in Disadvantaged Communities	-	\$9	100% = \$9
<b>Heavy-Duty Vehicle and Equipment Projects – up to \$85</b>			
• HVIP	\$5	\$5-\$10	100% = \$10
• Zero-Emission Truck and Bus Pilots		\$20-\$25	100% = \$20
• Advanced Technology Freight Demonstrations	-	\$50	100% = \$50
<b>Loan Assistance Programs – up to \$10</b>			
• Truck Loan Assistance Program	\$10	-	
<b>Reserve for Revenue Uncertainty</b>			
	\$2		
<b>Total</b>	<b>\$22</b>	<b>\$200</b>	50% = \$100

\*Note: Amounts listed includes administrative costs; actual project amounts may be lower.

For FY 2014-15, staff is proposing a total of \$125 million on light-duty vehicle projects. The vast majority of this funding would be spent through the current CVRP model of offering financial rebates to consumers who purchase zero- and near-zero passenger cars. But, as discussed below, staff is proposing some important adjustments to CVRP based on lessons learned. Over the past several years the project has greatly expanded as the market for zero-emission vehicles has expanded. To date funding has been focused on BEV and PHEV vehicles, and today production volumes are increasing and prices are decreasing while consumer demand continues to grow. However, because it is necessary to ensure that CVRP has sufficient funding throughout the course of the year, staff is proposing to reduce the amount of incentive funding for BEV and PHEV vehicles by \$500 per vehicle. Proposed rebate levels would be \$1,000 for PHEVs and \$2,000 for BEVs. FCEVs would newly be eligible for \$5,000 per vehicle under staff’s proposal due to their new introduction in the California market. While these revisions are necessary to stay within the CVRP budget, they also recognize the declining costs for batteries, and increasing consumer acceptance of BEV and PHEV vehicles. Further, staff’s proposed rebate amounts, when combined with the federal tax credit, would only reduce the overall financial incentive available by five percent, from up to \$10,000 to up to \$9,500. Staff is also proposing contingency measures to ensure that CVRP can operate uninterrupted throughout the fiscal year. Finally, staff is proposing new light-duty vehicle pilot projects to help consumers in disadvantaged communities access these new technologies, and to provide emissions benefits in areas where they are most needed.

For FY 2014-15, staff is proposing a total of \$85 million in incentives focused on advanced technology heavy-duty vehicle and equipment deployments and demonstrations in disadvantaged communities. Investments in this area will support HVIP, the first-come first-served voucher project that provides incentives for the purchase of heavy-duty hybrid and electric vehicles, several larger strategic pilot projects targeting freight and transit, and Advanced Technology Freight Demonstration Projects that provide funding to develop and demonstrate advanced technology heavy-duty vehicles. All of these Heavy-Duty Vehicle and Equipment Projects are proposed to focus on hybrid, zero- and near-zero trucks and buses that are just now becoming commercially available.

Staff is proposing to spend between \$10 and \$15 million on HVIP. Requirements would be strengthened to allow funding for cleaner certified hybrids or vehicles where testing has been conducted to demonstrate the emissions benefits of the hybrid technology. HVIP would also provide larger funding amounts for zero-emission heavy-duty vehicles. As a complimentary investment, staff is proposing to spend between \$20 and \$25 million on pilot projects for zero-emission trucks and buses. These projects would fund larger projects to provide a robust demonstration of zero emissions technologies in the freight transit sectors. Finally, staff is proposing to spend up to \$50 million on large advanced technology freight demonstration projects, potentially including zero-emission drayage trucks and other projects. All of this funding for Heavy-Duty Vehicle and Equipment Projects is designed to encourage commercialization of zero- and near-zero emissions heavy-duty vehicles that are just now beginning to come to market, and to focus early deployment of these technologies in disadvantaged communities where the emissions reductions are most needed.

For the final component of AQIP in FY 2014-15, staff is proposing to spend up to \$10 million for continued funding of the Truck Loan Assistance Program. This program is designed to move current best available technology trucks into smaller fleets that have difficulty financing vehicle upgrades. This program is highly effective, leveraging a modest amount of money into high value loans that allow fleet owners to access these technologies.

Together the incentive funding projects embodied by the Funding Plan will provide important support to nascent technologies, accelerating the development and commercialization of these technologies, reducing costs, and deploying these technologies into disadvantaged communities where the benefits are most needed. The funding plan establishes and follows a longer-term vision for the AQIP, which will evolve as the new technology landscape matures. Finally, the Funding Plan calls for the development of metrics to measure success of AQIP, which is important to help staff identify when funding structures should shift amongst technologies to ensure maximum effectiveness of each incentive dollar spent, and to ensure money is appropriately targeted to achieve AQIP goals and agency objectives.



# CHAPTER 1: INTRODUCTION

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ARB staff estimates that about \$20 million in fees authorized to support AQIP will be available for projects in FY 2014-15. Additionally, the Governor's FY 2014-15 proposed budget identifies \$200 million from the State's share of auction proceeds under ARB's Cap-and-Trade program that are deposited in the GGRF for low carbon transportation projects that reduce GHG emissions. This year, the AQIP funding plan will be combined with recommended Low Carbon Transportation investments. ARB proposes to administer the new Low Carbon Transportation funding in FY 2014-15 under the auspices of AQIP, with adjustments to increase benefits to disadvantaged communities.

## *Air Quality and Climate Change Goals: The Need for Incentives*

The South Coast and San Joaquin Valley air basins are the only two areas in the nation in extreme non-attainment of the national ambient air quality standard for ozone. Meeting the federal air quality standard will require both the South Coast and the San Joaquin Valley to reduce their NO<sub>x</sub> emissions by around 80 percent from 2010 levels by 2023 and by almost 90 percent by 2032. Attainment in the two areas to meet the two scheduled milestones will require the extensive use of zero-emission technologies, which are the same technologies called for in the Cap-and-Trade Auction Proceeds Investment Plan<sup>1</sup> to help achieve the State's near-term and longer-term GHG emission reduction goals. A fundamental transformation of the vehicle fleet will need to occur in order to meet all of the following goals:

- Reduce GHG emissions to 80 percent below 1990 levels by 2050<sup>2</sup>;
- Expand ZEV market share to over 1.5 million (passenger cars and trucks) by 2025<sup>3</sup>;
- Fulfill the 2007 State Alternative Fuels Plan, which envisions a 2050 vehicle fleet where 40 percent of California transportation fuel is electricity or hydrogen; and
- Successfully implement the 2012 Advanced Clean Cars regulation, which requires 1 of 7 new cars purchased in 2025 be zero-emission or plug-in hybrid.

To meet these multiple long-term air quality and climate goals, California must accelerate development and deployment of the cleanest feasible vehicle technologies for all vehicle and equipment sectors, from light-duty passenger cars to heavy-duty line-haul trucks. U.S. EPA is planning to revise the federal ozone standard in 2015, making it more stringent. This will necessitate the need for additional emission reductions beyond what has already been identified in order to attain the new more health protective standards.

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<sup>1</sup> Air Resources Board. (2013a) Cap-and-Trade Auction Proceeds Investment Plan: Fiscal Years 2013-14 through 2015-16. See also 2013 ZEV Action Plan, which was cited to in the Investment Plan and further describes the GHG benefits of implementing zero-emission technologies.

<sup>2</sup> Schwarzenegger, A. (2005) Governor's Executive Order S-3-05.

<sup>3</sup> Brown, E. (2012). Governor's Executive Order B-16-2012.

## **AQIP BACKGROUND**

### *Statutory and Regulatory Guidelines*

#### Enabling Statute

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; Núñez, Chapter 750, Statutes of 2007) to promote clean vehicle and equipment projects and air quality research and training. AQIP focuses on reducing criteria pollutant and diesel particulate pollution with concurrent reductions in GHG emissions.

AQIP is one of three incentives programs created under AB 118. The other two programs include the Alternative and Renewable Fuel and Vehicle Technology Program, administered by the Energy Commission, and EFMP, administered by BAR. The Alternative and Renewable Fuel and Vehicle Technology Program allocates roughly \$100 million a year toward alternative and renewable fuels; advanced technology cars, trucks, and equipment; vehicle manufacturing; workforce training; and fueling infrastructure. Additionally, BAR's EFMP provides approximately \$30 million annually to accelerate the turnover of the existing light-duty fleet.

With the passage of AB 8 (Perea, Chapter 401, Statutes of 2013) the funding for these programs is extended until January 1, 2024. AB 8 also requires ARB, when considering projects for AQIP funding, to provide preference to projects with higher benefit-cost scores. AB 8 project scoring criteria is discussed in detail later in this report.

HEALTH AND SAFETY CODE section 44274 allows for a variety of eligible AQIP project categories that can be divided into three general project types:

- **Commercial Deployment:** These projects include the next generation of advanced technology vehicles and equipment just reaching commercialization. Consumer incentives are needed because these products generally cost more than their traditionally powered (e.g., gas or diesel) counterparts, which can be a significant barrier to their purchase. Incentives will accelerate consumer acceptance and have the immediate benefit of reducing criteria pollutants, air toxics, and GHG emissions. Incentives help drive down vehicle costs through economies of scale as production volumes increase, and accelerate technology transfer to other sectors. Most AQIP funding awarded to date has been directed to commercial deployment projects.
- **Advanced Technology Demonstration:** AQIP funds help demonstrate the viability of new, cleaner technologies and accelerate the introduction of advanced technology vehicles, equipment or emission controls that are not yet commercialized. The demonstration projects funded now could transition to deployment projects if the technology proves successful.

- Research and Workforce Training: Statute allows AQIP to fund research on the air quality impacts of alternative fuels, biofuel production, and workforce training related to advanced technologies. These project types provide the information and training necessary to develop the advanced fuels and vehicles most effective in reducing air pollution. To date, ARB has not directed AQIP funding to research and workforce training categories because there are already large investments being made by the Energy Commission and other agencies. For example, the Energy Commission has already awarded \$24.25 million to advanced technology workforce training projects through the Alternative and Renewable Fuel and Vehicle Technology Program, and is allocating an additional \$2.5 million investment in the FY 2014-15 funding cycle.<sup>4</sup> Accordingly, ARB staff again proposes deferring AQIP funding for these project categories.

### Regulatory Guidelines

ARB adopted regulations that 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 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. The funding plan is each year's blueprint for expending AQIP funds appropriated to 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.

The Board also adopted AB 118 Air Quality Guidelines as required in Health and Safety Code section 44271(b). This regulation, also known as the "anti-backsliding guidelines," ensures that ARB 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.

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<sup>4</sup> California Energy Commission. (2014). 2014-2015 Investment Plan Update for the Alternative and Renewable Fuel and Vehicle Technology Program. Commission Final Report.

### *Funding Sources and History*

Funding for AQIP comes primarily from the Smog Abatement Fee which is assessed annually during a vehicle's first six registration years in lieu of providing a biennial smog certification. Of the \$20 collected for each vehicle at the time of annual registration, \$4 is allocated to ARB for AQIP, with the remaining directed towards the Carl Moyer Memorial Air Quality Attainment Program (Carl Moyer Program), the Energy Commission's AB 118 program, and BAR's smog check vehicle repair assistance program. In addition, a small portion of AQIP funding comes from two additional sources: a \$10 or \$20 initial registration fee for new vessels, dependent upon the year in which the new registration is filed; and \$2.50 for annual special equipment identification plate fees.

The fees identified above generate approximately \$2 million to \$2.5 million each month. As proposed in the Governor's FY 2014-15 Proposed State Budget, ARB staff estimates about \$20 million will be available to support AQIP projects in FY 2014-15.

Since the inception of the program, AQIP has funded projects in seven categories:

- CVRP (2009-10 to present),
- HVIP (2009-10 to present),
- Advanced Technology Demonstrations (2009-10 through 2012-13),
- Truck Loan Assistance Program (2008-2009; 2012-13 to present),
- Lawn & Garden Replacement (2009-10 and 2010-11),
- Off-Road Hybrid Equipment Pilot (2010-11), and
- Zero-Emission Agricultural Utility Terrain Vehicle Rebates (2009-10).

In addition to the fees above, AQIP has received augmentations in recent years, primarily in support of CVRP from the Energy Commission. In total, AQIP has received \$44.5 million from the Energy Commission for CVRP, and \$4 million for HVIP. These direct investments are further magnified by the Energy Commission's investments to support fueling infrastructure for both electric vehicle charging stations and hydrogen fueling stations as part of the Alternative and Renewable Fuel and Vehicle Technology Program.

Table 1 provides an overview of AQIP historical funding allocations to date.

**Table 1. AQIP Historical Funding (In millions)**

Project Category	Fiscal Years						Project Status
	08-09	09-10	10-11	11-12	12-13	13-14	

**Ongoing AQIP Projects**

CVRP	--	\$4.1	\$7 <sup>1</sup>	\$16.2 <sup>2</sup>	\$37 <sup>3</sup>	\$59.55 <sup>4</sup>	Launched March 2010. Total allocation of \$123M spent; over 56,000 rebates issued; implementation ongoing.
	<sup>1</sup> Includes \$2 million in funding from the Energy Commission. <sup>2</sup> Includes \$500,000 in funds redirected from the FY 2011-12 locomotive demonstration and \$700,000 in funds redirected from the FY 2009-10 Agricultural Utility Terrain Vehicle Rebates project. <sup>3</sup> Includes \$3 million in funds redirected from the FY 2008-09 Truck Loan Program; \$6 million in funds redirected from the FY 2012-13 Hybrid and Zero-Emissions Truck and Bus Voucher Incentive Project; and \$12 million in funding from the Energy Commission. <sup>4</sup> Includes \$24.55 million in funding from AB 101 (Committee on Budget, Chapter 354, Statutes of 2013) which redirected funding from the Energy Commission to AQIP, \$20 million in funding from SB 359 (Corbett, Chapter 415, Statutes of 2013), and \$5 million in funding from the Energy Commission.						
HVIP	--	\$20.4	\$23 <sup>5</sup>	\$11	\$0	\$15	Launched Feb 2010. ~\$54M of \$69.4M spent; over 1,600 vouchers issued; implementation ongoing.
	<sup>5</sup> Includes \$4 million in funding from the Energy Commission.						
Advanced Technology Demonstrations	--	\$1.8	\$1.8	\$1.7 <sup>6</sup>	\$1	--	~\$5M of \$6.3M spent; 12 projects complete/ended; 1 projects ongoing.
	<sup>6</sup> Includes \$500,000 in funds for hybrid truck testing, and \$199,800 in funds redirected from the FY 2009-10 Agricultural Utility Terrain Vehicle Rebates project to hybrid truck testing.						
Truck Loan Assistance Program	\$30	--	--	--	\$4 <sup>7</sup>	\$20	Launched April 2009. ~\$39M of \$54M spent; over 4,200 loans issued to support over 4,800 projects; implementation ongoing.
	<sup>7</sup> \$4 million in funds redirected from the FY 2012-13 Hybrid and Zero-Emissions Truck and Bus Voucher Incentive Project.						

**Past AQIP Projects**

Lawn & Garden Equipment Replacement	--	\$1.6	\$1	--	--	--	Launched spring 2010 with 9 air districts. Nearly \$2.6M spent; 12,615 mowers replaced; project ending June 30, 2014.
Off-Road Hybrid Equipment Pilot	--	--	\$2	--	--	--	Launched July 2011; project complete. 16 vouchers issued. Emission testing completed.
Zero-Emission Agricultural Utility Terrain Vehicle Rebates	--	\$0.13	--	--	--	--	Launched April 2010; closed December 2011. 56 rebates issued.
<b>Total Funding</b>	<b>\$30</b>	<b>\$28.03</b>	<b>\$34.8</b>	<b>\$28.9</b>	<b>\$42</b>	<b>\$94.55</b>	<b>\$258.28</b>

## *Program Benefits*

AQIP provides a modest down payment on the technologies needed to meet long-term air quality and climate change goals, with a focus on stimulating the widespread use of these technologies. AQIP 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 market penetration. These longer-term program benefits accrue primarily from overcoming deployment barriers, reducing production costs, promoting consumer acceptance, and accelerating technology transfer to other sectors. Additionally, AQIP investments in advanced technology vehicles have been supported by Energy Commission investments in infrastructure to ensure that necessary fueling networks are developed, thus reinforcing California's ongoing commitment to clean technologies.

Five years ago, the first (FY 2009-10) AQIP Funding Plan identified the needs and priorities for funding deployment and demonstration of advanced technologies, including hybrid, plug-in hybrid, battery electric, and hydrogen fuel cell vehicle technologies. In addition to achieving emission benefits from the vehicles directly funded by AQIP, the Board identified three ancillary benefits of the program. An overview and update on the progress toward realizing these benefits is provided below:

- Reduce Production Costs: CVRP and HVIP were intended to help advanced technologies transition from prototype and small scale production to assembly line production, thereby reducing vehicle costs. These programs also send a signal to manufacturers that California's investment in these types of technologies will pay dividends. *Today: Over 56,000 CVRP rebates have been issued, helping manufacturers transition to assembly line production and reducing production costs. On the heavy-duty side, HVIP has succeeded in bringing more economical hybrid delivery trucks to California.*
- Accelerate Technology Transfer: By sparking production and sale of advanced technologies, AQIP investments help accelerate the rate of technology transfer to other applications, such as off-road equipment and marine vessels. *Today: Hybrid technology has expanded to off-road equipment and marine vessels, often utilizing the same batteries, battery management systems or other technologies first proven in AQIP-funded light-, medium- and heavy-duty vehicles. Increased deployment of advanced batteries and other componentry in the on-road sector also helps reduce technology costs in off-road sectors, accelerating the path of these technologies to new markets.*
- Accelerate Consumer Acceptance: One of the barriers to commercialization of advanced technologies is consumer reluctance to invest in unfamiliar vehicles or equipment. As more Californians experience these technologies, they will become more acceptable as a purchase choice. *Today: Plug-in hybrid and zero-emission passenger cars are becoming an increasingly mainstream purchase option, and achieving widespread consumer acceptance is now seen as an attainable goal over*

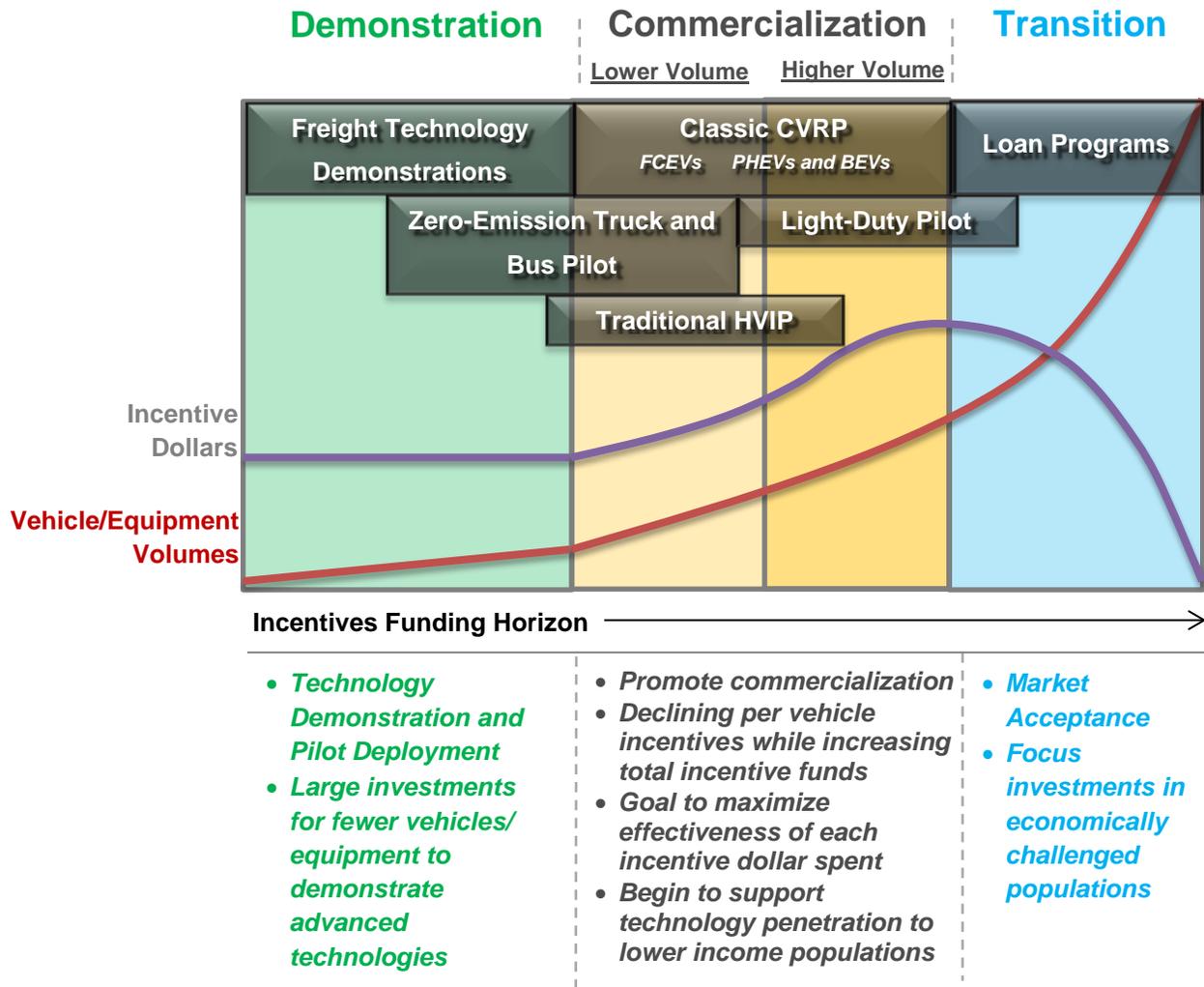
*the next decade. On the heavy-duty side, HVIP vouchers are helping several large, early-adopter fleets purchase zero-emission trucks, while an increasing number of small California fleets have purchased their first hybrid trucks.*

Staff believes that these initial AQIP program benefits remain important today. However, as consumer demand continues to rise, CVRP and HVIP must be positioned for success while recognizing finite funding availability. AQIP must adapt to its own successes by including comprehensive and quantifiable metrics for success and a long-term vision that targets funds where they provide the greatest benefit.

### Evolution of the Role of Incentives

AQIP embodies the following conceptual evolution that identifies how incentives support three phases of technology advancement: development, commercialization, and transition to widespread deployment. This concept is illustrated in Figure 1 below. Figures 1a, 1b, and 1c, found at the beginning of Chapters 4, 5, and 6, help to highlight how AQIP and Low Carbon Transportation investments in each proposed funding category further support this conceptual evolution.

**Figure 1. Conceptual Evolution of the Role of Incentives**



In the demonstration phase, manufacturers are developing, testing, and piloting technologies. Incentives are provided to help fund the development of these advanced technologies through demonstration projects focused on single vehicle prototypes or small volume vehicle demonstration and testing projects. Funding is also provided for pilot projects on the order of 10-50 vehicles to help the technology evolve to the commercialization phase. In the demonstration phase, per-vehicle incentives are high because manufacturing is not standardized and is focused on smaller batches of vehicles. Higher levels of incentives per vehicle are needed to help entrepreneurs cover the costs of technology development. While per vehicle incentives are larger for demonstration projects, these investments are crucial because advanced technologies often would not evolve into pilot projects and migrate to the commercialization phase without this public funding.

In the commercialization phase, incentives are provided to encourage consumer adoption of advanced technologies. Most of AQIP's funding to date has been focused in this phase of advanced technology deployment, with the CVRP spurring market

growth of passenger PHEVs and ZEVs, and HVIP spurring market growth of hybrid and zero-emission trucks.<sup>5</sup> The commercialization phase can be broadly separated into lower volume and higher volume production phases. In the lower volume commercialization phase, sales volumes generally start out low, but grow over time as consumer acceptance increases and manufacturing costs decrease with economies of scale. In the lower volume commercialization phase, per vehicle incentives are high.

As sales grow and economies of scale are achieved, incentive funding levels and vehicle eligibility requirements can be adjusted to reduce per vehicle funding to ensure maximum incentive efficiency by better targeting incentive funding to motivate consumer decisions. In this higher volume commercialization phase, while per vehicle incentives are decreasing, total sales are increasing and as a result total incentive funding commitments increase. For example, in the light-duty sector, per-vehicle incentive amounts are expected to shift from a focus on widely growing PHEV and BEV options to early commercial introduction of FCEVs. As a technology moves from lower volume commercialization to a fuller more mature higher volume, the incentive funding goals shift from a focus on technology development to a more specific focus on moving the technology from early adopters to mainstream consumers and to disadvantaged communities and the secondary market. The light-duty pilot projects proposed for FY 2014-15 are examples of project types intended to realize this shift.

As a technology moves from commercialization into the transition phase, incentives should be adjusted to focus specifically on moving the technology into new consumer demographic segments and on building upon earlier benefits in disadvantaged communities, as well as to support other technology sectors. In the transition phase, AQIP incentives are targeted to foster technology advancement in these communities. ARB's other incentive programs – the Carl Moyer Program and the Proposition 1B Goods Movement Incentive Program also focus investments in these areas. The Truck Loan Assistance Program is an example of this type of incentive, providing loan assistance to help small trucking fleets access financing to upgrade their trucks.

AQIP incentives have historically been prioritized and structured to accelerate the advancement of vehicle technologies (1) in the demonstration and commercialization phases, and (2) from the light-duty sector to heavier vehicle sectors. These key priorities will continue with the proposed FY 2014-15 investments. Today some technologies, like passenger BEVs and PHEVs are entering the higher volume commercialization phase. Incentive funding outlays are increasing to promote further market development, and per vehicle incentives can be decreased as economies of scale increase, while still ensuring incentive program effectiveness. Incentive funding, while still focused on commercialization, can now also be focused to help ensure

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<sup>5</sup> Greene, D., et al. (2014). "Transitioning to Electric Drive Vehicles: Public Policy Implications of Uncertainty, Network Externalities, Tipping Points and Imperfect Markets" provides an analysis of the need for public incentives to spur the zero-emission vehicle market, and illustrates why incentives to accelerate market "tipping points" are critical to maximizing program effectiveness.

broader access to these technologies, including lower income consumers and disadvantaged communities.

Other technologies, like passenger FCEVs and battery-electric or fuel cell heavy-duty vehicles are beginning to emerge into the lower volume commercialization phase. Thus, just as was the case when PHEV and BEVs were first introduced, larger per-vehicle incentives are needed to help transition this technology into the higher volume stage of commercialization. FCEV prototypes and small-scale demonstration projects have been completed and the technology is expected to soon be released commercially by several major automobile manufacturers. Building on this, AQIP will continue to foster the development and transfer of advanced technologies from the light-duty to the heavy-duty sector through projects focused on the freight sector.

### *Metrics of Success and a Long-Term Vision*

Because the AQIP program is evolving, there is a clear need to evaluate the effectiveness of program investments. This Funding Plan continues the process of working with stakeholders to identify appropriate metrics of success for each AQIP project. Metrics of success for AQIP projects should convey concepts such as: level of market penetration, manufacturer diversity, technology cost, consumer acceptance, or other indicators of market health. For battery-electric zero-emission passenger vehicles, for example, “number of vehicle manufacturers” may be a useful metric to indicate market diversity, while the average household income of battery electric vehicle purchasers may provide a metric of consumer acceptance. A trend indicating progressively lower income households are purchasing battery-electric vehicles may indicate this technology is increasingly appealing to a broader demographic. AQIP projects will likely need a suite of metrics to gauge when each specific vehicle technology can be self-sustaining without incentives. Additional research, identified in Chapter 4, to assess the maturity of the California ZEV market and impacts of sunseting incentives will also help inform this metrics-based approach.

AQIP demonstration and deployment incentives are structured to accelerate advancement of vehicle technology from basic hybrids to advanced zero-emission vehicles and from the light-duty sector, where commercialization is likely to initiate, to heavier vehicle and equipment sectors with more challenging duty cycles.

Vehicle technology typically migrates from light-duty passenger cars to heavier, on- and off-road vehicles and equipment with more demanding duty cycles. The catalytic converter, for example, was first applied to passenger vehicles in the 1970's, before migrating to heavier trucks, and then off-road equipment. More recently, diesel particulate filters have evolved from being deployed on light-duty vehicles in Europe to trucks, and finally to more challenging off-road sectors, such as construction equipment, marine, and locomotive applications. The market success for today's plug-in passenger cars is due in part to the market success of the Toyota Prius and other early, non-plug-in hybrids. Investments in early hybrid technology necessarily preceded and facilitated investments in today's more advanced plug-in hybrid and battery-electric passenger

vehicles. Commercialization of the first hybrid vehicles helped drive down the cost of manufacturing, promote investment in further technology advances, plant the seeds of new workforce training, and increase consumer awareness and acceptance.

The heavy-duty vehicle market is at a far earlier stage of development and is not being driven by a manufacturer zero-emission vehicle mandate like in the light-duty market. Therefore, increasing public investments are needed to reduce purchase costs and encourage consumer acceptance. AQIP investments in hybrid and zero-emission trucks and buses have resulted in deployment throughout California in far greater numbers than the rest of the nation. These investments provide the foundation for aggressive federal Phase 2 heavy-duty vehicle greenhouse gas regulations needed to drive technology advances. ARB is coordinating closely with U.S. EPA and NHTSA to ensure national standards will significantly accelerate transformation of the national and interstate truck fleet to utilize the cleanest possible technologies for both greenhouse gasses and criteria pollutants. Should federal Phase 2 standards not be sufficient for California to meet its air quality and climate goals, California may consider its own requirements based upon the truck technologies which AQIP has helped demonstrate and deploy.

To achieve the pace of technology advancement needed, AQIP should spur increasingly low-emission and low-carbon technologies as they are introduced and achieve market acceptance. As plug-in electric passenger vehicles achieve consumer acceptance, incentives for these vehicles can decline and eventually sunset as funding transitions to more advanced technologies, such as fuel cell passenger vehicles. This has already been illustrated with the commercialization of basic hybrid technologies in passenger vehicles almost a decade ago. As the market for plug-in electric passenger vehicles matures, and incentives are no longer needed to drive consumer purchases, AQIP incentives must shift to heavier on-road vehicle technologies. As with light-duty vehicles, basic hybrid trucks are a necessary precedent to advanced hybrids, and finally to the ultimate goal of zero-emission trucks (or trucks that achieve zero-emission miles in specific duty cycles). While today's AQIP heavy-duty vehicle incentives typically fund hybrid and zero-emission urban package and delivery trucks, the ultimate goal is to achieve widespread deployment of zero-emission freight and line-haul trucks, which are responsible for the bulk of truck emissions. Investments in CVRP, HVIP, and freight demonstrations all play a critical role in transitioning the entire freight and transportation sector to utilize zero-emission technologies.

## **LOW CARBON TRANSPORTATION INVESTMENTS: GGRF BACKGROUND**

### *Statutory and Regulatory Guidelines*

In 2012, the Legislature passed and Governor Brown signed into law 3 bills – AB 1532 (Pérez, Chapter 807), Senate Bill (SB) 535 (de León, Chapter 830), and SB 1018 (Budget and Fiscal Review Committee, Chapter 39) – that establish the GGRF to receive Cap-and-Trade auction proceeds and to provide the framework for how the auction proceeds will be administered in furtherance of the purposes of AB 32 (Nunez, Chapter 488, Statutes of 2006), including supporting long-term, transformative efforts to improve public health and develop a clean energy economy.

### Investment Categories and Goals

The legislation establishes broad categories of GHG emission reducing projects that may be funded with these proceeds, including investments in: clean and efficient energy; low-carbon transportation; natural resource conservation and management, and solid waste diversion; and sustainable infrastructure and strategic planning. In addition to the goal of reducing GHG emissions in California, the legislation establishes the following goals for this funding, where applicable:

- Maximize economic, environmental, and public health benefits to the state
- Foster job creation by promoting in-state GHG emission reduction projects carried out by California workers and businesses
- Complement efforts to improve air quality
- Direct investment toward the most disadvantaged communities and households in the state
- Provide opportunities for businesses, public agencies, nonprofits, and other community institutions to participate in and benefit from statewide efforts to reduce GHG emissions
- Lessen the impacts and effects of climate change on the state's communities, economy and environment

### Disadvantaged Community Requirements

In enacting the implementing statute, the Legislature stated its intent to direct resources to the State's most impacted and disadvantaged communities, in order to provide economic benefits as well as health benefits through additional emission reductions. Specifically, SB 535 directs at least 25 percent of funding from GGRF be allocated toward projects that benefit disadvantaged communities and at least 10 percent be allocated toward projects located in disadvantaged communities. The California Environmental Protection Agency (Cal/EPA) is responsible for identifying disadvantaged communities. Together with the Office of Environmental Health Hazard Assessment the Cal/EPA has released the California Communities Environmental Health Screening Tool (CalEnviroScreen), the nation's first comprehensive screening methodology to identify California communities that are disproportionately burdened by multiple sources of

pollution. Analysis, screening tool, and mapping information can be found at: <http://oehha.ca.gov/ej/ces042313.html>.

### Allocation Process

AB 1532 establishes a two-step process for allocating funding to State agencies to invest in GHG reducing projects. Department of Finance, in consultation with ARB, is required to submit to the Legislature a three-year investment plan identifying proposed investments of auction proceeds. The first investment plan was submitted to the Legislature in May 2013.<sup>6</sup> Funding is appropriated to State agencies by the Legislature through the annual Budget Act, consistent with the three-year investment plan.

### Reporting Requirements

SB 1018 specifies some of the responsibilities for ARB and any other State agencies receiving funds, including requirements to prepare a record describing: proposed expenditure; how the proposed expenditures further the purposes of AB 32; and how the agency will document the result of expenditures. This Funding Plan serves as part of this required record for funds appropriated to ARB. In addition, AB 1532 and SB 535 require the Department of Finance to report annually to the Legislature on program implementation status and outcomes.

### *Funding Sources and History*

Funding for Low Carbon Transportation Investments from GGRF is generated from auctions conducted as part of ARB's Cap-and-Trade Program. The market-based Cap-and-Trade Program is a key element of ARB's overall GHG reduction strategy. The program establishes a statewide emissions limit on the sources responsible for 85 percent of GHGs and creates a financial incentive for investment in clean and efficient technologies. The backbone of the Cap-and-Trade regulation is the system of tradable permits to emit GHGs known as 'allowances.' Because a market to exchange these allowances exists between entities, including those covered by the regulation, these allowances have value. Under the program, a portion of the allowances required for compliance are to be sold at auction. The first auction was held in November 2012, and auctions will be conducted quarterly through 2020. State proceeds from these auctions are deposited into the GGRF to fund projects that support efforts to reduce GHG emissions upon appropriation by the Legislature.

This is the first year that Low Carbon Transportation funding from GGRF is proposed for ARB. The Governor's Proposed Budget for FY 2014-15 recommends investing a total of \$850 million in Cap-and-Trade auction proceeds in programs that will promote GHG reductions and meet the SB 535 disadvantaged communities investment requirements consistent with the Cap-and-Trade Auction Proceeds Investment Plan. Of this total,

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<sup>6</sup> Air Resources Board. (2013a) Cap-and-Trade Auction Proceeds Investment Plan: Fiscal Years 2013-14 through 2015-16.

\$200 million is proposed for ARB to fund low carbon transportation projects that expand existing ARB efforts. Specifically, the Governor's Proposed FY 2014-15 Budget proposes for ARB:

Low Carbon Transportation - \$200 million for the Air Board to accelerate the transition to low carbon freight and passenger transportation, with a priority for disadvantaged communities. This investment will support the state's clean air and climate change goals, as well as the Administration's goal to deploy 1.5 million zero-emission vehicles in California by 2025. The Air Board administers existing programs that provide rebates for zero-emission cars and vouchers for hybrid and zero-emission trucks and buses. This proposal will respond to increasing demand for these incentives, as well as provide incentives for the pre-commercial demonstration of advanced freight technology to move cargo in California, which will benefit communities near freight hubs.<sup>7</sup>

This proposed Funding Plan describes staff's proposal for this \$200 million in greater detail.

## **FY 2014-15 DRAFT FUNDING PLAN DEVELOPMENT PROCESS**

To develop the recommendations presented in this Funding Plan, staff held two public workshops, six public work group meetings, and numerous individual meetings with interested public stakeholders. Specifically:

- On January 28, 2014, staff began the formal Funding Plan development process with a public workshop that presented an overview of the topics and projects that staff expected to evaluate for the coming year.
- From February 12 through February 24, 2014, staff held six workgroups on the following topics whereby staff presented information and gathered input:
  - Long-Term AQIP Planning (2 work group meetings) focused on conceptual evaluations for the role of incentives in meeting long-term clean air goals and on the advancement of new, cleaner technologies;
  - CVRP (2 work group meetings) focused on the current fiscal year project needs, future projections, potential modifications, long-term planning, and light-duty pilot projects in disadvantaged communities;
  - HVIP (1 work group meeting) focused on the current state of the truck market, incentive needs, potential changes to HVIP, and concepts for the Truck and Bus Pilot Project in disadvantaged communities; and
  - Advanced Technology Demonstration Projects (1 work group meeting) focused on projects and priorities for demonstration in the freight sector and funding levels needed to support GHG reductions in disadvantaged communities.
- A Discussion Document was posted on April 2, 2014, which provided staff's

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<sup>7</sup> Department of Finance. (2014). Governor's Budget Summary 2014-15; Environmental Protection.

preliminary recommendations based on analysis of available data and public comment received to date.

- The general deadline for comments on the Discussion Document was April 16, 2014, although staff continues to take comments on the concepts presented.
- Staff has included an overview of comments received and staff's responses later in each relevant section of this Funding Plan.
- On April 3, 2014, staff held the second workshop, where they presented preliminary draft recommendations provided in the Discussion Document.
- Throughout the entire process, beginning in early December, staff also met individually with all interested stakeholders to gather input, ideas, and data. Staff continues to discuss concepts, data, and recommendations with interested stakeholders.

Staff also maintains an open dialog with the Energy Commission and other agencies and stakeholders in the development of the Funding Plan.

## CHAPTER 2: AB 8 AQIP PROJECT SCORING CRITERIA

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As described below, AB 8 refined the evaluation criteria for projects funded by fees that support AQIP, such as CVRP and HVIP. Staff's analysis was developed specifically in response to AB 8 and intended for evaluation of such projects funded by the fees authorized to support AQIP. Staff conducted similar analysis of those projects proposed for Low Carbon Transportation funding. Appendix A provides specific details on the complete evaluation for both AQIP and Low Carbon Transportation projects considered for funding in FY 2014-15.

The purpose of AQIP is to fund air quality improvement projects that:

- Are related to fuel and vehicle technologies;
- Reduce criteria air pollutants;
- Improve air quality; and
- Provide funding for research to determine and improve the air quality impacts of alternative transportation fuels and vehicles, vessels, and equipment technologies<sup>8</sup>.

As required by AB 8, when considering projects for funding, preference must be given to projects with higher benefit-cost scores that maximize the purposes and goals of AQIP<sup>9</sup>. Benefit-cost score is defined as the "reasonably or expected potential criteria emission reductions achieved per dollar awarded by the board for the project<sup>10</sup>." Additional criteria may also be used, including a project's proposed or potential reduction of criteria or toxic air pollutants, contribution to regional air quality improvement, ability to promote the use of clean alternative fuels, ability to achieve climate change benefits, and ability to support market transformation, and ability to leverage private capital investments<sup>11</sup>.

To determine the benefit-cost score for potential projects to be funded during FY 2014-15, staff developed a standardized metrics analysis for the several projects that are being considered for funding under AQIP. As discussed in greater detail below, the benefit-cost score methodology for assigning preference to projects includes the following:

- Criteria Emission Reduction Analysis
- Project Cost Analysis
- Benefit-Cost Score Analysis
- Additional Preference Criteria
- Total Benefit Index

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<sup>8</sup> Health & Safety Code Section 44274(a)

<sup>9</sup> Health & Safety Code Section 44274(b)

<sup>10</sup> Health & Safety Code Section 44270.3(e)(1)

<sup>11</sup> Health & Safety Code Section 44274(b)

## Criteria Emission Reduction Analysis

Staff determined that a well-to-wheel analysis for emission reductions is the most appropriate methodology to determine emission benefits. A well-to-wheel emission analysis allows staff to analyze the emissions produced from the production, distribution and usage of the different fuel types, including electricity, and any associated tailpipe emissions. As part of the analysis, near-term emission reductions (i.e., the direct emission reductions expected from the project) and potential long-term emission benefits (i.e., those expected to be realized in the future as a result of current project investments), when applicable, were quantified for each proposed project. In projects where new fuels and advanced technologies are not involved, such as loan guarantees for diesel trucks, analysis of exhaust emissions was performed because the fuel sources are identical. For the analysis, staff calculated the near-term and expected future NOx, PM 2.5, and HC emissions, along with GHG emissions benefits for vehicle technologies/fuel types in each project.

## Project Cost Analysis

Since AQIP is intended to support long-term market transformation toward clean technologies, staff analyzed both the expected near-term and the potential long-term cost of the projects. Because AQIP project funding levels are directly related to the incremental cost of advanced technologies, staff estimated potential future incremental cost reductions of advanced technologies based on available information for light-duty<sup>12</sup> and heavy-duty vehicles<sup>13</sup>. The analysis then considered lowered future incentive per-project funding levels to reflect potential long-term cost reductions.

## Cost-Effectiveness/Benefit-Cost Score Analysis

To develop the cost-effectiveness scores for each project, the near-term and potential long-term NOx, PM 2.5, and HC reductions and costs were applied to a well-established incentive cost-effectiveness calculation methodology (consistent with that used in the Carl Moyer Program).

Staff based the analysis of PM emissions on PM 2.5 instead of PM 10 due to the difference in adverse health impacts associated with PM emissions of different sizes. In order to provide direct comparisons between the projects by comparing similar criteria emissions, PM 2.5 was selected as the corresponding PM emissions component. The adverse health impacts of PM 2.5 have been well documented in literature<sup>14,15,16</sup> and by the U.S. EPA<sup>17</sup>. Emissions of diesel PM, which are dominated

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<sup>12</sup> Air Resources Board. (2011d). Staff Report: Initial Statement of Reasons for Advanced Clean Cars; 2012 Proposed Amendments to the California Zero Emission Vehicle Program Regulations.

<sup>13</sup> U.S. Environmental Protection Agency and U.S. Department of Transportation. (2011). Final Rulemaking to Establish Greenhouse Gas Emissions Standards and Fuel Efficiency Standards for Medium- and Heavy-Duty Engines and Vehicles; Regulatory Impact Analysis.

<sup>14</sup> Miller KA, et al. (2007). Long-term exposure to air pollution and incidence of cardiovascular events in women.

by PM 2.5 particles, have been identified as a toxic air contaminant<sup>18</sup>. Moreover, the impacts of exposure to PM 2.5 can be greater regionally, as is seen in the San Joaquin Valley with increased emergency room visits and hospitalization of children and adults<sup>19</sup>. As a result, staff proposes to assign a greater weight to PM 2.5 in the analysis.

The cost-effectiveness scores are in units of dollars per ton of criteria emissions reduced (\$/ton). Per AB 8, the cost-effectiveness scores were converted to a benefit-cost score with the units of pound of criteria emission benefit per dollar (lbs/\$). Finally, the cost-effectiveness scores for each project were given points based on a scale from 1 to 5 points. Those projects with a cost-effectiveness of less than \$20,000 per ton of emissions reduced, received a high of 5 points, because this cost-effectiveness level is well within the range of allowable cost-effectiveness in other ARB incentive programs. The remaining bins were grown in \$20,000 increments with the least cost-effective projects, those projects over \$80,000 per ton of emissions reduced, receiving the lowest points possible. Table 2 lists the resulting scores provided to the proposed AB118 projects for FY 2013-14. This is consistent with the "Total Benefit Index" score, for project selection, described below.

### Additional Preference Criteria

As discussed further below, staff also evaluated additional preference criteria, as identified in AB 8. These criteria included:

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.
4. Ability to achieve GHG 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.

Recognizing the range of potential benefits and to ensure a robust mix of proposed projects to be funded, for quantitative preference criteria 1, 2, and 4, staff analyzed the associated data and equally divided the results into scoring ranks between 0 to 5, according to the following steps:

- Results for each specific Additional Preference Criteria were quantified for each of the proposed projects.

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<sup>15</sup> Sun Q., et al. (2009). Ambient air pollution exaggerates adipose inflammation and insulin resistance in a mouse model of diet-induced obesity.

<sup>16</sup> Pearson J., et al. (2010). Association between fine particulate matter and diabetes prevalence in the U.S.

<sup>17</sup> U.S. Environmental Protection Agency. (2012b). PM Health Outcomes.

<sup>18</sup> Air Resources Board. (2011b). Carl Moyer Program Guidelines; Approved Revisions 2011.

<sup>19</sup> Capitman, J., and Tyner, T. (2011). The Impacts of Short-term Changes in Air Quality on Emergency Room and Hospital Use in California's San Joaquin Valley.

- Scoring scale increments were established for each rank (0-5) to generate an equal distribution in points for the proposed projects. Additional information on the scales for each criterion is discussed below for each Additional Preference Criteria.
- The proposed projects are then ranked based on the scale (0-5) to be used in the “Total Benefit Index”

Staff anticipates that the scales for the quantitative Additional Preference Criteria may change each year depending on the mix of projects proposed due to differences in the range of expected benefits or when additional information becomes available to refine the evaluation. The data and rationale used to establish each of the criteria weighting factors are found in Appendix A.

The additional preference criteria are described below:

1. *Proposed or potential reduction of criteria or toxic air pollutants* – This analysis considered the magnitude of emission reductions by quantifying the direct lifetime criteria emission reductions expected per average vehicle or piece of equipment supported under each project. With the benefit-cost score analysis primarily driven by overall project incentive amounts, this additional criteria allowed staff to make direct comparisons of the emission reductions expected by the different proposed projects, independent of the associated incentive amounts. Staff analyzed the emission benefits on a per vehicle basis to account for differences in vehicle sale volumes and statewide populations of the various vehicles supported by AQIP. Resulting total lifetime emission reductions ranged from less than 0.1 tons to 3.5 tons of lifetime criteria emission reductions per vehicle. The scoring scale associated within each rank (1-5) for this criterion was established by calculating the range of lifetime tons between the highest and lowest value, and dividing that range by 5. As a result the, remaining bins were scaled in 0.7 ton increments. Projects with less than or equal to 0.7 tons of criteria emission reduced receive 1 point, while those projects with greater than 2.8 tons of criteria emission reductions reduced receive 5 points. Below is the resulting scale for criteria emission reductions per vehicle:
  - 5: Greater than 2.8 tons
  - 4: Greater than 2.1 tons and less than 2.8 tons
  - 3: Greater than 1.4 tons and less than 2.1 tons
  - 2: Greater than 0.7 tons and less than 1.4 tons
  - 1: Less than 0.7 tons
  - 0: No criteria emission reductions
2. *Contribution to regional air quality improvement* – Staff developed a scoring scale based on the ARB emission inventory for regions federally designated as extreme non-attainment for ozone, and ranked projects based on their corresponding emission inventory contributions from highest to lowest. Specifically, staff used the NOx emission inventory in tons per day for 2023 in the

South Coast Air Basin, found in ARB's Vision for Clean Air: A Framework for Air Quality and Climate Planning<sup>20</sup>. NOx emission sources were ranked in tons per day for various vehicle and equipment types, ranging from heavy gas trucks, at 14 tons per day, to heavy diesel trucks at 55 tons per day. The scoring scale associated with each rank (1-5) for this criterion was established by calculating the range of NOx emissions between the highest and lowest value, and dividing that range by five. As a result, the bins were rounded and scaled in 10 ton increments. Projects corresponding to inventory sources with less than or equal to 10 tons of NOx per day receive one point, while those projects with greater than 40 tons receive five points. The sources of emissions contribution were ranked based on the following scale:

- 5: Category contributes more than 40 tons of NOx per day
- 4: Category contributes between 31 and 40 tons of NOx per day
- 3: Category contributes between 21 and 30 tons of NOx per day
- 2: Category contributes between 11 and 20 tons of NOx per day
- 1: Category contributes between 1 and 10 tons of NOx per day

3. *Ability to promote the use of clean alternative fuels and vehicle technologies* – Clean alternative fuels are fuels that have a lower well-to-wheel emissions compared to conventional fuels, such as electricity, hydrogen, and renewable fuels. Clean vehicle technologies are technologies that emit zero tailpipe emissions, such as battery-electric and fuel cell vehicle technologies, or enabling technologies, such as hybrid or plug-in hybrid technologies. This qualitative analysis ranked projects by whether or not they used a clean low carbon alternative or renewable fuel or were clean vehicle technologies. Staff scored this preference criterion based on the following:

- 5: Technologies that use low carbon alternative fuels and are a clean vehicle technology.
- 3: Technologies that use low carbon alternative fuels or are a clean vehicle technology.
- 0: Technologies that do not use clean alternative fuels and are not a clean vehicle technology.

4. *Ability to achieve GHG reductions* – Similar to the methodology established in the first preference criterion, staff conducted a lifetime well-to-wheels GHG emissions analysis for the vehicles and equipment supported by the proposed projects. Staff determined expected GHG emission reductions per vehicle and piece of equipment funded by each proposed project. Due to the large difference in GHG emission benefits for the top two projects (zero-emission truck and bus pilots and advanced technology freight demonstrations) relative to the other projects proposed, staff assigned each of those a score of five and four

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<sup>20</sup> Air Resources Board. (2013d). Vision for Clean Air: A Framework for Air Quality and Climate Planning; Public Review Draft. Appendix: Actions for Development, Demonstration, and Deployment of Needed Advanced Technologies.

respectively. The remaining bins were determined by taking the high and low resulting benefits, and calculating the range between them. The range of benefits was then divided by three. As a result, the remaining bins were rounded and scaled in 50 MTCO<sub>2</sub>e increments. Below is the resulting scale for GHG reductions per vehicle:

- 5: Greater than 1,000 MTCO<sub>2</sub>e
- 4: Greater than 500 MTCO<sub>2</sub>e and less than 1,000 MTCO<sub>2</sub>e
- 3: Greater than 150 MTCO<sub>2</sub>e and less than 500 MTCO<sub>2</sub>e
- 2: Greater than 50 MTCO<sub>2</sub>e and less than 100 MTCO<sub>2</sub>e
- 1: Less than or equal to 50 MTCO<sub>2</sub>e
- 0: No criteria emission reduction

5. *Ability to support market transformation of California’s vehicle or equipment fleet to utilize low carbon or zero-emission technologies* – Similar to number 3 above, this qualitative analysis ranked projects by whether or not they supported technologies that support market transformation. Staff used ARB’s Vision for Clean Air document, as referenced above, as a key reference in scoring technologies for this evaluation. Light-duty PHEVs, BEVs, and FCEVs, for example, are considered transformative technologies that will help the State meet its air quality goals. Staff scored this preference criterion based on the following:

- 5: Technologies that support market transformation
- 0: Technologies that do not support market transformation

6. *Ability to leverage private capital investments* – Staff is not proposing to include this criterion for FY 2014-15 as staff is working on developing methodologies to analyze the private capital investments leveraged by projects. Staff intends to identify information sources and may include this preference criterion in future years.

### Total Benefit Index

Staff utilized the benefit-cost/cost-effectiveness scores of the proposed projects and the additional preference criteria in the consideration of the projects to be given funding preference. Staff developed the “Total Benefit Index” score that preferentially weights the benefit-cost score (at 75 percent of the total weighting) with additional preference scores (weighted at 25 percent). Staff weighted the cost-effectiveness/benefit-cost scores in this manner because AB 8 directly identified the benefit-cost score as the metric by which to assign funding preference to for proposed projects, and staff believes that weighting the benefit-cost score at 75 percent sufficiently satisfies the legislative intent in AB 8 to provide additional preference to the cost-effectiveness/benefit cost score. Table 2 summarizes the projects currently proposed to receive AQIP funding from AB 118/AB 8 fees in FY 2014-15 based on the Total Benefit Index score.

**Table 2. Summary of Benefit-Cost Scores and Total Benefit Index for Proposed AB 118/AB8 AQIP Projects**

	Proposed AQIP Projects		
	Truck Loans	CVRP	HVIP
<b>Cost Effectiveness Score<sup>1</sup> (2014 \$/ton)</b>	\$6,900	\$8,900	\$29,000
<b>Scale</b> 5: ≤\$20,000/ton 4: \$20,001-\$39,999 3: \$40,000-\$59,999 2: \$60,000-\$79,999 1: >\$80,000	5	5	4
<b>Benefit Cost Score (lbs/\$)</b>	0.29	0.23	0.07
<b>Additional Preference Criteria: Scale (1-5)</b>			
1) Proposed or potential reduction of criteria or toxic air pollutants (per vehicle)	2	1	2
2) Contribution to regional air quality improvement	5	2	4
3) Ability to promote the use of clean alternative fuels and vehicle technologies	0	5	3
4) Ability to achieve climate change benefits (per vehicle)	0	2	3
5) Ability to support market transformation	0	5	5
6) Ability to leverage private capital investments	--	--	--
<b>Preference Criteria Average Score</b>	1.4	3	3.4
<b>Total Benefit Index<sup>2</sup></b>	<b>4.1</b>	<b>4.5</b>	<b>3.9</b>

<sup>1</sup> "Cost Effectiveness Score" is dollars per reasonably expected or potential criteria pollutant emission reductions.

<sup>2</sup> "Total Benefit Index" is the sum of the weighted Cost Effectiveness Scale (75 percent) and the Preference Criteria Average Score (25 percent).

**SUMMARY OF PUBLIC COMMENTS AND AGENCY RESPONSES TO APRIL 2, 2014 DISCUSSION DOCUMENT: AB 8 PROJECT SCORING CRITERIA**

1. Comment: Recommend staff provide clarification in the scoring methodology to alleviate any misinterpretation of the impact of incentive programs on reducing GHG and criteria pollutants.

Agency Response: Staff provided clarification above and in the attached Appendix A.

2. Comment: Per vehicle emission reductions should not be used to compare different equipment categories such as light-duty vehicles and locomotives. Measuring near-term benefits could bias the index score against high priority projects needed to begin the shift to low-emission transportation categories.

Agency Response: Per vehicle emission reductions were used as the basis for additional preference criteria 1 and 4 due to the difference in the incentive levels provided, current and future vehicle populations, and potential new vehicle or equipment sales. The differences add significant variations to the results. Analyzing benefits on a per vehicle basis combined with the other additional preference criteria and the benefit-cost score allows ARB to perform a holistic comparison of the projects.

3. Comment: *ARB should use existing models to quantitatively measure benefits and equity impacts of existing projects.*

Response: ARB used existing models such as Argonne National Laboratory's Greenhouse Gases, Regulated Emissions, and Energy Use in Transportation Model (GREET) and ARB's Emission FACTors (EMFAC) models to quantify emission benefits. ARB will continue to refine the benefits analysis when additional information becomes available. Moreover, equity impacts of existing projects may be analyzed but staff's analysis is limited to the requirements defined in AB 8.

## CHAPTER 3: PROPOSED FUNDING PLAN FOR FISCAL YEAR 2014-15

This year, the proposed Funding Plan includes recommended allocations for projects from two sources of funding: AQIP and Low Carbon Transportation Investments from GGRF, both of which are pending approval as part of the State Budget. Table 3 below outlines Staff's proposed project categories and funding allocations based on funding levels identified in the Governor's FY 2014-15 Proposed State Budget.

**Table 3. FY 2014-15 Proposed Project Allocations (in millions)\***

	AQIP Investments	Low Carbon Transportation Investments	
		Total	Percentage of Total Proposed to Benefit Disadvantaged Communities
<b>Light-Duty Vehicle Projects – up to \$125</b>			
• Classic CVRP	\$5	\$111	10% = \$11
• Pilot Projects in Disadvantaged Communities	-	\$9	100% = \$9
<b>Heavy-Duty Vehicle and Equipment Projects – up to \$85</b>			
• HVIP	\$5	\$5-\$10	100% = \$10
• Zero-Emission Truck and Bus Pilots		\$20-\$25	100% = \$20
• Advanced Technology Freight Demonstrations	-	\$50	100% = \$50
<b>Loan Assistance Programs – up to \$10</b>			
• Truck Loan Assistance Program	\$10	-	
<b>Reserve for Revenue Uncertainty</b>	<b>\$2</b>		
<b>Total</b>	<b>\$22</b>	<b>\$200</b>	50% = \$100

\*Note: Amounts listed includes administrative costs; actual project amounts may be lower.

The Energy Commission has approved \$5 million in funding to support Classic CVRP from the Alternative and Renewable Fuel and Vehicle Technology Program. This investment, coupled with significant investments in fueling infrastructure to support both electric and hydrogen vehicles, builds upon the continued partnership between the agencies to invest in technologies critical to meeting the State's long-term air quality and climate change goals.

### GGRF and Disadvantaged Communities

SB 535 requires that at least 25 percent of the total GGRF funding be directed to projects that provide benefits to disadvantaged communities and at least 10 percent of GGRF funding be spent on projects located in disadvantaged communities. The Secretary for Environmental Protection is responsible for identifying disadvantaged

communities. The \$850 million of total GGRF appropriations in the Governor's FY 2014-15 Proposed State Budget includes programs amenable to location in or near a disadvantaged community, and fixed location projects outside those communities. As a result, some proposed appropriations need to achieve much greater benefits in disadvantaged communities to ensure that the SB 535 criteria are met or exceeded for the entire \$850 million.

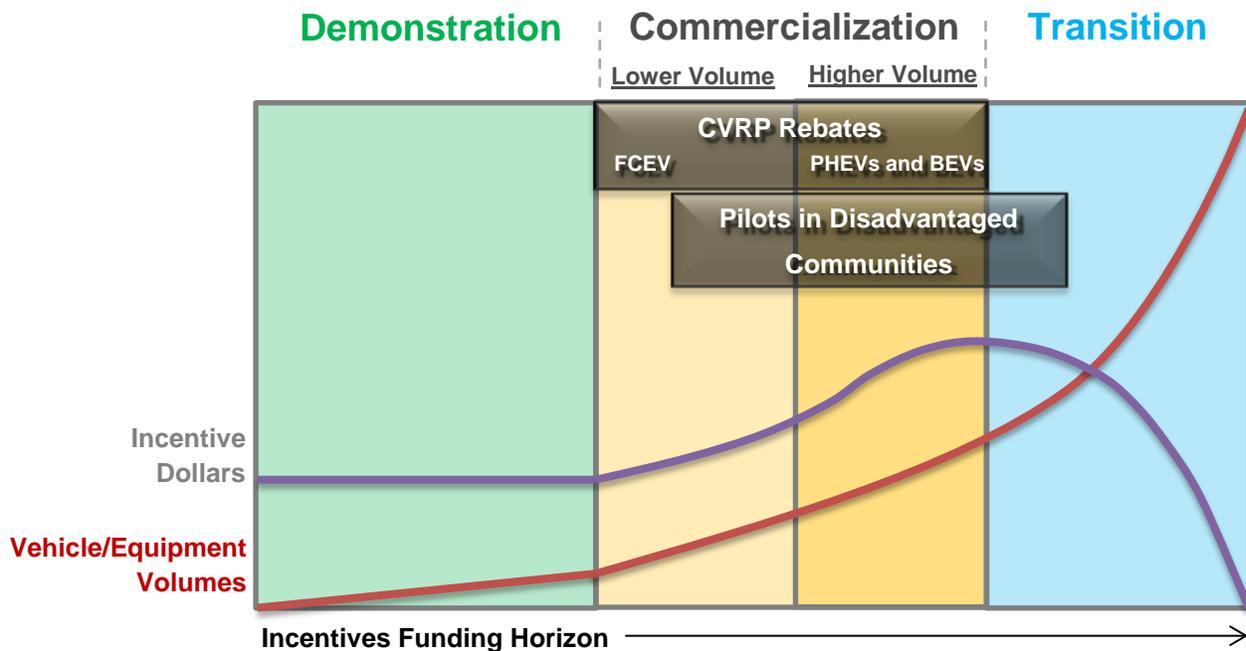
For ARB's Low Carbon Transportation investments, staff is targeting 50 percent of the investments to benefit disadvantaged communities, with a significant portion of these funds spent on projects based in those communities. This investment in projects to benefit disadvantaged communities is consistent with the requirement for GGRF funds per SB 535. As part of program implementation, ARB will develop metrics, such as reductions in criteria pollutant and air toxics emissions, that can be used to quantify these benefits to communities.

Also, it is anticipated that additional Cap-and-Trade Auction Proceeds for projects like these will be forthcoming in future years. Therefore, FY 2014-15 funds should be viewed as a first installment of funding that may be built upon to further advance these critical air quality and GHG reduction technologies as they move through the demonstration, commercialization, and transitions phases, as discussed in the long-term vision section of this document.

# CHAPTER 4: LIGHT-DUTY VEHICLE INVESTMENTS

Currently, advanced technology light-duty vehicles, such as PHEVs and BEVs, are in the commercialization phase, or are being introduced in limited quantities, such as FCEVs. The light-duty vehicle projects proposed have been established to help encourage consumer adoption of advanced technology passenger vehicles through two pathways. First, “classic CVRP” provides first come, first served rebates to encourage consumer adoption of advanced technology passenger vehicles and to spur market growth. Next, the proposed pilot projects have been established to increase penetration and technology acceptance of advanced clean vehicles in disadvantaged communities. The following section provides information on the two types of proposed projects.

**Figure 1a. FY 2014-15 Light Duty Investments**



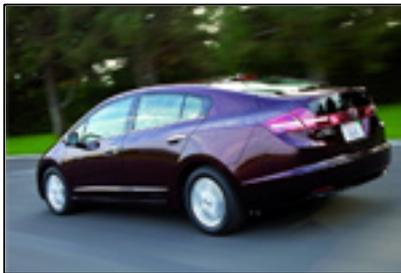
Several projects are being proposed for AQIP and Low Carbon Transportation investments to more effectively move the advanced technology light-duty vehicle market forward, reduce GHG emissions, and increase the benefits of such investments to disadvantaged communities. For FY 2014-15, total funding from AQIP and GGRF for light-duty projects is proposed at about \$125 million, which when combined with \$5 million from the Energy Commission for CVRP, totals \$130 million. Table 4 below summarizes the proposed Light-Duty Vehicle Investments.

**Table 4. Summary of Light-Duty Vehicle Investments**

	<b>AQIP Investment</b>	<b>Low Carbon Transportation Investment</b>	<b>Energy Commission Investment</b>
Classic CVRP	\$5M	\$111M	\$5M
Pilot Projects in Disadvantaged Communities	-	\$9M	
<b>Total Light-Duty Investments: \$130M</b>	<b>\$5M</b>	<b>\$120M</b>	<b>\$5M</b>

## CLASSIC CVRP

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**Proposed Funding Target: \$121M**

### **PROJECT GOALS**

Classic CVRP provides first come, first serve rebates to consumers for the purchase of passenger near-zero and ZEVs. Since its inception, the objective of CVRP has been to seed the market for widespread commercialization of the cleanest vehicles available today by helping to drive consumer purchasing decisions. The project has supported this simple goal by ensuring continued acceleration of ZEV purchases with an incentive strategy that is easy to understand and implement. Further, 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;
- Accelerate production economies of scale; and
- encourage co-investment in infrastructure and workforce training.

Staff recommends continuing these goals by proposing to further prioritize the most advanced technologies in addition to increasing benefits to disadvantaged communities. It is also important to ensure that the project remains effective, while recognizing the need to operate on a limited budget. Finally, a long-term plan and metrics for measuring success of the project will help to identify when the market is self-sustaining and incentives are no longer needed.

## **PROJECT OVERVIEW**

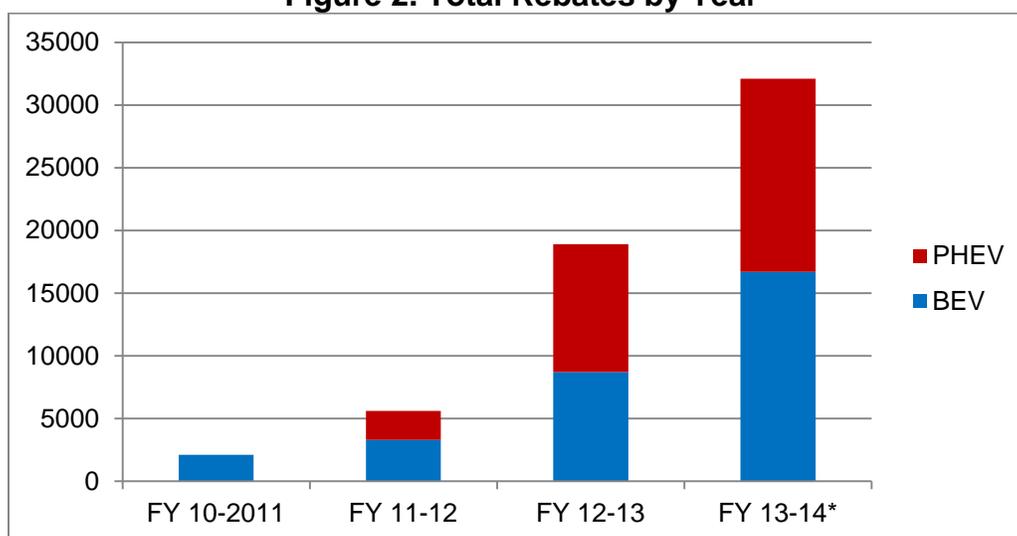
CVRP currently provides vehicle rebates of up to \$2,500 to California residents, businesses, non-profit organizations and government entities that purchase or lease a battery, fuel cell, or a plug-in hybrid electric vehicle. However, during the first two years of the program CVRP provided a rebate of up to \$5,000 per vehicle, which was consistent with ARB's existing Alternative Fuel Vehicle Incentive Program incentive amounts that had previously been in place at that time. As the program's success grew, the Board reduced rebate amounts in 2011 to the current rebate amount of up to \$2,500 to meet rapidly growing consumer demand with a limited budget.

CVRP also helps deploy the cleanest vehicles on the road in California by providing consumer rebates to partially offset the higher initial cost of these advanced technologies. ARB's investments through CVRP — coupled with corresponding investments in vehicle charging and fueling infrastructure by the Energy Commission, and regional and federal governments — are enticing manufacturers to focus early advanced vehicle deployments in California. To date, the grantee that oversees administration of the project is the Center for Sustainable Energy.

## **CURRENT PROJECT STATUS**

Rebates for about 59,000 vehicles totaling about \$125 million have been issued through March 2014. Figure 2 illustrates the total rebates issued per year, through April 30, 2014. Table 5 and Table 6 list the rebates issued by consumer type and vehicle model type, respectively, for the project through April 30, 2014. Figure 3 illustrates the statewide distribution of rebates by air district.

**Figure 2. Total Rebates by Year**



\*Note: FY 2013-14 data is current through April 30, 2014.

**Table 5. Rebates by Consumer Type (as of April 30, 2014)**

<b>Application Type</b>	<b>Rebates Issued</b>	<b>Total Rebate Amounts</b>	<b>Percentage of Total Dollars</b>
Individual	57,344	\$119,996,899	96.07%
Business	1,816	\$4,271,561	3.42%
Local Government Entity	150	\$322,700	0.26%
State Government Entity	107	\$189,450	0.15%
Non-Profit	52	\$96,150	0.08%
Federal Government Entity	28	\$35,200	0.03%
<b>Grand Total</b>	<b>59,497</b>	<b>\$124,911,960</b>	<b>100.00%</b>

**Table 6. Rebates by Vehicle Types and Model (as of April 30, 2014)**

<i>Vehicle Model</i>	<i>Rebates</i>	<i>Rebate Dollars Reserved/Distributed</i>	<i>Percent of Total Rebate Dollars</i>
<b>Light-Duty Zero-Emission Vehicles</b>	<b>31,064</b>	<b>\$81,564,959</b>	<b>65.30%</b>
BMW 1 Series Active E	70	\$52,500	0.04%
Chevrolet Spark EV	698	\$1,745,000	1.40%
CODA	49	\$122,500	0.10%
FIAT 500e	2,952	\$7,375,208	5.90%
Ford Focus Electric	1,075	\$2,682,223	2.15%
Honda FCX Clarity	15	\$57,500	0.05%
Honda Fit EV	314	\$783,750	0.63%
Mercedes-Benz F-CELL	26	\$65,000	0.05%
Mitsubishi i-MiEV	176	\$363,561	0.29%
Nissan Leaf	15,240	\$42,133,930	33.73%
Smart Electric Fortwo	1,022	\$2,369,000	1.90%
Tesla Model S	8,113	\$20,270,250	16.23%
Tesla Roadster and Roadster Sport	162	\$675,000	0.54%
Th!nk City	53	\$126,037	0.10%
Toyota RAV4 EV	1,097	\$2,739,000	2.19%
Wheego LiFe	2	\$4,500	0.00%
<b>Plug-In Hybrid Electric Vehicles</b>	<b>28,019</b>	<b>\$41,992,326</b>	<b>33.62%</b>
Cadillac ELR	19	\$28,500	0.02%
Chevrolet Volt	13,870	\$20,796,101	16.65%
Ford CMAX Energi	2,031	\$3,044,033	2.44%
Ford Fusion Energi	2,145	\$3,217,500	2.58%
Honda Accord Plug-In	208	\$312,000	0.25%
Toyota Prius Plug-in Hybrid	9,746	\$14,594,192	11.68%
<b>Neighborhood Electric Vehicles</b>	<b>138</b>	<b>\$143,050</b>	<b>0.11%</b>
GEM e2	43	\$39,000	0.03%
GEM e4	24	\$23,200	0.02%
GEM eL	4	\$4,950	0.00%
GEM eL XD	16	\$16,200	0.01%
GEM eS	15	\$14,100	0.01%
Miles EV ZX40S-AD	35	\$44,100	0.04%
Vantage EVX1000	1	\$1,500	0.00%
<b>Zero-Emission Motorcycles</b>	<b>227</b>	<b>\$231,625</b>	<b>0.19%</b>
Brammo Empulse	14	\$12,600	0.01%
Brammo Enertia	15	\$17,225	0.01%
Brammo Enertia Plus	2	\$1,800	0.00%
Vectrix VX-1	6	\$7,800	0.01%
Zero DS	131	\$138,500	0.11%
Zero FX	12	\$10,800	0.01%
Zero S	38	\$34,800	0.03%
Zero SR	4	\$3,600	0.00%
Zero XU	5	\$4,500	0.00%
<b>Commercial Vehicles<sup>1</sup></b>	<b>49</b>	<b>\$980,000</b>	<b>0.78%</b>
<b>Grand Total</b>	<b>59,497</b>	<b>\$124,911,960</b>	<b>100.00%</b>

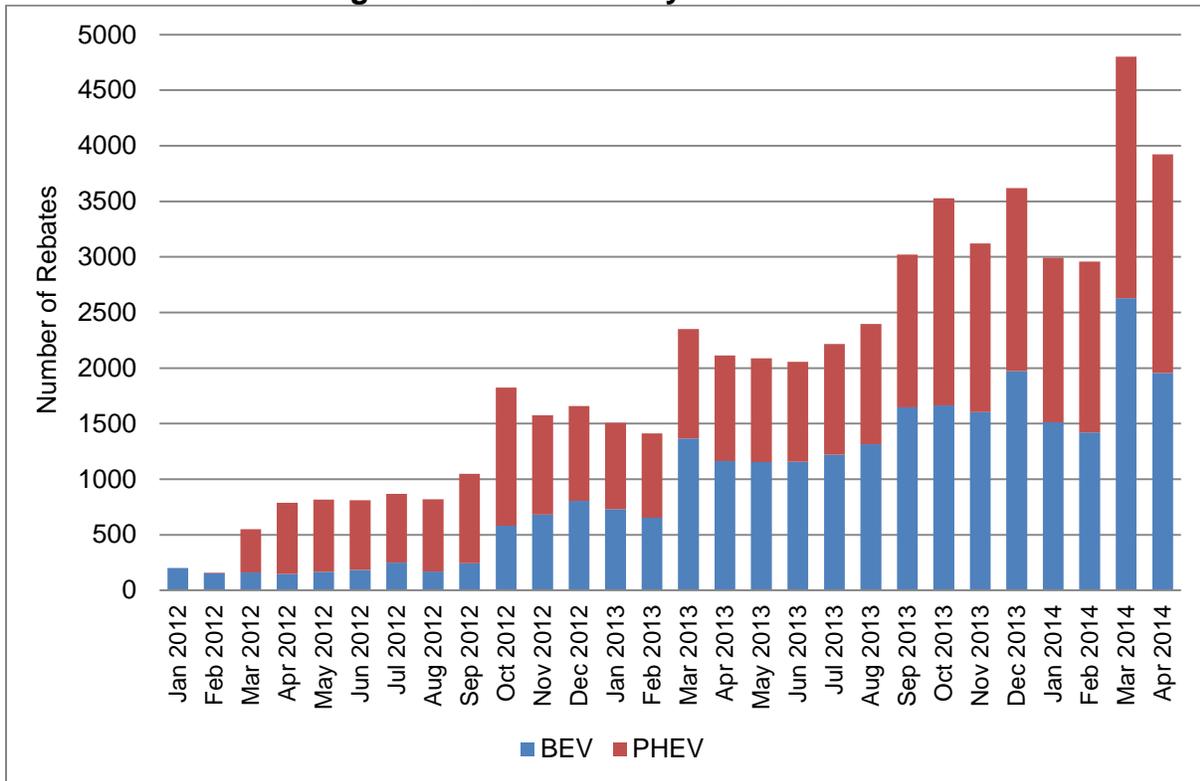
<sup>1</sup> Commercial vehicles received CVRP funding in FY 2009-10 only, and subsequently have received funding through HVIP.

**Figure 3. CVRP Rebate Distribution by Air District (as of April 30, 2014)**



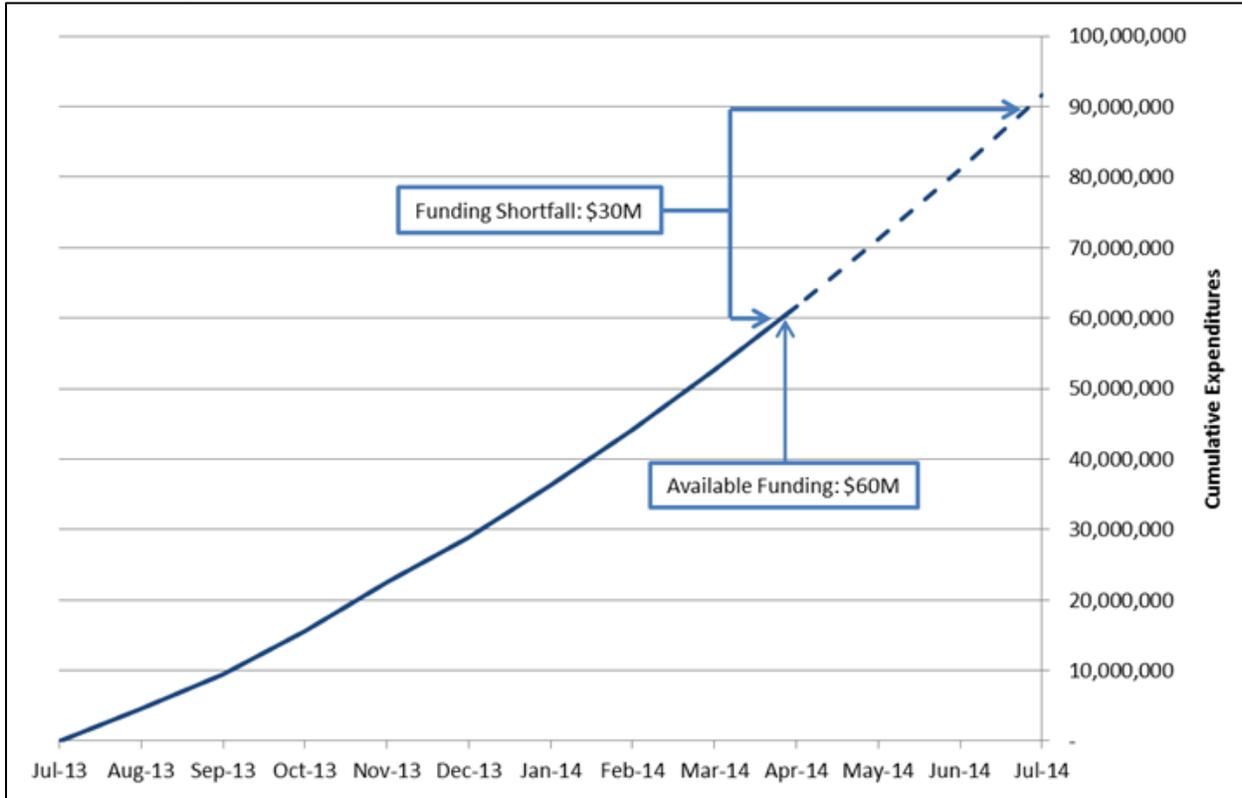
In FY 2013-14, CVRP experienced a rapid rise in rebate requests, with over a 160 percent increase in rebate reservations in 2013 compared to 2012. In March of 2014, a new record was set, with over 4,800 rebates reserved in a single month. Figure 4 illustrates monthly rebate demand since January 2012.

**Figure 4. CVRP Monthly Rebate Demand**



Because of this increased activity, staff is projecting a potential funding shortfall of about \$30 million for the current FY (Figure 5).

**Figure 5. Projected FY 2013-14 CVRP Cumulative Expenditures**

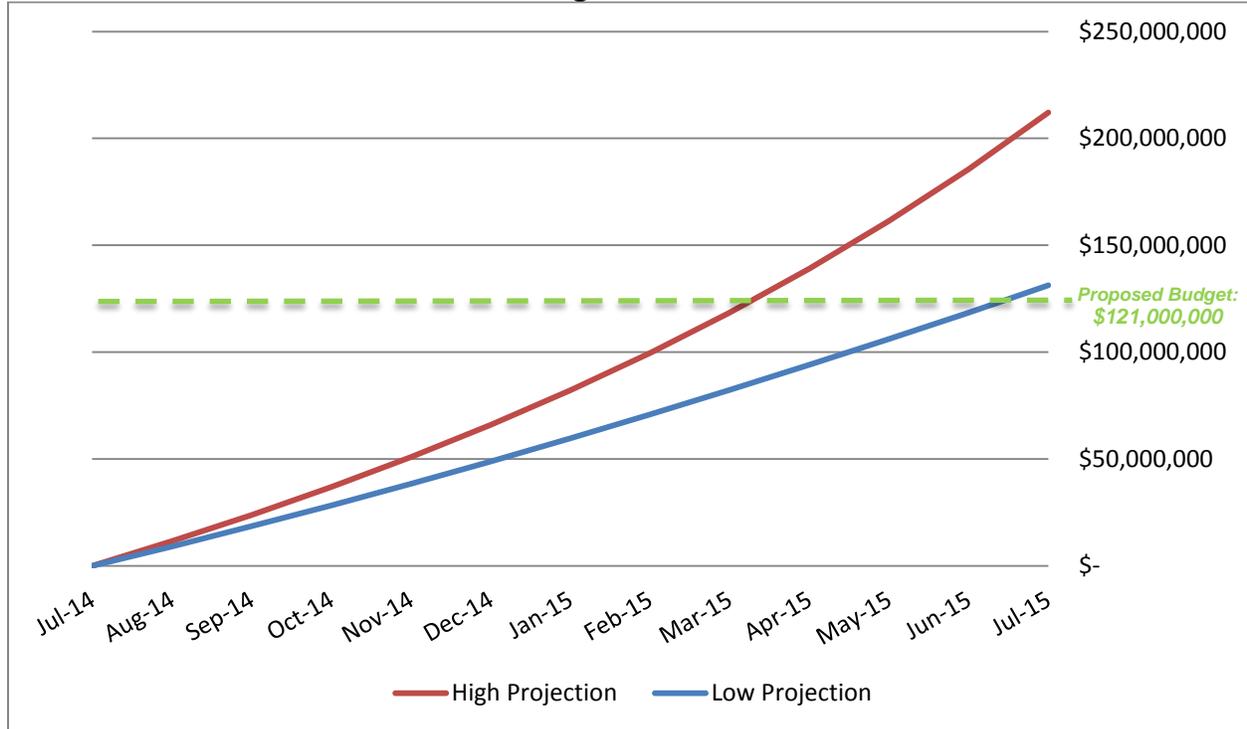


Note: \$15 million of the available funding comes from AB 118 (ARB and the California Energy Commission) with about \$25 million provided by AB 101 and another \$20 million authorized by SB 359.

CVRP funding was exhausted in early April 2014, and a \$5 million wait list was initiated. On April 25, 2014, the Board approved expanding the waiting list to a total of \$30 million. Expanding the waiting list not only prevents project suspension, but it provides consumers certainty that they will receive a rebate when making their purchase decision and alleviate disruption to the advanced clean car market in California. The Governor has proposed supplemental funding to satisfy this demand as part of the FY 2014-15 State Budget. Rebate applicants placed on the waiting list during FY 2013-14 will receive a rebate under current FY 2013-14 levels and restrictions.

*Projected Funding Demand for FY 2014-15:* Under the current program structure without modifications, CVRP funding demand in FY 2014-15 is projected to be significantly greater than previous fiscal years at between \$130 million and slightly over \$200 million (Figure 6). However, based on available funding, staff is proposing up to \$116 million for Classic CVRP, which combined with the Energy Commissions investment of \$5 million, brings the total for Classic CVRP to \$121 million. Because the success of the program depends on consistent and predictable funding, staff is also proposing modifications to align the project with expected funding levels so that the likelihood of funding lapses will be minimized.

**Figure 6. FY 2014-15 CVRP Rebate Demand and Funding Projections without Program Modifications**



## **STAFF PROPOSAL FOR FY 2014-15**

The California clean car market is growing rapidly and CVRP rebates will ensure sustained and healthy market growth. ARB staff and stakeholders recognize that changes to CVRP are essential in order to align project needs with budgetary limitations, program effectiveness, and to provide market certainty. Because of this, ARB staff evaluated various potential project modifications for FY 2014-15, in conjunction with the long-term plan and with a focus on the following project goals:

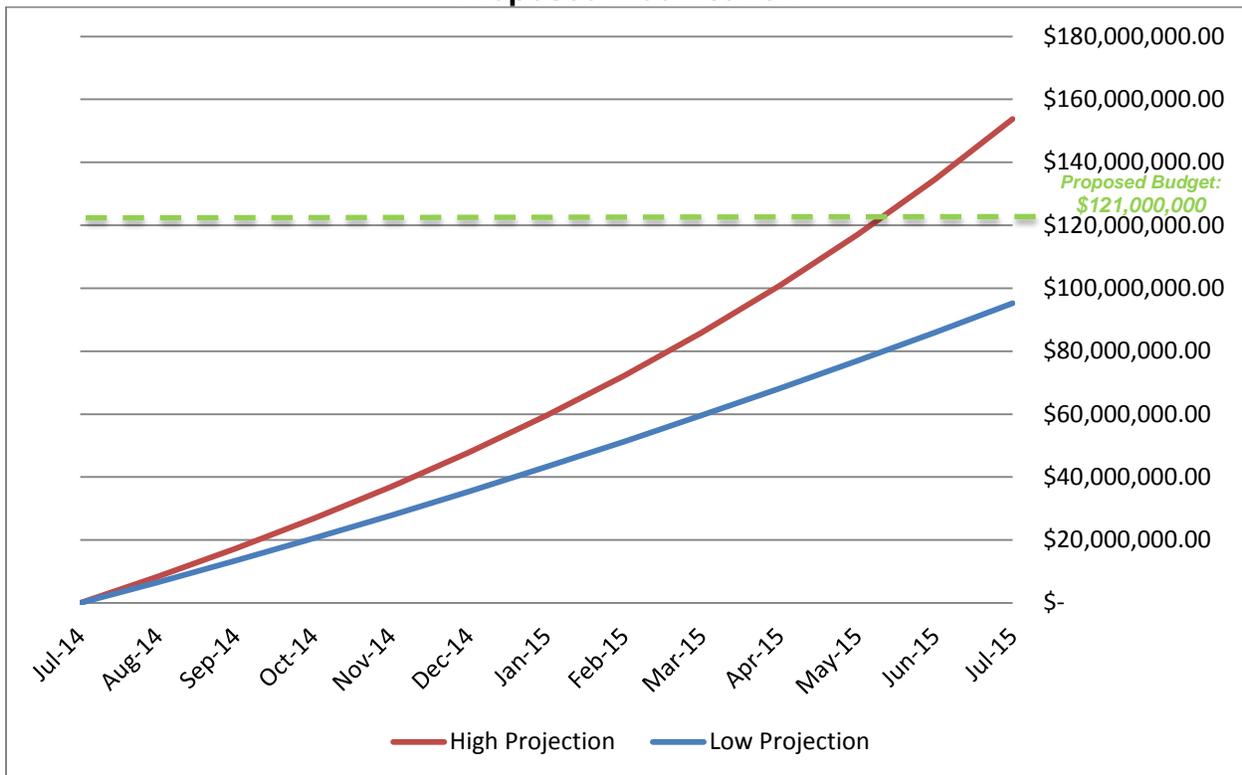
- Effectively motivate consumer purchasing decisions toward advanced technologies instead of conventional vehicles;
- Ensure the continued acceleration of advanced clean vehicle purchases;
- Increase benefits to disadvantaged communities;
- Leverage funding in related programs (car scrap, local sources, etc.);
- Maximize co-benefits associated with the deployment of advanced clean cars; and
- Simplify modifications so the program remains easy to implement and simple for consumers to understand.

Based on the assessment for FY 2014-15, using the best available data, staff proposes to reduce rebate amounts by \$500 for BEVs and PHEVs in order to meet the objectives above, and ensure that the program can operate within the specified budget over the full

fiscal year without interruption. Staff is also proposing contingency measures, to be implemented by the Executive Officer, that provide flexibility for midyear adjustments in order to ensure program continuity and fiscal solvency.

With the initial modification, staff anticipates a funding need of between about \$95 million and \$153 million for FY 2014-15 based on current market trends (Figure 7). In addition, this preliminary projection does not consider unannounced or unexpected changes to the market at this time (e.g., manufacturer incentives or vehicle price reductions that may increase demand).

**Figure 7. FY 2014-15 CVRP Rebate Demand and Funding Projections with Proposed Modification**



Reduced Rebate Amounts for BEVs and PHEVs

CVRP currently offers rebate amounts of \$2,500 for BEVs and \$1,500 for PHEVs. Staff recommends lowering the rebate amounts for BEVs and PHEVs by \$500 to \$2,000 and \$1,000, respectively, based on the findings below:

- A greater reduction (33 percent under staff’s proposal) in the PHEV rebate amount relative to BEVs is appropriate given the stronger growth in the PHEV market.
- Staff anticipates only a minimal short-term impact in the growth of sales of eligible vehicles due to the lower rebate amounts. However, the budget savings associated with the short-term market delay will more than offset this impact by

providing rebates for about 41 percent more vehicles during FY 2014-15 under a fixed budget. Table 7 illustrates how additional rebates could be supported by a reduction in rebate amounts if funding allocations between BEVs and PHEVs is divided evenly.

**Table 7. Additional Vehicles Supported with Reduced Rebate Amounts**

	BEV	PHEV	Total
Funding Level	\$60.5M	\$60.5M	<b>\$121M</b>
# cars supported w/o modification (\$2,500 for BEVs and \$1,500 for PHEVs)	24,200	40,333	<b>64,533</b>
# cars supported with reduced rebates (\$2,000 for BEVs and \$1,000 for PHEVs)	32,500	60,500	<b>90,750</b>
% increase in the amount of rebates available	25%	50%	<b>41%</b>

- In estimating this impact, staff first assumed a continuation of the current equal split in funding demand between PHEVs and BEVs. Staff then calculated the number of rebates which could be issued under both the current and proposed rebate levels. Finally, staff determined the percent increase in vehicle rebates for the full project.
- As discussed further below, staff expects the new rebate amounts to remain effective in influencing BEV and PHEV sales as the reduction in rebate amounts are still influential relative to the MSRP of eligible vehicles.
- The federal tax credit of up to \$7,500 remains available. Staff’s proposed rebate amounts, when combined with the federal tax credit, would only reduce the overall financial incentive available by five percent, from up to \$10,000 to up to \$9,500.

*Market Impact:* Looking at the effects of rebates and excluding other external variables, such as reduced manufacturing costs and the number of rebates available, reducing rebates by \$500 for BEVs and PHEVs will result in slight slowing to the continued expected growth of the California PEV market. Conversely, with a limited budget of \$116 million, staff expects reducing rebate amounts will extend rebate funding over the course of the full FY 2014-15, thereby supporting the deployment of more vehicles over the course of the entire year. This will more than offset the market uncertainties and impacts associated with making no rebate level changes, resulting in rebate funding likely being exhausted well before the end of FY 2014-15.

### FCEV Rebates

FCEV technology, while in early stages of commercialization for light-duty vehicles, is not as widely available in the marketplace as BEVs or PHEVs. Until manufacturers deliver increased vehicle volumes and varieties, and until early adopters begin to accept

the technology, these vehicles remain in the earlier phase of commercialization. Currently, a limited number of vehicle models, including the Hyundai Tucson FCV are available, with additional models expected in 2015. Because of this, staff recommends offering rebates for FCEVs at \$5,000, consistent with the rebate levels offered to BEVs when these vehicles were in that same stage of commercialization.

#### Other Options Considered but Rejected

Below are project modifications considered but rejected for FY 2014-15:

- MSRP Cap: Preliminary staff recommendations included a MSRP cap of \$60,000. Staff has determined, however, that implementing an MSRP cap will restrict incentives for emerging advanced technologies with lower production volumes and higher costs. Staff believes at this time that incentives remain a valuable tool for encouraging all consumers to purchase an advanced technology vehicle compared to a traditional gasoline-powered passenger car, and that it is not appropriate to impose an MSRP cap that could potentially harm growth in the advanced technology marketplace.
- Income cap: Implementing an income cap could provide useful budget savings, but could also have a significant effect on the market. At the same time, an income cap could be difficult to administer and enforce.
- Rebates for ZEVs Only: This option would restrict rebates to ZEVs by excluding all other rebate-eligible vehicle types. While PHEVs are important to the overall health and growth of the advanced technology market, some PHEVs provide greater benefits than others by offering better capabilities for all-electric range. Because of this, staff is proposing that the Executive Officer have the flexibility to reduce or eliminate rebates for some PHEVs based on all-electric range. The contingency measures are discussed in more detail beginning on page 39.
- Focus on impacted communities: CVRP rebates could be restricted to specific geographical regions and focus funding to areas that have been disproportionately affected by air pollution. However, this option might be problematic because purchases of advanced clean cars in those communities are limited.
- Tiered Rebates: This option would provide a set base rebate amount for all advanced technology vehicles, with additional rebate 'add-ons' for vehicles that meet certain policy priorities, such as extended vehicle range, extended warranty, or vehicles with a lower MSRP. While this approach might offer the most strategic opportunity to tailor incentives toward certain technologies/consumers, it could add significant layers of complexity to both the implementation and consumer understanding of the program.
- Other options include those that would likely require legislation (sales tax, feebates, choose your incentive, etc.) and merit further consideration in the future.

## Other Administrative Changes

*Adjust Maximum Number of Rebates per Consumer Type:* In response to limited rebate availability, last year the Board approved an adjustment to the maximum number of rebates per consumer type for each funding year as shown in Table 8.

**Table 8. Maximum Number of Rebates per Consumer Type**

Consumer Type	Maximum Number of Rebates Proposed
Individual	2
Public Fleet	30
Rental Fleet	20
Car Share	20

Historically, most individuals have not applied for more than two rebates. Because CVRP is intended to encourage consumers to invest in these newer, advanced technologies, staff is proposing to limit the lifetime number of rebates to individuals to two overall, since the project's inception. This limitation would only apply to individuals and businesses, not fleet or car share vehicles. Staff is also proposing an exemption for individuals who were previously rebated and wish to upgrade to a FCEV. Staff believes that two rebates overall, in addition to a FCEV exemption, helps to better focus incentives toward those individuals that are still unsure of the technology and therefore rely upon a rebate as an incentive for making their purchase decision. Staff believes this approach is consistent with the overall goals and objectives of the program.

*Two-Year Grantee Solicitations:* Staff is proposing to issue a two-year solicitation for a CVRP grantee that will allow ARB to enter into a grant agreement for rebate administration of up to two fiscal years. Each solicitation will encompass up to two fiscal years, while the grant agreement will initially cover one fiscal year with the option to renew for the following year. Staff is proposing this option for all deployment projects to help ensure a smooth transition from one year to the next.

*Waiting List Provision:* The CVRP waiting list provision has been an important feature for consumers and manufacturers alike because it provides a degree of funding certainty during gaps between funding cycles. While staff is proposing contingency measures (discussed below) to avoid project disruption during the year, staff also proposes that the Board provide the Executive Officer discretion to establish an appropriate waiting list to bridge the gap between FY 2014-15 and FY 2015-16 funding, should one be warranted. A decision-making trigger would be invoked when the remaining vehicle funding reaches \$10 million. Parameters that would be evaluated in making the decision to establish a waiting list include: expenditure rate of CVRP funding, amount of projected shortfall, effect of proposed contingency modifications, potential for additional funds, and projected future vehicle volumes.

## Contingency Measures

As mentioned previously, the California clean car market is growing very dynamically and various factors cause unpredictability in project demand. In order to accommodate a sudden increase in project demand that may outstrip available funding or address any unexpected funding shortfalls, staff proposes to conduct quarterly funding evaluations while continuing to develop and refine projections. Should CVRP experience a sudden and/or significant change demand, staff proposes that the Executive Officer have the ability to offset those increases by making adjustments to avoid interruptions in the project.

Specifically, staff proposes that the Executive Officer have the ability to reduce or eliminate rebates for some PHEVs based on all-electric range, if necessary, to help align expected demand with remaining budgetary constraints. This approach is consistent with ZEV credit provisions in the ZEV regulation, which recognizes varying ranges of BEVs, while preserving consumer options for PHEVs to meet mobility needs that may not be satisfied by current BEV options. However, staff recognizes continued consumer demand for longer-all electric range PHEVs, and is not proposing to eliminate rebates for all PHEVs.

Staff does not propose that the Executive Officer make any changes should there be an unexpected reduction in demand during FY 2014-15. Unless there is a significant reduction in rebate demand, staff believes that the accumulation of a 2-3 month reserve in funding for CVRP specifically is appropriate. A modest reserve will allow the project to continue standard operation between fiscal years, and ensure that funding is available while other sources of funding (such as the fees that support AQIP) accumulate on a month-to-month basis to support the project in the next fiscal year.

Prior to the implementation of any contingency measures, staff would meet with the CVRP Work Group, and take necessary steps to ensure timely and effective communication to the public and participating stakeholders.

## **LONG TERM PLAN**

Consistent with the above stated goals and metrics for measuring the project's success, staff proposes the following evaluation milestones for CVRP:

- Evaluate the state of technology for each of the three main technology types as they approach specific levels
  - When advanced clean cars represent around 5 percent of total new passenger car sales in California, they begin to shift out of the early adopter market (1-2 percent of sales) and fast-follower (2-5 percent of sales) market segment<sup>21</sup>. Once the advanced car market reaches beyond the fast-follower market, vehicle prices may be reduced enough where CVRP rebates may not be necessary, although additional research in this area is suggested below.

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<sup>21</sup> National Research Council. (2013). Overcoming Barriers to Electric-Vehicle Deployment: Interim Report.

- Using rebate demand projections and projected passenger car sales, staff believes that this threshold will be achieved once advanced clean cars approach the milestones of about 150,000 rebates for BEVs, 150,000 rebates for FCEVs, and 75,000 rebates for PHEVs starting in FY 2014-15.
- Staff proposes that evaluations of the technologies' progress toward reaching these milestones begin once vehicle volumes reach the halfway point for each initial target.
- Staff expects to reevaluate each technology type in future funding plans with the metrics of success, described below, to determine whether to make further adjustments, such as reducing rebate amounts further for specific technologies, or considering other project changes.

Given the success of the project and the anticipated growth in demand, metrics are necessary for evaluating continued effectiveness of the project and determining when advanced technology light-duty vehicle incentives are no-longer needed. Staff believes a set of metrics can be useful in determining if, and how quickly, a specific vehicle technology is becoming a mainstream purchase option where rebates are no longer needed or another incentive would be more effective.

Staff has identified three potential metrics that can be considered in determining the success of the project. For each of the three primary metrics, staff included sample indicators that could be used to conduct an evaluation:

- State of Advanced Clean Car Market:
  - ZEVs sold as a percent of total California car market
  - ZEVs sold as a percent of total market in other states administering ZEV requirements
  - Demand for CVRP rebates
- Household Ownership Patterns:
  - Number of *new* households purchasing ZEV technology to demonstrate market expansion
  - Purchaser income distribution (relative to new car purchases)
- Manufacturer Achievements:
  - Manufacturer and vehicle model diversity
  - Number of manufacturers with more than a certain number of vehicles sold

Because the clean car market is continuing to grow dynamically, there is a clear need to evaluate the effectiveness of investments toward CVRP. Staff expects that utilizing metrics of success to inform CVRP's long-term plan will allow the project to be as effective as possible in encouraging continued transformation of California's clean vehicle market, supporting early compliance of the ZEV mandate, continuing development of necessary supporting infrastructure, and supporting the State's long-term air quality and climate change goals. Further, the metrics help ensure that the project is sustainable and can adapt to a changing market with increasing participant demand.

## Incentives Research

Throughout the course of development for the FY 2014-15 Funding Plan, staff consulted a broad range of literature, and used the best available data to conduct the analysis contained within the plan. However, there are gaps in the existing research related to helping define the scope and duration of incentives moving forward. A research proposal, coordinated with other ARB research, will help inform the ongoing evaluation of the project and provide valuable information on how to adjust the project, and help identify when incentives are no longer needed.

For example:

- Existing research supports rebates as an effective type of financial incentive to encourage adoption of cleaner vehicles. However, additional research related to other program designs, such as feebates, registration fee reductions, sales tax exemptions, and the value of other incentives such as free public charging and carpool stickers, would be beneficial.
- Research related to identifying the vehicles that are most likely to be purchased in the absence of incentives is not available.
- Further, research related to when incentives may no longer be needed for technology types is also not yet available.
- Some literature illustrates that charging/fueling infrastructure may be more important than incentives for encouraging clean vehicle adoption. But it does not adequately explore regional variations in the association between charging infrastructure and clean vehicle adoption, nor does it address the cost that drivers are willing to pay for what they consider adequate access.

## **SUMMARY OF PUBLIC COMMENTS AND AGENCY RESPONSES TO APRIL 2, 2014 DISCUSSION DOCUMENT: CVRP**

1. Comment: *Reducing incentives such as reduced rebates and an MSRP cap at this stage in the light-duty clean vehicle market is premature and undercuts a more strategic long-term approach for reducing rebates over time as technology costs lower.*

Agency Response: We believe the proposed rebate reductions are necessary and are consistent with a longer-term approach to reducing rebates as technology costs are reduced. In the current year, demand for CVRP rebates has greatly exceeded supply.

CVRP experienced a rapid rise in rebate activity in 2013, which has continued into 2014 and led to the record breaking month of March with over 4,800 rebates reserved. The excess demand in the current fiscal year resulted in a \$30 million shortfall that is currently being addressed by a waiting list. Clearly, demand for advanced clean cars is increasing. Both of the projections illustrated in Figure 6 exceed the current budget of \$121 million.

While it is possible that sales will flatten-out in fiscal year 2014-2015 and we recognize that only a limited number of additional models will be released in the next fiscal year, we continue to believe today's robust demand for existing models will continue into the next fiscal year. This is witnessed by the program's growth between 2012 and 2013, the sustained growth in the first 3 months of 2014, and recent price reductions on the most popular models. Lowering the rebate amounts will allow CVRP to stay effective as rebates are adjusted to capture declining manufacturing costs and vehicle prices. Battery costs, which are of the main cost component for a PEV, continue to decline. As evidence, the U.S. Department of Energy recently announced that the cost of batteries has been cut in half in the last four years<sup>22</sup> (from \$625/kWh in 2010 to \$325/kWh in 2014), which will enable increased PEV affordability for consumers.

Multiple commenters suggest that with no change to funding levels, 65,000 rebates could be issued. However, we believe that without modifications, the rebate supply may be lower after accounting for administrative costs and may not be able to accommodate anticipated strong demand in rebates. We continue to believe that with the growth witnessed in the program, demand for incentive funding would outstrip supply if rebate levels are not reduced. By reducing rebates, CVRP will be able to provide rebates for more total vehicles during fiscal year 2014-15. This will help to minimize the risk of program interruptions due to the exhaustion of funding during the course of the fiscal year, which may cause greater disruptions to the market due to consumer confusion and a potential suspension of the program. The program must live within its means.

While long-term approaches for PHEV deployments are being discussed in the Legislature, staff believes the PEV market is in its early stages and it is difficult to project for the implementation of a long-term plan at this moment. Consequently, staff has proposed implementing evaluation milestones for different technologies. Staff anticipates that when the milestones are reached, advanced clean car sales will be above 5 percent of total new passenger car sales in California. At above 5 percent, the advanced clean car market will begin to shift out of the early stage market and into the early core market, where the need for incentives may be reduced<sup>23</sup>. Staff believes that as sales increase and costs decrease, per vehicle incentives should decrease and be limited to those vehicles and income levels that provide the most value per incentive dollar spent.

Further, as discussed previously, staff has re-evaluated the preliminary proposal of establishing a MSRP cap at \$60,000, and has determined that it is not appropriate to include that recommendation at this time.

2. Comment: *Recommend staff implement a \$400,000/household income cap over the proposed MSRP cap.*

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<sup>22</sup> U.S. Department of Energy. (2014). EV Everywhere Grand Challenge; Road to Success.

<sup>23</sup> National Research Council. (2013). Overcoming Barriers to Electric-Vehicle Deployment: Interim Report.

Agency Response: After further analysis, staff has proposed to limit initial modifications to a reduction in rebates and is not proposing an MSRP cap.

However, in response to the comments received, based on staff's analysis, a MSRP cap of \$60,000 has a similar market impact compared to an income eligibility cap of \$400,000 per household. But, despite having similar market impacts, other differences exist. Mainly, an income eligibility cap will be more difficult to implement, administer, and enforce than an MSRP cap, which may increase the overall implementation costs of the project while lowering the number of rebates available. Without an established dataset that can be used for verification, implementing an annual household income cap will be more difficult compared to a MSRP cap. To prevent fraud, a new enforcement strategy would need to be developed to implement an income cap.

3. Comment: *Recommend ARB adopt changes that allow flexibility to avoid another funding shortfall. However, the proposed MSRP cap as a contingency measure will be disruptive to the market. An income cap as a contingency measure should be used over an MSRP cap.*

Agency Response: Staff agrees that an MSRP cap is not an appropriate modification for mid-year adjustments to the project, but further disagrees that an income cap would serve as a better modification, because of the complexities discussed above. Staff is instead proposing to reduce or eliminate rebates for some PHEVs based on all-electric range. As discussed in the contingency section beginning on page 39, this approach is consistent with ZEV credit provisions in the ZEV regulation.

4. Comment: *ARB should consider an exclusion from CVRP leased plug-in vehicles that lack the option to buy or renew at the end of the original lease agreement. This exclusion should not apply to fuel cell vehicles at this time.*

Agency Response: ARB staff is concerned that this exclusion might slow innovation and commercialization of new ZEV technologies, including innovation of new battery-electric technologies. Leasing ZEVs represents an important part of the innovation process with respect to encouraging the development and deployment of new technologies. Because many automakers remain generally concerned about technology performance, durability, warranty risk, and customer satisfaction with early ZEVs, they tend to offer short-term leases where they have more control over the time these early vehicles are on the road. At the end of the lease period, the manufacturer may remove the vehicle from service and in doing so, learn more about how that vehicle performed in the field and quickly develop options for improving the new technology. Allowing consumers to access rebates for closed-end leased vehicles supports this early innovation period by encouraging manufacturers to field test new ZEV technologies.

## *LIGHT-DUTY PILOT PROJECTS IN DISADVANTAGED COMMUNITIES*

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**Proposed Funding Target: \$9 million**

### **PROJECT GOALS**

Staff recommends allocating up to \$9 million of the Low Carbon Transportation Investments from the overall light-duty vehicle budget to administer clean vehicle pilot projects that reduce GHG emissions in or to directly benefit disadvantaged communities. This focused investment will allow ARB to investigate the viability of these pilot projects in assisting lower-income households and disadvantaged communities in using cleaner vehicle technologies.

## **PROPOSED LIGHT-DUTY PILOT PROJECTS FOR FY 2014-15**

Staff recommends dividing the \$9 million allocation for light-duty pilot projects between four proposed projects. Projects will be developed with public input over the next several months with a series of work group meetings and individual stakeholder discussions. Staff expects to stagger grant solicitations or project agreements throughout the year based on the needs of each of the projects. Similar to administration of other AQIP projects, ARB will maintain project oversight responsibilities, and enter into grant agreements with public agencies or non-profit organizations to carry out the duties of each project. Proposed allocations listed below represent the funding needs identified by staff for the upcoming fiscal year. However, consistent with overall contingency measures for the plan, staff recommends that the Executive Officer have the authority to adjust funding amounts between the categories should funding needs in one project outweigh the needs in another, or in the event that funding demand for a specific project does not materialize.

### Targeted Car Sharing in Disadvantaged Communities

Proposed Allocation: Up to \$2.5 million

Car sharing allows an individual to benefit from the use of a private automobile without the responsibility of car ownership costs. Staff is proposing to allocate funding to establish hybrid and advanced clean car sharing fleets in disadvantaged communities to offer an alternate mode of transportation and encourage the use of clean cars. The pilot would provide immediate emission reduction benefits and be used to gather data that could help support larger scale advanced technology car share programs.

Staff plans to establish a public work group to determine the needs and parameters of the project. The work group is expected to include members and representatives of disadvantaged communities, representatives of organizations with experience administering car share programs, research institutions, local air districts, and other stakeholders. Staff proposes to issue a solicitation for several deployments throughout the State, including at least two projects in federal extreme nonattainment areas. ARB intends to solicit for projects that meet the mobility needs of specific disadvantaged communities, including traditional carsharing models as well as vanpooling, shuttles, and other advanced technology mobility options. Eligible project components will include capital costs for vehicles and infrastructure, marketing, operating expenses such as staffing and insurance, and data collection and reporting. Staff envisions that the remainder of 2014 will be used to further develop this pilot project and the corresponding solicitation, with a target timeframe of early 2015 for actual project solicitation.

### Increased Incentives for Public Fleets in Disadvantaged Communities

Proposed Allocation: Up to \$3 million

Public fleets are not eligible for additional incentives, such as the federal tax credit, to bring down the higher prices associated with advanced clean cars. As a result, combined with other barriers, local and state government fleets make up a very small number of the total number of rebates reserved. Staff is proposing to offer rebates to public fleets located in or serving disadvantaged communities of up to \$5,250 for plug-in hybrid electric vehicles, up to \$10,000 for battery electric vehicles, and up to \$15,000 for fuel cell electric vehicles. The vehicles will be required to operate in disadvantaged communities and the communities will experience the direct benefits of the vehicle operating on their roads. This pilot project is expected to be administered as a set-aside within classic CVRP.

Staff is also considering options to support infrastructure for public fleets in disadvantaged communities. Staff will continue coordination with the Energy Commission regarding infrastructure investments, and consider allowing a portion of the proposed allocation to be used for infrastructure to serve public fleet vehicles.

### Vehicle Retirement and Replacement Plus-up

Proposed Allocation: Up to \$2 million

This pilot program will focus on promoting advanced technology vehicle replacements (both new and used) by providing additional financial assistance for cleaner vehicles under EFMP or other vehicle retirement programs. To determine a sustainable replacement vehicle solution for low-income participants in federal extreme non-attainment areas, staff believes that innovative approaches must be evaluated and tested. Assistance will include increased incentive amounts, eligibility for used advanced technology vehicles, and may include alternative options, such as transit and carshare subsidies, or low-cost loans. Staff is proposing incentive amounts of up to \$5,000 for plug-in hybrid or zero-emission vehicles and up to \$2,500 for conventional hybrid vehicles that are eight years old or newer at the time of purchase.

Staff anticipates establishing a work group during summer of 2014 to further develop this project, and is targeting fall of 2014 to finalize project parameters, including specifics of project administration.

## Financing Assistance Programs

Proposed Allocation: Up to \$1.5 million

For some individuals, vehicle financing is a significant barrier to vehicle ownership. Staff proposes to evaluate the feasibility of programs that provide financing assistance, such as a loan loss guarantee for financial institutions or programs that buy down interest rates for consumers, in order to improve financing options for low-income individuals interested in moving into a cleaner vehicle. These programs may help some consumers that would not typically qualify for conventional financing to better afford an advanced technology vehicle. Further, as more hybrids and advanced clean cars enter the used car market, financing assistance for used vehicles may help to increase the number of cleaner vehicles in disadvantaged communities.

Consistent with the pilots listed above, staff proposes to begin further evaluation of this pilot through a work group process, that would include financial institutions, automotive dealers, community groups, and others, in order to determine which financing assistance options might offer the best benefits to low-income consumers purchasing advanced technology vehicles. This pilot will be further developed throughout the summer and fall of 2014, and staff is targeting early 2015 to finalize project parameters, including specifics of project administration.

### **LONG-TERM PLAN**

These projects are focused on expanding the market of advanced clean passenger vehicles to individuals that otherwise might not have an opportunity to use these technologies at the individual level. As noted above, these investments are intended to allow ARB to investigate the viability of these pilot projects, and if successful, serve as a foundation for future investments. Because each of these pilots uses a different mechanism to engage and assist low-income and disadvantaged individuals, staff proposes to develop specific metrics of success throughout the workgroup process identified above for each project, and where applicable, include metrics within project solicitations.

### **SUMMARY OF PUBLIC COMMENTS AND AGENCY RESPONSES TO APRIL 2, 2014 DISCUSSION DOCUMENT: LIGHT-DUTY PILOT PROJECTS IN DISADVANTAGED COMMUNITIES**

1. Comment: *Recommend ARB place limits on proposed funding allocations to ensure all proposed pilots projects receive sufficient funding.*

Agency Response: ARB staff has proposed funding targets for each of the light-duty pilot projects. Staff has also included contingencies to ensure that if the funding need in

a project does not materialize while another project demonstrates a higher need, that funding can be adjusted between them.

2. Comment: *The proposed public fleet pilot project should be a part of classic CVRP and should be paired with an investment in infrastructure.*

Agency Response: Staff agrees that proposed Increased Incentives for Public Fleets in Disadvantaged Communities should be administered through the process already established under Classic CVRP. However, staff believes the funding to support this pilot should come from the \$9 million allocation for Light-Duty Vehicle Pilot Projects.

## CHAPTER 5: HEAVY-DUTY VEHICLE AND EQUIPMENT INVESTMENTS

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Extensive deployment of zero-emission freight and transportation technologies will be needed to meet federal ozone standard in 2023 and 2032 and reduce GHG emissions by 80 percent below 1990 levels by 2050.<sup>24</sup> For this reason, AQIP invests in accelerating commercialization of technologies capable of operating with zero-emission miles (zero-emission vehicles and plug-in hybrid vehicles) and provide a bridge to zero-emission technologies (hybrid vehicles).

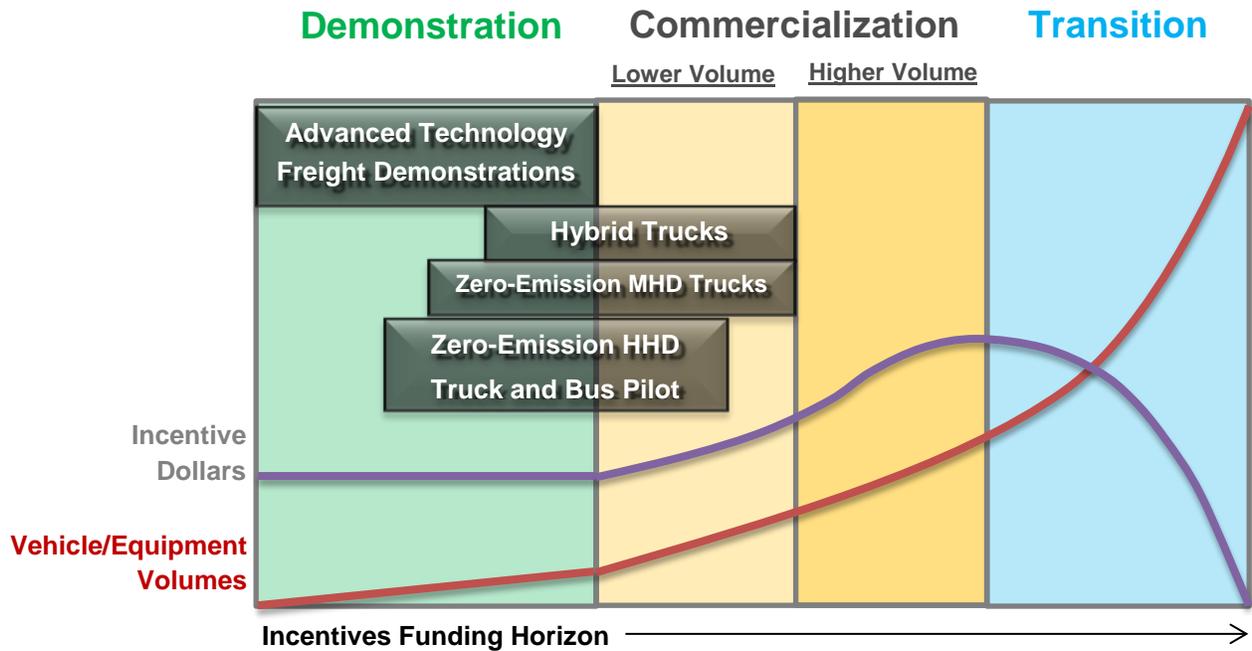
AQIP investments in MHD hybrid and zero-emission trucks and buses have resulted in successful vehicle deployments throughout California in far greater numbers than the rest of the nation as a result of incentive funding. However, heavy duty advanced technology trucks and buses (i.e. HDD) are at an earlier stage of commercialization and pilot deployments to validate the efficacy of the technologies are still necessary.

Further, the funding of demonstration projects to showcase the functionality and commercial aspects of advanced technology projects remains critical for meeting our long-term air quality and climate change goals. Demonstration projects by their very nature have a certain level of risk and costs are often higher than compared to commercialized technology. However, these risks can be mitigated through coordination with knowledgeable technology demonstrators, and engaged stakeholders with an eye toward the prospects of commercialization. Considering this, staff's proposed investments will help move these technologies toward the goal of zero-emission freight movement in California.

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<sup>24</sup> Air Resources Board. (2013c). Vision for Clean Air: A Framework for Air Quality and Climate Planning; Public Review Draft.

**Figure 1b. FY 2014-15 Heavy-Duty Advanced Technology Investments**



To address the need for zero-emission transportation investments in the medium-, heavy-, and off-road sectors, staff is proposing up to \$85 million for trucks, buses, and freight sector demonstrations and deployment from AQIP and Low Carbon Transportation Investments. These investments will reduce GHG emissions and be focused significantly in disadvantaged communities. Table 9 below summarizes the proposed Heavy-Duty Vehicle and Equipment Investments.

**Table 9. Summary of Heavy-Duty Vehicle and Equipment Investments**

	AQIP Investment	Low Carbon Transportation Investment
Traditional HVIP	\$5M	\$5-\$10M
Zero-Emission Truck and Bus Pilot Projects	-	\$20-\$25M
Advanced Technology Freight Demonstration Projects	-	\$50M
<b>Total Heavy-Duty Vehicle and Equipment Investments:</b>	<b>\$5M</b>	<b>\$80M</b>
	<b>\$85M*</b>	

\*Note: \$85 million represents the total amount of funding for this category based on using the high end of one of the ranges above and the low end of the other. For example, if \$10 million of Low Carbon Transportation Investments is allocated to HVIP, then only \$20 million would be available for Zero Emission Truck and Bus Pilot Projects. These amounts, combined with the allocation from AQIP for HVIP and Advanced Technology Freight Demonstration Projects, would total \$85 million. Further explanation of these ranges is provided in the upcoming sections.

## TRADITIONAL HVIP

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**Proposed Funding Target: \$10 - \$15 million**

### **PROJECT GOALS**

HVIP is intended to encourage truck and bus manufacturers to offer, and California fleets to purchase or lease, progressively cleaner advanced technology vehicles in multiple truck and bus vocations. HVIP helps ensure California consumer acceptance of the nation's first commercially-available hybrid and zero-emission trucks and buses, and helps drive production economies of scale and lower technology costs. HVIP is also structured to encourage smaller fleets to consider purchase of these technologies as they make their way into the market and prices decline. In the near-term, HVIP must incentivize more vehicle manufacturers to come to market with vertically-integrated hybrid truck and bus systems – in which the engine and driveline are specifically manufactured to work together seamlessly – to maximize operational efficiency and ensure in-use emission benefits. For example, Hino Motor Company had been producing a vertically-integrated hybrid truck for the Japanese market for over a decade, and selected California for its United States debut of this vehicle in late 2012 due to availability of HVIP-funding. California needs additional manufacturers to enter the California market and offer vertically-integrated hybrid trucks in a diversity of vocations and platforms.

In addition, HVIP must help accelerate relatively flat demand for zero-emission trucks and buses (about 100 vehicles annually), while increasing operations in disadvantaged communities. Longer term, urban hybrid vocational vehicles must pave the way for advanced hybrid and zero-emission technologies in a variety of heavy-duty vocations, with the ultimate goal of reliable freight and long-haul trucks that operate with zero-emissions, particularly within freight corridors and disadvantaged communities.

## **PROJECT 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 dealership as part of their vehicle purchase order. HVIP incentives drive manufacture production and fleet acceptance of the advanced heavy-duty vehicle technologies California must adopt to meet its long-term air quality and climate goals. Consumer incentives are needed because these products generally cost more than their diesel-powered, conventional counterparts, which can be a significant deterrent to their purchase. 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.

Since its launch in 2010, HVIP has provided over \$50 million to help California fleets purchase over 400 zero-emission and 1,200 hybrid trucks and buses. HVIP is also structured to enable leveraging of local, State and federal funding. The Energy Commission (\$4 million), the South Coast AQMD (\$2 million), and the Sacramento Metropolitan APCD (\$500,000) have all provided voucher enhancements to accelerate fleet demand for hybrid and zero-emission trucks and buses. Most recently, the San Joaquin Valley APCD has provided \$2 million to provide an HVIP “bump-up” for zero-emission and hybrid trucks and buses deployed in the San Joaquin Valley.<sup>25</sup> These investments enable air districts to accelerate hybrid and/or zero-emission technology deployment within their region, while maintaining the streamlined, statewide HVIP structure needed to drive production economies of scale and accelerate market penetration.

## **CURRENT PROJECT STATUS**

As in previous funding years, Calstart has been selected via competitive solicitation to act as ARB's Grantee to help implement the FY 2013-14 HVIP. The FY 2013-14 HVIP launched in April 2014 with \$15 million, which staff expects will meet fleet demand until FY 2014-15 funding becomes available in early 2015.

A limited number of large fleets, such as UPS and Frito Lay are responsible for most zero-emission truck demand thus far, while smaller fleet purchases of Hino hybrid trucks have driven recent hybrid truck demand increases. Tables 10 and 11, below, identify the types of vehicle vocations and weight classes receiving HVIP funding thus far. While HVIP is responsible for over half of the national hybrid and zero-emission truck purchases, deployment must accelerate significantly for California to meet GHG targets

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<sup>25</sup> Typical per vehicle voucher increase is \$20,000 per zero-emission truck or bus voucher (from \$40,000 to \$60,000) and \$15,000 per hybrid truck or bus voucher (from \$20,000 to \$35,000). Actual voucher amounts may vary, based upon vehicle weight. More information is available at: <http://www.californiahvip.org/san-joaquin-valley-plus-up> .

and attain federal ozone standards in the South Coast and San Joaquin Valley air basins.<sup>26</sup> Figure 8 illustrates the distribution of vouchers by Air District.

**Table 10. Vouchers Issued By Vocation (as of May 1, 2014)<sup>1</sup>**

Vehicle Type	Vouchers Issued	Total Voucher Funds	Average Voucher Amount	% of Total Vouchers	% of Total Voucher Funds
Parcel Delivery	614	\$18,694,000	\$30,446	37%	37%
Beverage Delivery	424	\$14,128,000	\$33,321	26%	28%
Other Truck	202	\$5,175,000	\$25,619	12%	10%
Food Distribution	151	\$5,162,000	\$34,185	9%	10%
Uniform & Linen Delivery	117	\$2,935,000	\$25,085	7%	6%
Tow Truck	63	\$2,121,000	\$33,667	4%	4%
School, Shuttle or Urban Bus	33	\$951,776	\$28,842	2%	2%
LP Pick-up & Delivery	24	\$352,000	\$14,667	1%	1%
Refuse Hauler	14	\$514,000	\$36,714	1%	1%
<b>Total</b>	<b>1,642</b>	<b>\$50,032,776</b>	<b>\$30,471<sup>2</sup></b>	<b>100%</b>	<b>100%</b>

<sup>1</sup> Data includes \$4 million in CEC funding.

<sup>2</sup> Overall average for all vouchers provided in the program.

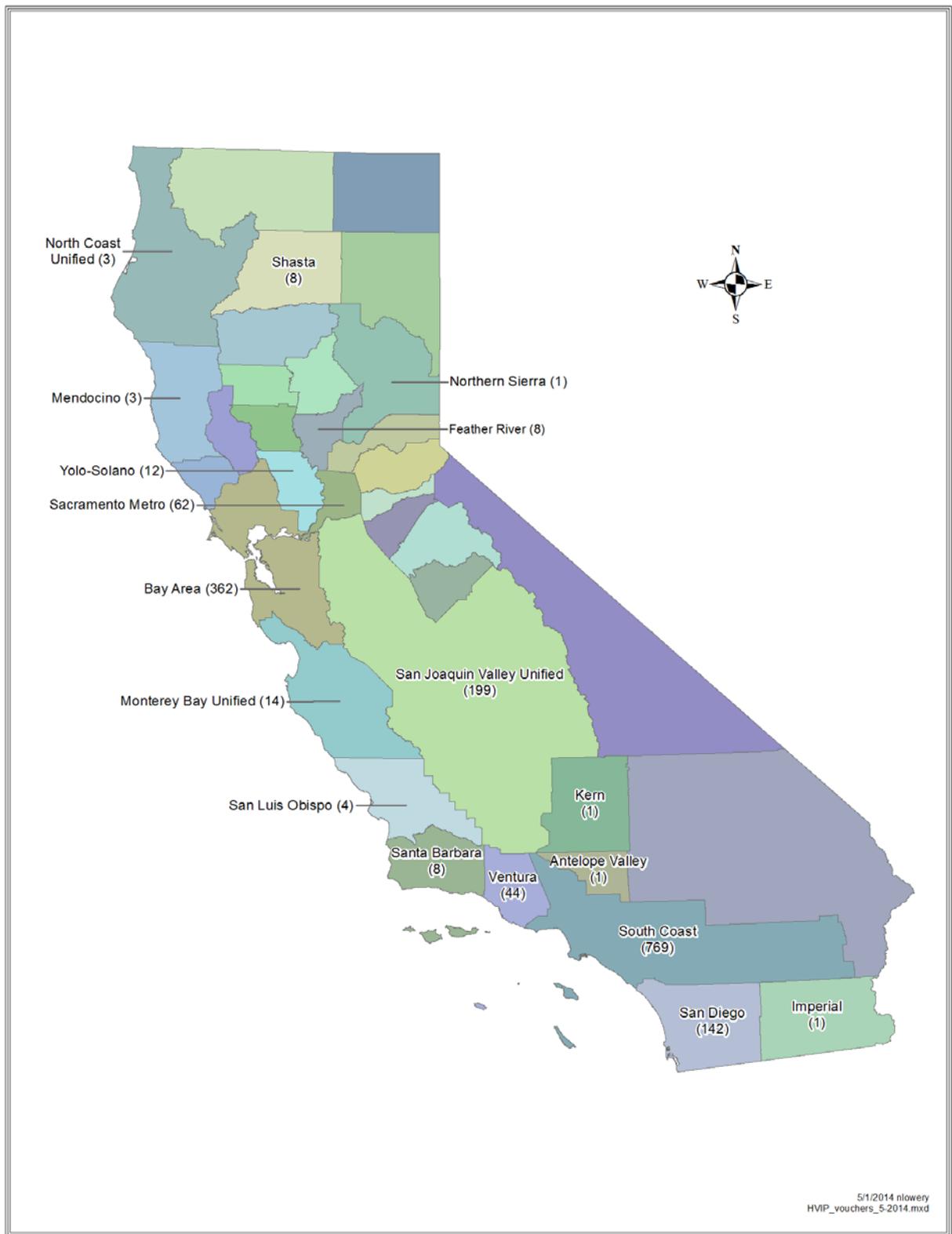
**Table 11. Vouchers Issued By Gross Vehicle Weight Range (as of May 1, 2014)<sup>1</sup>**

Gross Vehicle Weight Range	Vouchers Issued	Total Voucher Funds	% of Total Vouchers	% of Total Voucher Funds
5,001 – 6,000 lbs.	51	\$653,000	3%	1%
6,001 – 10,000 lbs.	0	\$0	0%	0%
10,001 – 14,000 lbs.	34	\$715,000	2%	1%
14,001 – 19,500 lbs.	684	\$20,088,000	42%	40%
19,501 – 26,000 lbs.	349	\$11,730,000	21%	23%
26,001 – 33,000 lbs.	97	\$2,521,776	6%	5%
>33,000 lbs.	427	\$14,325,000	26%	29%
<b>Total</b>	<b>1,642</b>	<b>\$50,032,776</b>	<b>100%</b>	<b>100%</b>

<sup>1</sup> Data includes \$4 million in CEC funding.

<sup>26</sup> Air Resources Board. (2013c). Vision for Clean Air: A Framework for Air Quality and Climate Planning; Public Review Draft.

**Figure 8. HVIP Vouchers by Air District (as of May 1, 2014)**



ARB is also coordinating with the California Pollution Control Financing Authority to enable smaller California fleets accessing loans through the Truck Loan Assistance Program to also leverage HVIP funds if these fleets obtain a new hybrid or zero-emission truck instead of a diesel truck. ARB and the California Pollution Control Financing Authority will launch this effort in the second half of 2014, which will enable Truck Loan Program participants to also leverage HVIP voucher funding to reap fuel economy benefits when they upgrade their vehicle.

## **STAFF PROPOSAL FOR FY 2014-15**

Staff proposes \$10 million to \$15 million be provided to continue the traditional statewide first-come, first-served HVIP voucher program. Funding for HVIP would derive from \$5 million from AQIP and \$5 million to \$10 million from Low Carbon Transportation investments. All Low Carbon Transportation investments will pay for vehicles that provide benefits in disadvantaged communities, as directed by SB 535.

Staff recommends two significant project modifications to ensure deployed technologies achieve the expected emission benefits, and to accelerate demand for zero-emission technologies. First, staff recommends requiring hybrid vehicle makes/models complete in-use emissions testing to become HVIP-eligible, in order to demonstrate the vehicle will achieve expected in-use emission benefits. In addition, staff proposes increasing HVIP voucher amounts for zero-emission vehicles, with an additional incentive for those vehicles domiciled in disadvantaged communities, to boost what thus far has been extremely limited demand for zero-emission trucks and buses.

### **Shift Toward Requiring Hybrid Vehicle Certification**

In order to better encourage and fully capture the emission benefits of hybrid and other advanced truck and bus technologies, ARB must shift towards vehicle-based, rather than engine-based, technology certification. Recent hybrid truck emissions testing conducted by the US Department of Energy, National Renewable Energy Laboratory (NREL) underscore the need for more a comprehensive approach to hybrid technology certification.

ARB provided NREL with over \$700,000 in FY 2011-12 AQIP funding to collect hybrid vehicle vocational drive cycle data, and perform emissions and fuel economy testing of hybrid and conventional heavy-duty trucks utilizing a chassis dynamometer and a portable emissions measurement system. This emissions testing, completed in late 2013, suggests hybrid trucks in which the engine and driveline combination are not adequately integrated may emit more NO<sub>x</sub> emissions than their non-hybrid counterparts. One concern pertaining to non-vertically-integrated hybrid systems is that the typical new diesel truck employs a sophisticated engine plus aftertreatment emission control strategy to achieve extremely low in-use exhaust emissions. As shown by the preliminary NREL data, attaching a hybrid driveline to a vehicle without careful integration with the engine plus aftertreatment system can have the unintended

consequence of increasing criteria pollutant emissions (for example, lower exhaust temperatures may lead to less efficient NOx control). ARB staff and NREL have briefed industry stakeholders on the draft results of the emissions study, and NREL's project report is due for release in Summer 2014.

The pathways for certification of new vehicles and engines are specified in regulatory certification procedures, with important differences depending upon vehicle size. In general, Class 1 through 3 vehicles (cars and light trucks below 14,001 lbs) must be certified to meet emissions, OBD, warranty and other requirements *as a complete vehicle*. In contrast, heavy-duty engines for use in Class 4 through 8 vehicles (trucks and buses above 14,000 lbs) are certified before being integrated into a vehicle. Additionally for 2014 and subsequent model years, engine certification requires a comprehensive OBD system covering both the engine and the hybrid drivetrain. A new Class 4 through 8 truck or bus is not required to be certified as a complete vehicle as long as it utilizes the appropriate ARB-certified engine and attendant OBD system.

In order to quantify and ensure emission benefits of hybrid vehicles, efficiency-enhancing aerodynamic devices, or other strategies California needs to meet its air quality and climate goals, a more holistic, vehicle-based certification model will be needed.

ARB is laying the groundwork for this shift. In December 2013, the Board approved Heavy-Duty Hybrid-Electric Vehicle Certification Procedures, providing voluntary, vehicle-based certification procedures to validate emission benefits of new hybrid trucks and buses.<sup>27</sup> Federal Phase 2 heavy-duty vehicle GHG regulations, to be implemented in the 2020 timeframe, is expected to require the ability to validate vehicle-based (rather than engine-based) emission benefits. As part of the Phase 2 regulation, ARB is leading the development of certification procedures for hybrids. Staff anticipates these will be included nationally as part of federal Phase 2 regulations. It is expected that an engine manufacturer wanting to use hybrid technology to meet the federal Phase 2 emission standards would have to certify via those procedures. ARB is using the Heavy-Duty Hybrid-Electric Vehicle Certification Procedures as the starting place for the Phase 2 hybrid certification procedures.

Incentives can play an important role in encouraging this shift towards a vehicle-based certification paradigm to capture the benefits of hybrid and other advanced technologies. In the near term, staff recommends continuing to allow hybrid vehicles to become HVIP-eligible via voluntary full vehicle certification, utilizing the new Heavy-Duty Hybrid-Electric Vehicle Certification Procedures. Hybrid vehicle make/models that

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<sup>27</sup> Air Resources Board. (2013b). Staff Report: Initial Statement of Reasons for Proposed Rulemaking; Proposed Greenhouse Gas (GHG) Regulations for Medium- and Heavy-Duty Engines and Vehicles, Optional Reduced Emission Standards for Heavy-Duty Engines, and Amendments to the Tractor-Trailer GHG Regulation, the Diesel-Fueled Commercial Motor Vehicle Idling Rule, and the Heavy-Duty Hybrid-Electric Vehicles Certification Procedures.

become ARB-certified would be eligible for the following per vehicle voucher enhancement:

- \$10,000 for vehicles between 14,001 and 19,500 lbs GVWR;
- \$15,000 for vehicles between 19,500 and 33,000 lbs GVWR; and
- \$20,000 for vehicles above 33,000 lbs.

Staff recommends a second option for a hybrid vehicle make/model to become HVIP-eligible for hybrid manufacturers unwilling to pursue full vehicle certification. HVIP currently requires manufacturers to provide a second-by-second, in-use exhaust temperature profile to demonstrate hybrid truck or bus exhaust temperatures consistently reach thresholds needed for aftertreatment strategies to function optimally during typical operations. Considering the indications from the NREL study that the temperature profiles may not be an adequate indicator of emissions performance, staff recommends the exhaust temperature profile requirement be replaced by an in-use or chassis dynamometer emission testing requirement. Staff believes this dual path for HVIP-eligibility balances the need to ensure expected emission benefits, while providing an HVIP-eligibility pathway for manufacturers not yet ready to submit to full vehicle certification. Staff expects, however, that full vehicle certification will be a requirement for HVIP-eligibility within the next few funding cycles.

#### Increase Zero-Emission Vehicle Voucher Amounts, with Focus on Disadvantaged Communities

Fleet demand for zero-emission trucks has averaged fewer than 100 vehicles annually since this technology's initial market commercialization in 2010. HVIP has offered vouchers for about half the incremental cost of these vehicles, with the expectation that this would encourage early adopter fleets to purchase this technology. Unfortunately, fleets have only purchased zero-emission trucks and buses when able to find sufficient co-funding from a local air district, Energy Commission, or other source for full vehicle incremental cost (about \$100,000 for the typical 14,000 – 19,500 lbs zero-emission delivery truck). Demand for these vehicles has therefore depended upon the occasional availability of co-funding from other programs to drive the market.

Demand for zero-emission trucks and buses must accelerate significantly over the next several years to lay the groundwork for fleet transformation to zero-emission technologies. In order to meet this goal, staff recommends significantly increasing the zero-emission vehicle Base Vehicle Incentive to approach full vehicle incremental cost, with slightly higher voucher amounts, as identified in Table 12, below, for those

domiciled in or benefitting a disadvantaged community.<sup>28</sup> These higher voucher amounts reflect staff’s assessment of the incentive needed to boost near-term demand, based upon lessons learned in implementing HVIP, as well as discussions with fleets, technology manufacturers and other stakeholders. These higher voucher amounts are also intended to be competitive with zero-emission truck incentives potentially available as part of the Zero-Emission Truck and Bus Pilot. Much lower HVIP voucher amounts could discourage fleets from HVIP participation in order to compete for pilot project funds at a later date.

Voucher amounts for zero-emission vehicles within or benefitting disadvantaged communities (“Within DC” in Table 12), reflect staff’s assessment of the additional incentive needed for fleets to preferentially locate or operate their vehicles in specific areas. The disadvantaged community voucher enhancement is intended to encourage the larger, multi-locational fleets that typically purchase zero-emission trucks to strategically locate or operate these vehicles in disadvantaged communities. The location of each vehicle’s charging infrastructure (to which the vehicle must return daily) provides a mechanism for ARB to verify each vehicle’s domicile location. Staff expects this voucher enhancement for zero-emission vehicles will further the ability of HVIP to ensure 100 percent of funding from Low Carbon Transportation investments benefit disadvantaged communities, as described in the previous section.

**Table 12. Zero-Emission Truck and Bus Voucher Amounts**

GVWR (lbs)	Base Vehicle Incentive		
	1 to 100 vehicles <sup>1</sup>		101 to 200 vehicles
	Outside DC <sup>2</sup>	Within DC <sup>2</sup>	
5,001 – 8,500	\$12,000 / \$20,000	\$25,000	\$10,000 / \$12,000
8,501 – 10,000	\$18,000 / \$25,000	\$30,000	\$12,000 / \$18,000
10,001 – 14,000 <sup>3</sup>	\$30,000 / \$50,000	\$55,000	\$20,000 / \$30,000
14,001 – 19,500	\$35,000 / \$80,000	\$90,000	\$25,000 / \$35,000
19,501 – 26,000	\$40,000 / \$90,000	\$100,000	\$30,000 / \$40,000
> 26,000	\$45,000 / \$95,000	\$110,000	\$35,000 / \$45,000

1 - The first three vouchers received by a fleet, inclusive of previous funding years, are eligible for the following additional funding amount: \$2,000/vehicle if below 8,501 lbs; \$5,000/vehicle if 8,501 to 10,000 lbs; and \$10,000/vehicle if over 10,000 lbs.

2 - ‘DC’ refers to ‘a disadvantaged community’

3 - This weight range is not intended for vehicles utilizing a pick-up truck chassis/platform typically found in vehicles below 10,001 lbs GVWR. Vehicles at the lower end of the 10,001 to 14,000 lbs weight range will be evaluated on a case-by-case basis to determine eligibility for the full \$30,000 Base Vehicle Incentive.

<sup>28</sup> ARB/CalEPA is conducting a multi-stakeholder process to define benefits to a disadvantaged community as required by SB 535. This process will be complete prior to launch of the FY 2014-15 HVIP. For vehicles domiciled outside of a disadvantaged community that may meet the benefits criteria, ARB may, in coordination with the HVIP Work Group, adjust vehicle eligibility requirements as needed to ensure transparent and enforceable benefits to a disadvantaged community are achieved. HVIP Base Vehicle Incentives in Table 12 may not exceed vehicle incremental cost; however, when higher FY 2014-15 HVIP funding amounts are implemented, the combination of HVIP plus local air district or other public incentives may exceed incremental cost, up to 90 percent of the new vehicle cost.

Staff does not recommend extending this voucher enhancement to hybrid vehicles since: 1) the smaller, local fleets that increasingly purchase hybrid trucks have less ability to preferentially locate and operate their vehicles within disadvantaged communities, and; 2) the hybrid vehicles currently participating in HVIP require no charging infrastructure, which eliminates an important mechanism to identify where a vehicle is domiciled.

Staff further recommends that all zero-emission vehicles receiving HVIP funding be required to be equipped with telematics devices and report annually to ARB regarding percent operation within disadvantaged communities. Staff may also require additional geographic summary data be provided as needed to better evaluate and determine benefits to disadvantaged communities. While all HVIP-eligible zero-emission vehicles currently are capable of generating this information, and some participating fleets already provide this type of information to local air districts which have provided HVIP co-funding, a geographic tracking requirement may place an undue burden on the smaller fleets that make up an increasing portion of the hybrid truck market. ARB therefore recommends defining minimum geographic tracking requirements for zero-emission vehicles, and potential similar requirements for HVIP-funded hybrid vehicles during the public HVIP Work Group meeting process prior to FY 2014-15 project launch.

Finally, staff recommends the Board make these voucher enhancements effective August 1, 2014 for vouchers in the existing FY 2013-14 HVIP funding cycle which have not been redeemed as of this date. Zero-emission vehicles funded in FY 2013-14 HVIP are not required to provide summary geographic mileage data, due to the additional administrative costs associated with enforcing this commitment which cannot be accommodated in the existing FY 2013-14 HVIP budget. Instead, until the definition of benefits to a disadvantaged community is developed and finalized, a vehicle participating in the current (FY 2013-14) HVIP may be eligible for the disadvantaged community voucher enhancement on a case-by-case basis, if the participating fleet commits the vehicle will be domiciled in a disadvantaged community for a minimum of three years. If these voucher enhancements were delayed until launch of the FY 2014-15 HVIP, near-term demand would likely decline significantly as fleets defer vehicle purchases until higher voucher amounts become available.

In order to maximize the number of vehicles funded, staff further recommends that the higher recommended voucher amounts apply to new voucher requests only. Vouchers approved as of May 15, 2014 would not be eligible for the higher voucher amounts identified in this Funding Plan. Cancellation of an existing voucher (for which a vehicle identification or serial number has been provided as of May 15, 2014) and request of a new voucher for the same fleet at the higher voucher amount would be strictly prohibited. Eligibility criteria for these voucher enhancements will be further defined in coordination with the public HVIP Work Group in July 2014.

## HVIP Funding Allocation

Since project launch in 2010, over forty percent of HVIP funds have gone to fleets in the top ten percent of census tracts identified as most disadvantaged by CalEnviroScreen 2.0. Staff anticipates that a voucher enhancement for zero-emission vehicles domiciled in disadvantaged communities will increase this percentage in FY 2014-15.

In order to meet ARB's goals for SB 535, 100 percent of proceeds from Low Carbon Transportation investments for HVIP must benefit disadvantaged communities. Staff's proposed funding allocation ranges for HVIP and the Zero-Emission Truck and Bus Pilot, discussed in the following section, are intended to ensure sufficient HVIP funding to meet expected demand, while ensuring all Low Carbon Transportation investments directed to this project benefit disadvantaged communities. Staff's proposed minimum allocation of \$10 million for HVIP assumes that, based upon past project performance, at least 50 percent of project funds (i.e. \$5 million from Low Carbon Transportation investments) will naturally benefit disadvantaged communities. Staff proposes that the Executive Officer have the authority to infuse HVIP with up to an additional \$5 million from Low Carbon Transportation investments, if necessary to meet expected project demand AND the Executive Officer determines that 100 percent of these additional funds would benefit disadvantaged communities. This would be achieved through the following four-step process:

1. Prior to release of the FY 2014-15 HVIP and Zero-Emission Truck and Bus Pilot grantee solicitations (expected in Fall 2014), the Executive Officer will determine whether FY 2014-15 HVIP demand is projected to exceed \$10 million. This determination would be based upon the most up to date HVIP demand projections, as well as the latest information from participating fleets and technology manufacturers.
2. If the Executive Officer projects that FY 2014-15 HVIP demand is likely to exceed \$10 million, the Executive Officer must then determine what percentage of FY 2014-15 HVIP funds are projected to benefit disadvantaged communities based upon historical HVIP data. For example, if 75 percent of HVIP funds have historically benefitted disadvantaged communities to date, the Executive Officer may assume about 75 percent of FY 2014-15 HVIP funds may reasonably be projected to benefit these communities.
3. The Executive Officer would then have the authority to increase the FY 2014-15 HVIP funding allocation to an amount between \$10 million and \$15 million, up to the amount that all funding from Low Carbon Transportation investments allocated to this project (the base \$5 million HVIP allocation from AQIP plus up to \$10 million in additional funding) can reasonably be expected to benefit disadvantaged communities. For example, if 75 percent of HVIP funds historically have benefitted disadvantaged communities, it may be assumed that

over \$10 million of a \$15 million allocation would likely benefit disadvantaged communities (i.e., 75 percent of \$15 million = \$11.25 million).

4. Conversely, if during this evaluation the Executive Officer determines that less than 50 percent of HVIP funds historically have benefitted disadvantaged communities, the Executive Officer would have the authority to adjust project criteria to ensure the entire base \$5 million in funding from Low Carbon Transportation investments benefits disadvantaged communities. Adjustments could include enhanced dealer outreach, targeting vouchers to disadvantaged communities, or other strategies.

Staff will also monitor the FY 2014-15 HVIP during project implementation and staff recommends the Executive Officer have the authority to make mid-course updates to project criteria as needed to ensure 100 percent of funding from Low Carbon Transportation investments benefits disadvantaged communities. This flexibility will enable HVIP to remain straightforward for participating California fleets, while ensuring all funds from Low Carbon Transportation investments allocated to HVIP will benefit disadvantaged communities. Any necessary mid-course adjustments would be evaluated and implemented in coordination with the HVIP Work Group.

### Project Solicitation

Staff projects FY 2013-14 HVIP funds to meet program demand through the 2014 calendar year. The FY 2014-15 HVIP solicitation would be issued approximately three months before previous year HVIP funds are projected to be exhausted to ensure funding continuity. Staff is proposing to issue two-year solicitations that will allow ARB to have the discretion to re-solicit for the second year of the project. Each solicitation will encompass two fiscal years, while the grant agreement will cover one fiscal year with the option to renew for the second year of the project. As noted previously, staff is proposing this option for all deployment projects to help ensure a smooth transition from one year to the next. Staff anticipates, as in prior years, that the project solicitation will be open to individuals, federal, state and local government entities and agencies, and organizations with California heavy-duty vehicle, vehicle incentive, or air quality expertise or experience. Staff may recommend allowing up to 7 percent of project funds to be used for project administrative costs.<sup>29</sup>

## **LONG TERM PLAN**

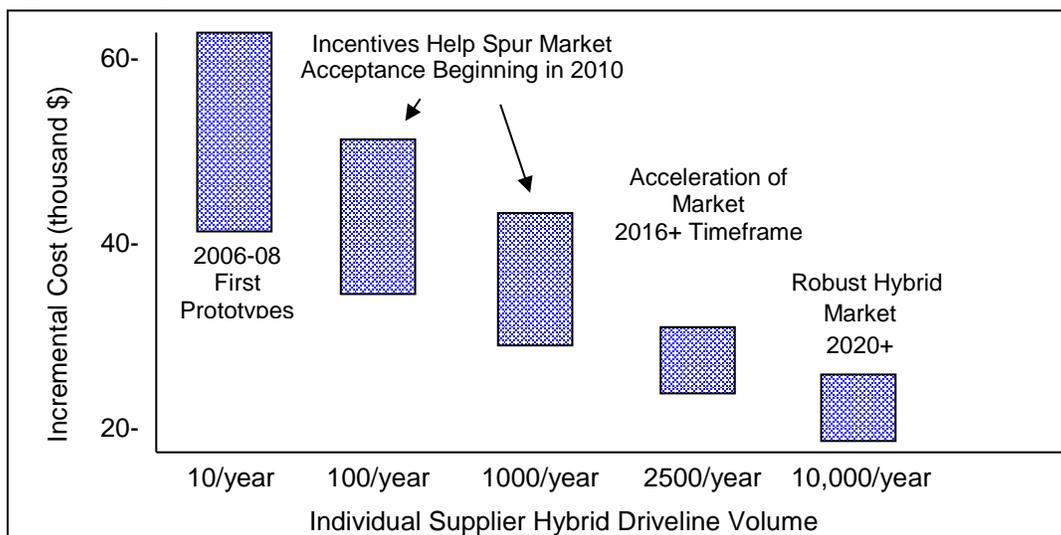
The hybrid and zero-emission heavy-duty truck and bus markets are still at the very early stages of commercialization. Production capacity has substantial growth potential for both hybrid and electric trucks and buses, but current low production volumes contribute to a \$20,000 to \$60,000 vehicle cost premium for hybrid trucks and up to

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<sup>29</sup> Additional funding may be allocated for telematics data generation and reporting. ARB staff will work with the HVIP Work Group to determine the most cost-effective mechanism for receiving telematics data from project vehicles.

\$110,000 cost premium for battery-electric zero emission trucks. ARB expects production costs to decline as hybrid driveline and battery production volumes increase. When this occurs, the fuel economy payback period should shorten to the point where a hybrid or zero-emission truck purchase is economical without incentives (Figure 9). Incentives also have a critical, parallel role in increasing consumer acceptance to ensure a willing market for this next generation of vehicles as technology costs decline.

**Figure 9. Hybrid Truck Incremental Cost as a Function of Annual Volume**



Source: Adapted from Center on Globalization, Government and Competitiveness<sup>30</sup>, NESCAFF<sup>31</sup>, and CALSTART

Over the next several years, increasing annual investments in HVIP will be needed to continue encouraging early deployment of advanced technology stop-and-go vehicles, such as zero-emission delivery trucks and transit buses, and encourage technology advances in heavier truck sectors. These investments will be structured to encourage increasing HVIP participation among smaller California fleets, and in disadvantaged communities. The Long-Term Vision for AQIP, described in Chapter 1, illustrates the connection between advanced technology light-, medium-, and heavy-duty vehicle deployment incentives and technology demonstration projects, and how these complementary funding programs are crafted to promote and accelerate California's transition to zero-emission passenger and freight transportation.

Because the HVIP program is evolving, there is a clear need to evaluate the effectiveness of program investments. Staff believes metrics of hybrid and zero-emission truck and bus market success can eventually help illustrate when specific heavy-duty vehicle technologies becomes self-sustaining. Potential metrics could include: number of hybrid (or battery electric) trucks sold per vehicle vocation; hybrid

<sup>30</sup> Lowe, M., et al. (2009). Manufacturing Climate Solutions: Carbon-Reducing Technologies and U.S. Jobs; Chapter 9, Hybrid Drivetrains for Medium- and Heavy-Duty Trucks.

<sup>31</sup> Northeast States for Coordinated Air Use Management (NESCAFF) et al. (2009). Reducing Heavy-Duty Long Haul Combination Truck Fuel Consumption and CO2 Emissions; Final Report.

powertrains sold per manufacturer; declining vehicle incremental cost; number of offerings in different vocational applications; and number of vehicles sold in states without public incentives. These metrics are unlikely to drive a decision to sunset funding for hybrid or zero-emission trucks or buses in the near term. Instead, such a decision will be driven more by desire to promote purchase of a new, even cleaner available technology. This could take the form of phasing out basic hybrid truck eligibility in favor of new commercially available plug-in hybrids. Possible metrics of market health will be discussed more in depth with stakeholders prior to launch of the FY 2014-15 Grantee Solicitation in late 2014.

## **SUMMARY OF PUBLIC COMMENTS AND AGENCY RESPONSES TO APRIL 2, 2014 DISCUSSION DOCUMENT: HVIP**

1. Comment: *ARB should consider increasing HVIP voucher amounts for zero-emission trucks and buses to better enable fleets to offset the higher up front cost of this technology.*

Agency Response: Staff agrees, and is proposing to increase zero-emission truck and bus voucher amounts.

2. Comment: *Higher voucher amounts for zero-emission vehicles should be implemented immediately to ensure fleets do not delay purchases.*

Agency Response: Staff agrees, and is recommending higher voucher amounts for zero-emission vehicles be implemented as of July 1, 2014.

3. Comment: *ARB should increase voucher amounts for vehicles in disadvantaged communities.*

Agency Response: Staff agrees and is proposing voucher enhancements (higher voucher amounts) for vehicles within disadvantaged communities.

4. Comment: *HVIP has been oversubscribed in the past, and ARB should set a level of funding that can be expected to last the full fiscal year to avoid market disruption.*

Agency Response: Staff agrees. As of April 15, 2014, approximately \$8 million remained in FY 2013-14 HVIP. Based upon demand thus far, and discussions with participating fleets, dealerships, and vehicle manufacturers, staff believes that FY 2013-14 funds will be sufficient to meet demand through at least the first three to six months of the 2014-15 fiscal year. The FY 2014-15 HVIP is therefore not projected to need to launch until well into the fiscal year (when FY 2013-14 HVIP funds are exhausted). Further, staff's recommendation allows for the HVIP allocation to be adjusted between \$10 million and \$15 million, based upon the latest demand projections (and disadvantaged community considerations).

5. Comment: *HVIP should extend eligibility to commercial Class 2b non-plug-in hybrid vehicles, in applications such as hybrid shuttle buses.*

Agency Response: Zero-emission and zero-emission range extended vehicles in the 2a and 2b classes are currently HVIP-eligible due to their ability to achieve zero-emission miles. However, non-plug-in hybrids are not HVIP-eligible. As mentioned in this document, HVIP is intended to facilitate deployment of the cleanest technologies, particularly in the larger vehicle classes that pose the greatest technical challenges.

6. Comment: *Additional metrics of success should be considered, such as declining vehicle incremental cost, increasing number of manufacturers offering hybrid and plug-in trucks, and increasing offerings in different vocational applications.*

Agency Response: Staff agrees, and has identified some of these in this Proposed Funding Plan for future discussion. However, the heavy-duty hybrid and zero-emission vehicle market is at a far earlier early stage of development than that for passenger cars, and defining metrics of success (at which point incentives can sunset) at this point would be premature. Staff believes few manufacturers would offer significant numbers of hybrid or zero-emission trucks for sale with neither a regulatory driver nor public incentives. Possible metrics of success will be discussed more in depth with stakeholders prior to launch of the FY 2014-15 Grantee Solicitation in late 2014.

## ZERO-EMISSION TRUCK AND BUS PILOT PROJECTS IN DISADVANTAGED COMMUNITIES

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**Proposed Funding Target: \$20M - \$25M**

### **PROJECT GOALS**

ARB's HVIP has encouraged California-based fleets to purchase about 350 zero-emission trucks and buses since 2010. These early adopter fleets typically deploy a limited number of zero-emission vehicles at each fleet location. However, zero-emission medium- and heavy-duty vehicle deployment must be significantly accelerated for California to meet its post-2020 air quality and climate goals. While HVIP has enabled zero-emission technology to be widely deployed, staff's proposed Zero-Emission Truck and Bus Pilot takes the next step by leveraging resources, promoting efficiencies and helping drive down per vehicle costs via large, location-specific deployments.

These projects would place a significant number of zero-emission trucks and buses in a handful of strategic truck or bus "hubs", encouraging advanced technology clusters with infrastructure, marketing, workforce training, and other synergies. The technology hub or ecosystem concept, when fully implemented, can help address many of the deployment challenges we see today by supporting economies of scale in manufacturing, workforce training and vehicle maintenance and repair, and infrastructure/grid issues. This concept would also help achieve the California's ZEV Action Plan goal of encouraging zero-emission vehicle deployment in public and private fleets by "providing funding support, keeping fueling affordable (and) increasing coordination and communication among fleet users..."<sup>32</sup>

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<sup>32</sup> Brown, E. (2013). ZEV Action Plan: A roadmap toward 1.5 million zero-emission vehicles on California roadways by 2025; Governor's Interagency Working Group on Zero-Emission Vehicles.

## **PROPOSED HEAVY-DUTY PILOT PROJECTS FOR FY 2014-15**

Staff is proposing to provide \$20 million to \$25 million in funding from Low Carbon Transportation investments for Zero-Emission Truck and Bus Pilots, with 100 percent of funding to benefit disadvantaged communities.<sup>33</sup> Project fleets would operate within a concentrated, well-defined geographic area where commercial zero-emission vehicles, charging or refueling stations, energy storage devices, communications systems and support networks allow fleets to optimize the participation of zero-emission vehicles. Ideally, this 'zero-emission ecosystem' would help facilitate the transition of other similar fleets to utilize zero-emission technologies by including an assessment of vehicle performance, infrastructure and maintenance costs, and other information of interest to other potential technology adopters.

Staff believes incentive amounts exceeding incremental cost and charging/refueling infrastructure funding may be needed to target demand within a few specific locations. Plug-in hybrid and hybrid-electric trucks with the ability to operate with all zero-emission miles within disadvantaged communities may also be considered for project funding. Conversion of vehicles from diesel to zero-emission technologies are also eligible, albeit at a much lower vehicle incentive amount than newly manufactured vehicles. Funded projects would have a focus on maximizing operational efficiencies and targeting zero-emission operation where it is most needed, including in disadvantaged communities and extreme non-attainment areas. Utilizing advanced telematics data (such as state-of-charge, fuel economy benefits per driving mode, and location-specific mileage) and fleet management software that enables future deployments will help to support this objective. Below are examples of three potential categories of vehicle projects that could receive funding under this pilot.

### *Zero-Emission Transit Bus*

Transit agencies tend to be early demonstrators and adopters of advanced heavy-duty vehicle technologies, which help accelerate the migration and availability of these technologies in the heavy-duty truck market. Such a project would help support ARB's update to the Transit Bus and Zero-Emission Bus Regulations, intended to accelerate zero-emission bus deployment among California transit agencies and reduce overall transit emissions, which is under development and scheduled for Board consideration in late 2014 or early 2015. Technologies can include fuel cell electric and battery electric transit buses.

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<sup>33</sup> The actual allocation will be driven by the FY 2014-15 HVIP funding need and disadvantaged communities compliance projection to be conducted by the Executive Officer, as described in the HVIP section of this document. Any portion of the additional \$5 million in GGRF funds not directed to HVIP would accrue to the Zero-Emission Truck and Bus Pilot. For example, if the FY 2014-15 HVIP is allocated \$12 million (\$10 million + \$2 million in GGRF funds), the Zero-Emission Truck and Bus Pilot would be allocated \$23 million (\$20 million + \$3 million in GGRF funds).

The most detailed recommendation for a zero-emission hub to date is the *California Fuel Cell Partnership's Road Map for Fuel Cell Buses in California* (Road Map).<sup>34</sup> This proposal, completed in coordination with fuel cell technology manufacturers, transit bus operators, and other stakeholders, identifies a need for two transit bus Centers of Excellence in California – one in Northern California and one in Southern California – to accelerate lower costs and technology advancement in the fuel cell transit bus sector. The Road Map cost analysis indicates that production of 40 fuel cell buses per Center of Excellence would enable the assembly economies of scale needed to reduce the per bus cost from \$2 million to \$1 million. The Road Map indicates the cost of each Center of Excellence would be about \$50 million, including infrastructure and other associated costs. While each Center of Excellence could be funded in different fiscal years, funding must be assured for at least 40 buses in order to reduce manufacturing cost to the point that per bus cost would decline from \$2 million currently to \$1 million. Staff will also evaluate the potential for 40 fuel cell buses distributed among multiple agencies to achieve similar economies of scale.

Zero-emission battery-electric transit buses are more commercially available and could provide an opportunity to accelerate bus deployment this fiscal year at a lower project cost. Proterra offers an Altoona-tested fast charge-compatible electric heavy-duty bus for which automated rooftop fast charging can be integrated into the bus route. The San Joaquin Regional Transit District has purchased two fast-charge Proterra buses that will operate on a rapid charging system and have the functionality of a conventional transit bus, with the help of \$2.56 million in funding from the California Energy Commission's AB 118 program. By recharging for 10 minutes every two hours, the buses are manufactured to operate throughout the entire daily operation cycle. In addition, the bus charging station is fully automated so that when the bus approaches the charge station, the station recognizes the bus, guides the bus into position, and charges the vehicle without driver interaction. Additional cost efficiencies can be achieved by funding buses in eight bus per charging station increments, with the goal of bringing the cost of each fast-charge battery-electric transit bus down to \$825,000. Opportunities also exist for large traditional (slow-charge) battery-electric bus projects that would help accelerate production economies of scale and provide fleets with key information needed to accelerate widespread zero-emission transit bus deployment. Changsha BYD Bus Company Ltd (BYD Motors) also produces an HVIP-eligible zero-emission transit bus.

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<sup>34</sup> California Fuel Cell Partnership. (2013). A Road Map for Fuel Cell Electric Buses in California: A zero-emission solution for public transit. This report was developed in response to a directive in the Governor's ZEV Action Plan to develop a fuel cell bus commercialization and deployment road map for California.

### Zero-Emission School Bus

Zero-emission school buses provide an opportunity to not only accelerate deployment of zero-emission technology, but to eliminate children's exposure to toxic diesel school bus emissions during their daily school bus commute.

Two school bus concepts show significant promise in helping accelerate the rate of zero-emission school bus technology commercialization and deployment. The first, advocated by the Clinton Global Initiative, the County of Los Angeles, and other partners, would demonstrate the economic viability of transitioning to vehicle-to-grid (V2G) capable zero-emission battery-electric school buses.<sup>35</sup> The project would demonstrate V2G technology that enables a battery-electric school bus to communicate with and provide power to the electrical grid based upon the electrical energy stored in the batteries. Such services could generate significant revenues during stretches of afternoon downtime typical to school bus operations, making zero-emission school buses more economically viable for school districts. The cost of a six bus zero-emission V2G project (including infrastructure) would be approximately \$3 million, with declining costs for each additional bus once a six bus threshold has been met.<sup>36</sup>

A second potential school bus project would provide a zero-emission school bus (or pool of buses) for school districts operating in disadvantaged communities to share, so local school district transportation officials can evaluate the technology. This project would build upon similar FY 2011-12 AQIP demonstration projects in the San Joaquin Valley (\$496,696) and San Diego (\$502,304). Funding for these two projects sunsets in June 2014. Zero-Emission Truck and Bus Pilot funding for this concept could expand the program to additional school districts in these two regions, or to other regions such as the South Coast Air Basin. Rather than focusing on reduced costs and economies of scale from large scale deployments, this concept would focus on increasing consumer acceptance of zero-emission technology among multiple school district officials.

### Zero-Emission Freight/Delivery Truck

The most concerted planning efforts around a geographic hub concept thus far have focused primarily on zero-emission buses. However, opportunities do exist for a large zero-emission truck hub focused on distribution centers, warehouses or other geographic areas. A truck fleet or fleets would focus a large number of zero-emission vehicles that are served by common fueling/charging infrastructure, mechanics, reservoir of critical vehicle components, and other shared resources. Per vehicle costs could decline significantly if an entire warehouse, block or other geographic area were constructed or retrofitted for electric vehicle charging. Vehicle maintenance and repair

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<sup>35</sup> More information available at: <http://www.cgiamerica.org/commitments/?id=827810> .

<sup>36</sup> Discussions with Clinton Global Initiative representatives indicates that a minimum of six battery-electric V2G buses would be needed to generate the electricity the California Independent Systems Operator requires for participation in the wholesale electricity market. The \$3 million assumed cost is based upon conversion of diesel school buses into a zero-emission battery-electric bus.

costs could also be reduced, and the project would provide valuable lessons regarding the costs and benefits of widespread conversion to zero-emission technologies. A zero-emission hub could also operate in collaboration with a zero-emission freight demonstration project at the same location, leveraging additional economies of scale. In such a collaboration, a warehouse or distribution center could include both commercialized zero-emission delivery trucks and zero-emission freight truck technology demonstrations, all sharing infrastructure, mechanics and other resources. ARB will work closely with local air districts, fleets, technology providers and other stakeholders over the next several months to gauge interest in and further refine the zero-emission delivery/freight truck concept.

### Project Solicitation

Staff recommends ARB issue an initial project solicitation for the full Zero-Emission Truck and Bus Pilots funding allocation, in the fall 2014 timeframe. Staff's preference is to fund multiple projects of between \$5 million to \$10 million in different parts of the state, encompassing both battery-electric and hydrogen fuel cell zero-emission technologies, but is interested in all potential projects, including those that exceed the funding levels identified above. Should this solicitation receive insufficient responsive applications to expend the all Zero-Emission Truck and Bus Pilot funds, ARB would also have the opportunity to re-solicit for additional projects at a later date.

Staff proposes that the maximum cost share provided by state funds for this project be 75 percent, mirroring cost share requirements for AQIP Freight Technology Demonstration projects. Ability to leverage significant additional match funding (beyond the minimum 25 percent applicant contribution) will be an important criteria in application scoring.

The solicitation will define the scoring criteria to be used to evaluate potential projects for funding. Scoring criteria will be used to numerically score applications, and then applications will be ranked in order of the highest scored projects to the lowest. The highest scoring project(s) meeting a minimum project score will be awarded funding. Staff recommends a multi-month open solicitation period to enable local air districts, fleets, technology manufacturers, and other stakeholders the opportunity to forge the partnerships to submit the best possible project proposals.

Project applications would receive scoring priority for the following elements:

- GHG Reductions
- Vehicles operating high daily, weekly, and yearly mileages
- Utilizing highly visible routes or a significant public awareness or educational element
- Overall benefits to disadvantaged communities
- Operation in areas designated as extreme nonattainment for the federal eight-hour ozone standard (i.e. the South Coast or San Joaquin Valley Air Basins)
- Technology transferability to heavier freight or line-haul sectors

- Ability of project to expand geographically, or to a wider group of participating fleets
- Timeliness of projected vehicle procurement and deployment
- Ability to leverage significant project co-funding

Specific application scoring criteria will be developed after the Board approval of the AQIP Funding Plan and passage of the FY 2014-15 State Budget, in coordination with a Zero-Emission Truck and Bus Pilot Work Group. The project solicitation will be open to individuals, federal, state and local government entities and agencies, and organizations with California heavy-duty vehicle, vehicle incentive, or air quality expertise or experience. Staff envisions an open solicitation period of up to 90 days to enable potential applicant's time to forge partnerships, secure match funding, and submit the strongest possible project proposal. Staff recommends allowing up to 10 percent of project funds to be used for project administrative costs.

## **LONG-TERM PLAN**

The Zero-Emission Truck and Bus Pilots are intended to evaluate the effectiveness of a zero-emission hub to enable a fleet or fleets to minimize risk of new technology deployment and leverage resources as a model to accelerate large scale zero-emission truck and bus deployment. Ideally, these initial ecosystems would help facilitate the transition of other similar fleets to utilize zero-emission technologies by including an assessment of vehicle performance, infrastructure and maintenance costs, and other information of interest to other potential technology adopters. During next year's funding cycle, this pilot project will likely still be in the initial implementation stages. ARB will consider level of first year funding demand, strength of proposed project applications, ability to expand upon first year projects, new technology deployment opportunities, and funding availability in assessing next year's program funding allocation. In future years, demonstrated project successes and challenges will guide the direction of future funding for this pilot project.

Because these investments are new, there is a clear need to evaluate the effectiveness of the project. Metrics of success can help illustrate the success of this pilot project in accelerating technology deployment and achieving consumer acceptance within targeted zero-emission hubs. Staff proposes to develop proposed metrics of success, include them within the project solicitation, and, where feasible, ensure the project proposals be structured to enable collection of data needed to inform these metrics. Metrics will focus on achievement of technology price reductions, manufacturer diversity and consumer acceptance.

**SUMMARY OF PUBLIC COMMENTS AND AGENCY RESPONSES TO APRIL 2, 2014  
DISCUSSION DOCUMENT: ZERO-EMISSION TRUCK AND BUS PILOT PROJECTS IN  
DISADVANTAGED COMMUNITIES**

1. Comment: *ARB should increase the proposed funding allocation for the Zero-Emission Truck and Bus Pilot in FY 2014-15, including exploring interagency transfer possibilities from the Energy Commission and/or others.*

Agency Response: The California Energy Commission has in past years provided AB 118 funding to help augment ARB's HVIP and CVRP, in order to augment these established programs. In this case, however, staff does not recommend ARB seek California Energy Commission co-funding for a pilot project with up to \$25 million in its first funding year. In future years, demonstrated project demand and success in accelerating zero-emission vehicle deployment in disadvantaged communities will dictate if expanded funding is needed.

2. Comment: *ARB should allow partially zero-emission vehicles (vehicles able to operate partially with zero-emission miles) as part of the Zero-Emission Truck and Bus Pilot.*

Agency Response: Staff agrees and is proposing to allow range-extended zero-emission vehicles in this program, if they are able to utilize telematics to concentrate zero-emission operations in disadvantaged communities.

3. Comment: *ARB should conduct a simple, streamlined, rolling solicitation model for the Zero-Emission Truck and Bus Pilot to enable fleets access to these funds throughout the year. ARB may also want to consider separate solicitations for trucks versus buses.*

Agency Response: Staff's preference is to fund multiple zero-emission hubs in different parts of the State. However, staff recognizes that a single solicitation could provide the opportunity, depending upon the strength of the project proposals, to fund several zero-emission truck and bus hubs in multiple air districts. Staff's recommendation for a two to three month open solicitation period is intended to enable local air districts, fleets, technology manufacturers, and other stakeholders the opportunity to forge the partnerships to submit the best possible project proposals. Should all project funding not be allocated during the initial project solicitation, ARB would have the opportunity to re-solicit the project at a later date.

4. Comment: *The total funding recommended for HVIP and the Zero-Emission Truck and Bus Pilot (\$35 million).is too low to meet market demand.*

Agency Response: The funding allocated for HVIP is in the same range as allocated in previous years, and based upon discussions with potential fleets and other stakeholders, staff believes it will be sufficient to meet demand for FY 2014-15. As

mentioned earlier, staff envisions the pilot project as an initial investment in what can hopefully be scaled up as necessary to most effectively drive market demand.

5. Comment: *We recommend some flexibility to fund compelling projects outside of disadvantaged communities.*

Agency Response: ARB is committed to ensuring 100 percent of funding from Low Carbon Transportation investments for HVIP and the Zero-Emission Truck and Bus Pilots benefit disadvantaged communities. Once “benefits to a disadvantaged community” has been defined later this year, staff looks forward to working with the public HVIP and Zero-Emission Truck and Bus Pilot work groups to determine operational or other requirements needed to comply with disadvantaged community requirements.

7. Comment: *The transition from traditional HVIP to a mix of HVIP and pilot programs may pose some challenges, because demand for HVIP may dwindle if companies focus solely on pilot solicitations. Smaller companies may have more difficulty competing in pilot solicitations than they have in the existing voucher program. These difficulties could be alleviated if ARB increases the voucher amounts for plug-in vehicles in disadvantaged communities, which would ensure HVIP remains an attractive option. Likewise, keeping the solicitation as simple as possible, and holding more than one solicitation annually would better enable smaller companies to participate.*

Agency Response: Staff agrees, and is recommending increasing HVIP voucher amounts for zero-emission vehicles in disadvantaged communities, to be on par to those likely provided by the Zero-Emission Truck and Bus Pilots. HVIP’s straightforward, first-come, first-served statewide voucher structure is proving successful in enabling smaller fleets to purchase more economical Hino hybrid trucks, and as smaller fleets begin to express interest in zero-emission trucks, the voucher structure will be available to facilitate this migration.

While HVIP will likely be the primary mechanism to help small businesses purchase zero-emission vehicles, the Zero-Emission Truck and Bus Pilots will also enable small business participation by encouraging large projects that help multiple fleets utilize zero-emission technologies. For example, an air district application to transform a distribution hub to utilize zero-emission technologies would be stronger if it included multiple smaller fleets that leverage resources (such as infrastructure and workforce training) rather than one large fleet, since a multi-fleet project would better promote scalability and consumer acceptance. A small fleet participating in a multi-fleet project would also have an opportunity for cost savings associated with larger scale infrastructure, maintenance, and repair facility.

Staff agrees that multiple solicitations for this project would provide additional opportunities for small fleets to apply for funding. However, HVIP is intended as a convenient mechanism for fleets to access funds throughout the year. Staff ‘s

recommendation for multi-month open solicitation period is intended to enable local air districts, fleets, technology manufacturers, and other stakeholders the opportunity to forge the partnerships to submit the best possible project proposals. Should all project funding not be allocated during the initial project solicitation, ARB would have the opportunity to re-solicit the project at a later date.

## ADVANCED TECHNOLOGY FREIGHT DEMONSTRATION PROJECTS

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**Proposed Funding Target: \$50M**

### **PROJECT GOALS**

Demonstrations of advanced technologies for the movement of freight within and through California will be the focus of Advanced Technology Demonstrations in FY 2014-15. The targeting of significant funding for pre-commercial demonstrations of advanced freight technologies can have a direct and immediate impact on the current state of technology and has the potential to provide real benefits to communities that are located near facilities that are the backbone of California's freight network. It is the goal of this proposed demonstration plan to significantly transform the technologies used in freight transport with substantial and targeted investments in freight movement technologies and strategies.

All projects funded under this proposed plan will be required to significantly reduce GHG emissions compared to conventional technologies and will be demonstrated in disadvantaged communities that have historically borne a disproportionate burden from freight movement in the State. The projects will showcase technologies with commercial viability and suitability for the California marketplace. Further, the co-benefit of reduced criteria pollutants and toxics emissions from advanced freight technologies will be considered a high priority when selecting projects for funding.

## **PROJECT OVERVIEW**

Advanced Technology Demonstration Projects accelerate the introduction of advanced emission reducing technologies that are on the cusp of commercialization into the California marketplace. A public investment in these technologies helps to achieve significant emission reductions of criteria pollutants and toxic air contaminants, as well as greenhouse gases, sooner than would be possible otherwise. This commitment from the State encourages industry to expeditiously invent, develop, test, and introduce cutting edge emission reducing technologies. Finally, Advanced Technology Demonstration Projects leverage public investment with private capital and ingenuity to go beyond what is currently at the technological forefront.

While Advanced Technology Demonstration Projects carry inherent complexities and engineering challenges, ARB mitigates this potential by requiring a competitive selection process to award funding to the most promising technologies, requiring a significant cost share from technology demonstrators, and requiring that project applicants be a California-based entities with expertise in the project category. Grants are awarded to facilitate the management of the day-to-day administration of the projects with ARB oversight. Typically, public agencies are local air districts, port authorities, or public school districts, but other non-public agencies may be 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

## **CURRENT PROJECT STATUS**

AQIP's Advanced Technology Demonstration program has funded 13 separate demonstration projects. Eight projects were completed, one project ended at its mid-point due to issues outside the control of the technology demonstrator, and three were begun but halted before completion due to expiration of funding. One project, the Zero-Emission Yard Truck demonstration at the Ports of Los Angeles and Long Beach, is still underway.

An overview and update on each of the projects funded by AQIP is provided in Appendix B. Further, all final reports for completed AQIP Advanced Technology Demonstration Projects and status updates on projects that are underway are posted on AQIP's demonstration project website at <http://www.arb.ca.gov/msprog/aqip/demo.htm> .

## **STAFF PROPOSAL FOR FY 2014-15**

In order for California to facilitate a transition toward a low-carbon transportation future, a sustained multiyear investment strategy in advanced technologies that can reduce emissions of greenhouse gases from vehicles and equipment is critical. Demonstrating to manufacturers and end-users that zero or near-zero emission technologies is a viable economical alternative to conventional technologies will competitively position California companies for the future.

The first five years of AQIPs demonstration project funding has been predominately directed toward off-road equipment, like marine vessels and locomotives, while the Energy Commission's AB 118 Alternative and Renewable Fuel and Vehicle Technology Program demonstration projects, now nearing \$30 million invested, has had a focus directed toward on-road vehicle projects along with other categories such as fuels and charging infrastructure. With the new ARB focus on freight demonstrations including significantly increased funding levels proposed in this plan, on-road vehicle demonstrations will now be major part of AQIP's demonstration project focus. Further, the match funding requirements have been reduced from the historic 50 percent of the total project cost to a minimum of 25 percent of the project cost to help facilitate a transition toward pre-commercial production of vehicles and equipment ready for the marketplace. ARB plans to closely coordinate with the Energy Commission to ensure that proposed projects are complementary, and to ensure that both agencies build off the work that has already been done synergistically.

The focus of past demonstrations have been directed at small-scale projects with fewer than 10 vehicles or pieces of equipment, typically focused in the freight sector, but not exclusively. In order to take advantage of those freight technologies that are currently ready for large pre-commercial demonstrations, staff is recommending that there be a concerted focus on two large project categories that are in a promising stage of development for the first year of this program. Those two categories are zero-emission drayage trucks and multi-source facility projects at warehouse, distribution center, and intermodal facilities. Therefore, staff's proposed recommendation is to allocate up to \$50 million from Low Carbon Transportation investments in FY 2014-15 that facilitate demonstrations of advanced freight technology in the following project categories:

### *Zero-Emission Drayage Trucks*

Proposed Allocation: \$20 to \$25 million in funding from Low Carbon Transportation investments to demonstrate zero-emission drayage trucks. Potential applicants to the zero-emission drayage project solicitation should consider the following elements:

- Potential projects in this category will be required to completely eliminate truck tailpipe emissions and GHGs and will concurrently eliminate criteria pollutants and toxic PM emissions.

- Potential projects will need to show strong commercialization prospects with the potential to transform the drayage truck industry toward zero-emission technologies.
- It is anticipated that projects funded under this category should field a large enough fleet of trucks during the demonstration to help transition technologies from the demonstration to the commercialization stage.

#### Multi-Source Facility Projects

Proposed Allocation: \$20 to 25 million in funding from Low Carbon Transportation investments to demonstrate zero- and near zero-emission technologies at distribution centers, warehouses and intermodal facilities throughout the State.

- Potential projects in this category could include zero- and near zero-emission yard and regional haul trucks, advanced transportation refrigeration units, and other equipment used in the distribution center, warehouse and intermodal environment. Additionally, fueling/charging infrastructure to facilitate the successful demonstration of technologies, and logistics/operations efficiency improvements would be considered.
- It is the intent of this category to facilitate the demonstration in one facility of multiple types of equipment that employ advanced emission reducing or eliminating technologies to synergistically demonstrate the practicality and economic viability of wide-spread adoption of advanced technology for various sources at one facility.
- Multiple projects in this category could be funded concurrently so that technologies are demonstrated at multiple facilities throughout the State.

#### Other Freight Projects

Proposed Allocation: Up to \$10 million in funding from Low Carbon Transportation investments to demonstrate advanced freight technologies in the following categories:

- Line-Haul and regional-haul truck demonstrations.
- Locomotive and other rail projects which could include reducing emissions as well as increasing efficiency in freight movement.
- Marine Vessel projects, such as the hybridization of tugboats or other vessels and other promising advanced marine vessel technologies that have the potential to significantly reduce emissions and/or increase efficiency.
- Cargo Handling Equipment demonstrations that can show zero- and near zero-emission technology for cargo handling equipment that significantly advances the state of technology. Some such projects would have the potential for broad applicability to many industries in the State. Projects will need to significantly reduce or eliminate tailpipe emissions from equipment compared to conventional technologies now employed.

- Near Dock Container Movement demonstrations such as automated container movement technologies that facilitate the movement of freight from the State's ports to near-port warehouses, distribution centers or intermodal facilities.
- Emerging Technology demonstrations for other advanced freight technologies not discussed above.

All projects funded with Advanced Technology Freight Demonstration funds will need to show the potential for widespread commercialization that will significantly transform the industry while benefitting disadvantaged communities. Specific funding amounts and project focus for each of the demonstration categories above will be vetted through category-specific public workgroup meetings with technology demonstrators, public agencies, community representatives and other interested stakeholders to be held after the June 26, 2014 Board Hearing.

It is anticipated that additional Low Carbon Transportation funding for advanced technology demonstrations will be forthcoming in future years. Therefore, FY 2014-15 funds should be viewed as a first installment on a much larger investment in advanced technology demonstrations. Future years' funds may be directed at specific segments of freight movement like the locomotive and rail segment, or in other non-freight segments like zero-emission transit buses or advanced agricultural equipment. The focus of future years' funding for demonstration projects is not yet established, however, future demonstration project funding will certainly be directed at taking advantage of those technologies that are on the cusp of transformative advances in technologies that significantly reduce GHG emissions.

#### Cost Sharing Requirements

Past AQIP Advanced Technology Demonstration Projects have always had an emphasis on developing a strong public/private investment to ensure a successful demonstration of advanced technology and as such has required cost sharing from the technology demonstrator, grantee and/or the fleet or equipment end-user to successfully apply for demonstration funding. The cost share requirement historically has required a match in funding from the applicant team of at least 50 percent of the total project cost with higher than the proposed match scoring higher than those applications that only meet the minimum 50 percent cost match requirement. Staff proposes to increase the maximum cost share for state funds for Advanced Technology Freight Demonstration from 50 percent of the total projects cost to a maximum of 75 percent of the total project cost, but maintain that those applications that propose a higher overall match toward the project above the minimum 25 percent will score higher than those that only propose the minimum match. The proposed change to the minimum match requirement from applicants is an acknowledgement of the anticipated magnitude of the projects that staff anticipates will be submitted and ARB's commitment to facilitating an expeditious movement toward zero and near-zero emission technology in the freight transport sector.

## Administration of Projects

Historically, AQIP demonstration projects have required that a California-based public agency act as the project's grantee, submit the application for funding, and administer the day-to-day operations of the project. For example past grantees have included ports and air districts. For the Advanced Technology Freight Demonstration program, however, it is proposed that additional flexibility be considered for freight demonstrations that may allow non-public agencies to be considered as the grantee if that is in the best interest for successful completion of specific projects. Any potential grantee in future freight demonstration projects needs to have the requisite experience and knowledge in implementing demonstration projects in the category to which their application is directed and can act as an unbiased party to the project.

## Solicitation Process

ARB will issue solicitations that clearly identify for which project category applications are being requested, the amount of funding that is anticipated to be available for demonstration projects in each category, and the anticipated number of projects that will be funded. More than one category may be presented in a single solicitation, but specific categories outlined in a solicitation will not compete directly against other discreet categories in the same solicitation. The solicitation will also outline the scoring criteria that will be used to evaluate potential applications for funding. Scoring criteria will be used to numerically score submitted applications, and then applications will be ranked in order of the highest scored projects to the lowest. The highest scoring projects will be awarded funding. In past AQIP Advanced Technology Demonstration solicitations, scoring criteria have included specific metrics such as cost effectiveness of the technology, or whether the commercialized technologies will benefit Environmental Justice communities. Many of the same criteria that have been used in past AQIP Advanced Technology Demonstrations will be carried over into the FY 2014-15 Advanced Technology Freight Demonstration solicitations. Some of the proposed new scoring criteria that will be employed will include the ability to significantly reduce emissions of greenhouse gases, and benefits to disadvantaged communities.

Specific scoring criteria for each of the proposed project categories will be developed after the Board approval of the AQIP Funding Plan and after the passage of the State's FY 2014-15 Budget. Additional details on the scope and amount of funding available for specific demonstration project categories will also be developed after Board approval of the Funding Plan. Staff will also develop specific project results for specific categories, refine the timeline for the issuance of solicitations, and outline special provisions for match requirements or other competitive process. All of the post Board Hearing tasks will be informed by the ongoing Advanced Technology Freight Demonstration work group process that will convene after Board approval of the Funding Plan as has been done historically under past iterations of AQIP's Advanced Technology Demonstration Program.

Solicitations will be issued in a staggered fashion to manage workload and to accommodate the nature of GGRF revenue accumulation. ARB staff anticipates that the first solicitation for Advanced Technology Freight Demonstration will be issued in the winter of 2014.

### Future Demonstration Projects

ARB may employ a Request for Information process to solicit input from industry and stakeholders. A Request for Information process could help identify potential large scale projects for future year funding and help assess the current state of the technology for certain categories such as line-haul trucks and locomotive and rail technologies. The Request for Information process may begin as early as fall of 2014 to inform the process of determining focuses for Advanced Technology Demonstration projects for FY 2015-16 and beyond.

### **LONG TERM PLAN**

Advanced Technology Demonstration projects are a critical component for achieving long-term emission reduction and climate change goals. Only a long-term demonstration program, with sustained, multiyear funding directed at the acceleration of advanced technology into the marketplace will allow ARB to reach the emission reduction goals for GHG and criteria pollutant emission reductions that have been set. The movement toward zero or near-zero emission technologies in on-road, off-road, locomotive and other categories can only begin once a strong financial commitment is made by the State, signaling to vehicle and equipment manufacturers as well as end-users of such equipment that their investments in advanced technologies will provide a return on their investment, reducing the costs to manufacture advanced equipment and reduced costs of operation while providing an overall benefit to the State. As with the FY 2014-15 demonstration project focus on freight movement in and thru the state, it is intended that future years of funding can focus on specific segments of vehicles and equipment, such as reducing emissions from long-haul trucks and realizing zero-emission miles from locomotives.

Because these investments are especially critical for long-term adoption of zero-emission technologies across multiple sectors, there is a clear need to evaluate the effectiveness of the projects. Staff recommends that metrics of success for specific Advanced Technology Freight Demonstrations be closely aligned with the stated goals and required results for each specific solicitation. Success toward meeting the goals illustrated for each technology category and demonstration project's guiding principles should also be included. Applications for demonstration project funding will detail the individual project's metrics for success and compare the results of each project with the applications stated goals, the requirements of the solicitation and the Funding Plan. Successful projects will demonstrate the potential for cost-effective emission reductions in the specific demonstration project category with the potential for widespread commercial acceptance.

**SUMMARY OF PUBLIC COMMENTS AND AGENCY RESPONSES TO APRIL 2, 2014  
DISCUSSION DOCUMENT: ADVANCED TECHNOLOGY FREIGHT DEMONSTRATION  
PROJECTS**

1. Comment: There may be considerable potential overlap between the pilot programs focused in freight or delivery hubs and the multi-source facility projects focused at distribution centers, warehouses, etc. These projects should be more clearly distinguished between.

Agency Response: Zero-Emission Truck and Bus Pilots proposals are intended for deployment of commercialized truck and bus technologies. These projects will enable fleets to evaluate larger-scale integration of these vehicles into their fleets and include a telematics data component for gathering of vehicle performance data. Staff anticipates that truck proposals for the Zero-Emission Truck and Bus Pilots will focus on the lighter, stop-and-go delivery trucks which have been funded through HVIP thus far but continue to have significant incremental costs. These vehicles are commercialized and have been deployed throughout the state. Freight Demonstration Projects will focus on heavier truck classes with much more challenging operational requirements, for which zero-emission technology still faces technical hurdles.

2. Comment: Ensure the grant application process is not an obstacle to deployment of funds and provides enough certainty to applications to ensure project solicitations meet expectations.

Agency Response: The grant application process ensures technically competent entities are awarded demonstration project funding. Applications for Advanced Technology Freight Demonstration funding does use specific mechanisms to mitigate risk in determining which applications are selected for funding; which balances the need to quickly deploy funds versus the prudent use of public funds. Some of these mitigation steps include a detailed analysis of the emission reducing potential and cost effectiveness of a specific technology, and requires a substantial match funding commitment from the project application team to ensure that State funds are being spent judiciously. Solicitations for specific project categories will clearly layout the requirements that need to be meet to successfully apply for funding.

3. Comment: Require an evaluation component for each project that is sufficient to document the results of the program for use by other potential technology adaptors and maximize the opportunity to learn from the successes and failures of the projects.

Agency Response: Staff agrees and will follow the process that has been used for past Advanced Technology Demonstration Projects, which requires a comprehensive final report, to be posted on ARB's demonstration project website, at the completion of the

project that describes the entire project in detail along with reasons for delays and solutions to problems that were encountered during the project.

4. Comment: Demonstration projects which include fueling infrastructure installation should allow for public accessibility whenever possible and appropriate.

Agency Response: Staff agrees that any charging or fueling infrastructure that is funded as part of a demonstration project should, if feasible, provide public access to that infrastructure to facilitate a holistic transition toward advanced technology vehicles and fuels.

5. Comment: Recommend the combination of two proposed Advanced Technology Freight Demonstration categories, Multi-Source Facilities Project and Other Freight Projects, into one category to facilitate a seamless logistic management and long-haul trucking concept.

Agency Response: The Other Freight Projects is not a specific category of its own, but is a combination of six separate categories that will be available for funding based on the current state of the technology in each of the individual categories and on the availability of funds. The Multi-Source Facilities (Node) Project can be used for logistical management of trucking projects if tied to a much larger project that meets the goals of the node project concept, where multiple pieces of emission reducing or eliminating equipment and vehicles are used in concert at one facility to reduce emissions compared to conventional technologies. Further, the Line-Haul and Regional-Haul Truck Demonstration, Near Dock Container Movement and Emerging Technology Categories would all be seen as a potential projects for funding.

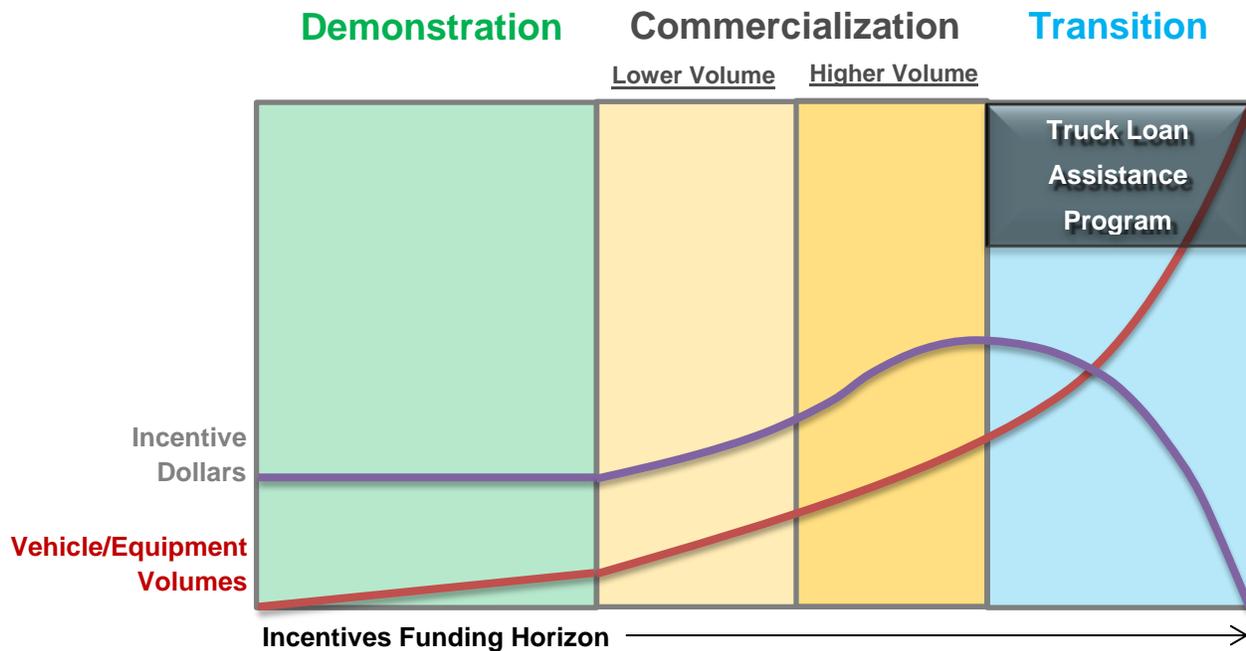
6. Comment: The match requirements for Advanced Technology Freight Demonstration projects were unclear, please explain the requirements.

Agency Response: The proposed match requirements for Advanced Technology Freight Demonstrations require that an application for funding commit at least 25 percent of the total project cost as coming from the applicant team. The maximum amount of the total project cost that will be borne by the ARB will be 75 percent of the total project cost. Those applications that commit more than the minimum 25 percent of the total project cost will score higher than those that only commit the minimum match amount.

# CHAPTER 6: LOAN ASSISTANCE PROGRAM

In addition to supporting technology development and advancement through commercialization, AQIP funding has also historically been targeted to advance technologies into new consumer demographics and among disadvantaged communities. Over twenty percent of AQIP funds to date have been allocated toward the Truck Loan Assistance Program, which is aimed at assisting low-income and small business truckers to obtain financing for truck upgrades or retrofits. The technologies funded are well commercialized, but the need to increase penetration of these technologies in certain demographics remains.

**Figure 1c. FY 2014-15 Loan Assistance Program**



Currently, the Truck Loan Assistance Program is the only program funded by AQIP in the transitional phase of technology advancement. However, as discussed in the light-duty vehicle section, staff is proposing a new light-duty financing assistance pilot project for FY 2014-15. Consistent with the incentive needs within the transitional phase of commercialization, the light-duty financing assistance pilot project would be designed to offer financing options to low-income or disadvantaged individuals in disadvantaged communities that are unable to obtain financing through conventional sources.

Staff is proposing to allocate \$10 million from AQIP for the Truck Loan Assistance Program in FY 2014-15. Table 13 below summarizes the proposed Loan Assistance Program Investments.

**Table 13. Summary of Loan Assistance Program Investments**

	<b>AQIP Investment</b>	<b>Low Carbon Transportation Investment</b>
Truck Loan Assistance Program	\$10M	--
<b>Total Loan Assistance Program Investments: \$10M</b>	<b>\$10M</b>	<b>--</b>

## *TRUCK LOAN ASSISTANCE PROGRAM*

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**Proposed Funding Target: \$10 million**

### **PROJECT GOALS**

The Truck Loan Assistance Program aids small-business fleet owners affected by ARB's In-Use Truck and Bus Regulation by providing financing assistance to upgrade to newer trucks or with diesel exhaust retrofits. It is specifically tailored to truck owners that experience challenges obtaining conventional financing because they do not conform to traditional underwriting standards.

## **PROJECT OVERVIEW**

Launched in April 2009, the Truck Loan Assistance Program utilizes AQIP funds to aid small-business fleet owners affected by ARB's In-Use Truck and Bus Regulation to secure financing for clean truck upgrades. This program is an on-going and successful incentive option that leverages public funding with private funding from participating lending institutions. Implemented in partnership with the California Pollution Control Financing Authority through its California Capital Access Program, the Truck Loan Assistance Program creates financing opportunities for truck owners that fall below conventional lending criteria and are unable to qualify for traditional financing. 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. Of the almost \$40 million invested to date, over \$280 million in private dollars have been leveraged, resulting in assistance to small business owners that likely would not have occurred otherwise.

## **CURRENT PROJECT STATUS**

Throughout 2012 and 2013, participation in the Truck Loan Assistance Program progressed rapidly in response to approaching regulatory compliance deadlines. As of April 8, 2014, about \$39 million in Truck Loan Assistance Program funding has been leveraged to provide about \$282 million in financing to small-business truckers for the purchase of over 4,800 cleaner trucks, exhaust retrofits, and trailers. Of the \$39 million deposited into lenders' loan loss reserve accounts for loan assistance, the program has reimbursed lenders just over \$1.5 million for a total of 81 claims (out of 4,263 loans as of April 8, 2014) for losses resulting from loan defaults. In the program, lenders use their customary asset recovery processes for loan defaults and then may request reimbursement from the program for losses not recouped through that process. Depending on the balance of a lender's loan loss reserve account, it is eligible for up to 100 percent coverage on its claim request.

Table 14 (below) provides a breakdown of financing offered. Historically, nearly 80 percent of enrolled loans have been issued to owner operators with one truck, and 93 percent of enrolled loans have been issued to fleet owners with 10 or fewer employees. The program continues in 2014 with \$10 million provided by Senate Bill 359 (Corbett, Chapter 415, Statutes of 2013), and remaining AQIP funds allocated to the Truck Loan Assistance Program in 2013.

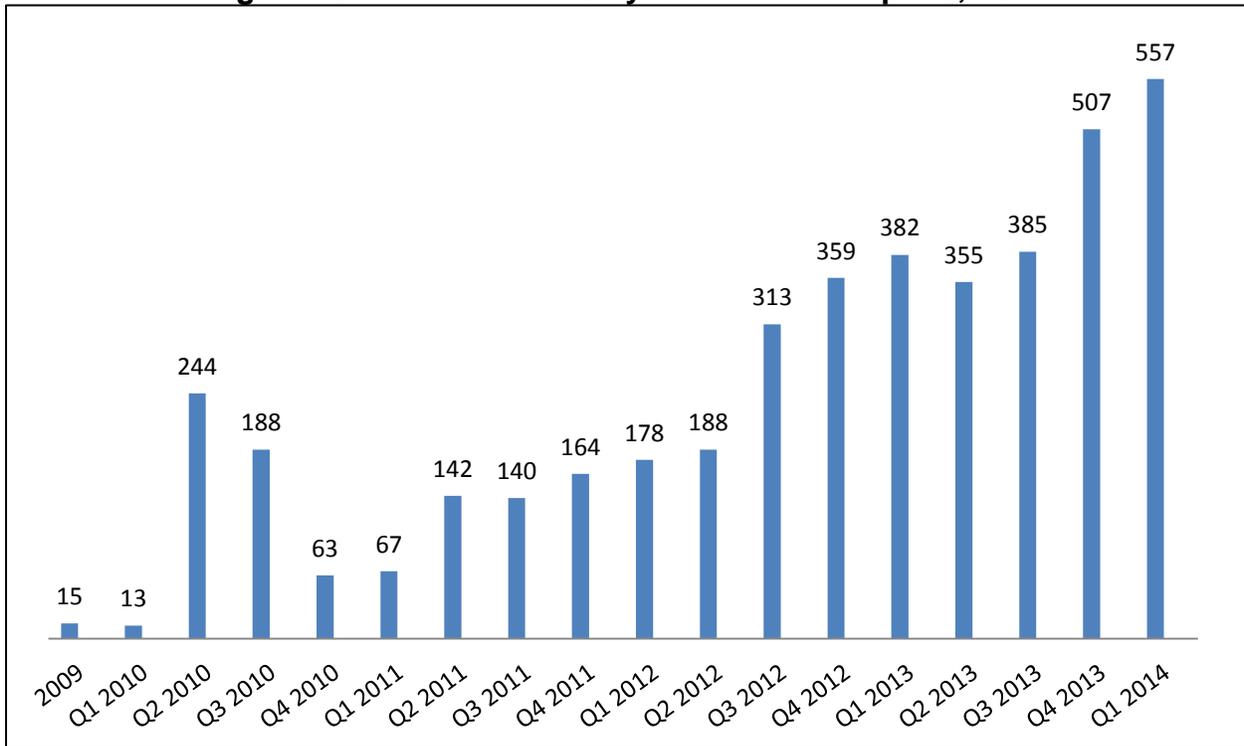
**Table 14: Truck Loan Assistance Program Status:  
Vehicles/Equipment Financed as of April 8, 2014**

Program	Number of Loans Issued <sup>1</sup>	Number of Projects Financed	Project Type	\$ Spent	Total Amount Financed
ARB/California Pollution Control Financing Authority Truck Loan Assistance Program	4,263	4,519	Truck Purchases	\$39M	\$282M
		284	Exhaust Retrofits		
		27	Trailers		

<sup>1</sup> Total number of loans issued does not equal the number of projects financed because some loans included multiple projects.

Figure 10 below shows the historical quarterly activity for loans enrolled in the program.

**Figure 10. Enrolled Loans by Quarter as of April 8, 2014**



With ongoing near-term regulatory deadlines under the In-Use Truck and Bus Regulation, ARB staff expects a continued strong demand for program funding to assist the small-business trucking sector most in need of financing for required truck upgrades.

## **STAFF PROPOSAL FOR FY 2014-15**

Projections based on historical program activity indicate an annual baseline funding need of at least \$20 million. With \$10 million from Senate Bill 359 projected to fill half of the baseline annual funding need, staff proposes an allocation of \$10 million from the FY 2014-15 AQIP Funding Plan to extend the program through June 2015.

Because loan enrollment rates have increased significantly, resulting in a 30 percent increase in loan loss reserve contributions in 2013 (over 2012 contribution levels) and a sustained demand in 2014, this funding level is necessary to continue support for truck upgrades for small-business fleet owners. Staff will continue to monitor the program for on-going accelerated activity that may affect the overall funding need.

### **LONG-TERM PLAN**

The majority of participants in the Truck Loan Assistance Program are small-business fleet owners with one truck. At its April 2014 meeting, the Board approved regulatory amendments to the In-Use Truck and Bus Regulation to provide small fleet owners additional time to meet upgrade requirements. Staff anticipates that future funding plans will maintain funding for the program to continue support for small-business fleets through the extended compliance deadlines. Assessments of ongoing funding needs will take into account updated program activity trends, which reflect truck owners' demand for financing assistance; compliance schedules; and noncompliance rates. Because program activity fluctuates based on truckers' participation in the program, the staff commits to perform periodic assessments to develop funding projections for annual program needs. Based on historical program activity, staff anticipates ongoing baseline annual funding needs in the \$14 million to \$20 million range per year until the In-Use Truck and Bus Regulation is fully implemented.

Staff proposes to measure the success of the program by evaluating overall small fleet compliance with final regulatory requirements. When significant compliance has been achieved), staff anticipates recommending discontinuing the program.

## CHAPTER 7: CONTINGENCY PLANS

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The proposed Funding Plan is based upon the latest available information. However, circumstances may change between the time the proposed Funding Plan is released for public comment (such as pending changes in the FY 2014-15 State Budget or lower than anticipated revenues), and when the Board approves the funding plan, project solicitations are issued, project funds awarded, or as projects are implemented. This section describes staff's proposed contingency plans should mid-course corrections be needed to ensure that AQIP funds are spent expeditiously and efficiently. Under these provisions, the Board would grant the Executive Officer authority to make the necessary mid-course adjustments to address the cases described below.

In recent years, revenues in the Air Quality Improvement Fund have been nearly 30 percent lower than the amount appropriated in the State Budget, so ARB had to scale back its AQIP project funding accordingly. For example, in FY 2012-13, revenues were even less than the "realistic" estimate, which resulted in the delay and ultimate reassignment of a demonstration project into this year's Funding Plan.

Based on this experience, ARB staff is proposing a Funding Plan that establishes minimum allocations for each project category totaling *less* than both the Governor's Proposed Budget allocation of \$26 million and the projected available funding for projects. ARB staff forecasts that AQIP fees could generate up to \$22 million in project revenue, after accounting for various state administrative costs. Staff is proposing minimum funding targets for each category totaling \$20 million, which should leave roughly \$2 million unallocated to function as a prudent reserve. Establishing minimum targets for each category based on a "realistic" funding scenario reduces the risk of over-obligating funds beyond available revenues, and avoids disproportionately affecting projects that start later in the fiscal year if revenue projections are lowered, as was experienced in FY 2012-13 with the Zero-Emission Transit Demonstration Project.

Further, this Funding Plan describes proposed allocations for Low Carbon Transportation investments from GGRF, as described in the Governor's budget. Should the State Budget authorize an amount less than \$200 million, staff proposes to scale back funding proportionately from each project in order to maintain the goals established for providing benefits to disadvantaged communities. If the State Budget includes an amount more than \$200 million, staff proposes to increase funding amounts proportionately, unless otherwise specifically directed by legislation.

Various sections of this Funding Plan include additional contingencies specific to each project. For example, staff has proposed a set of contingency measures for Classic CVRP should the funding identified for the project fall short of meeting the project's demand (page 39). Other specific contingencies are included in the sections regarding Light-Duty Pilot Projects in Disadvantaged Communities (page 46), and Traditional HVIP (page 60, regarding HVIP Funding Allocation).

ARB staff plans to release initial grant solicitations based on the minimum allocations in Table 3. However, the solicitations and grant agreements will be written with provisions to allow an increase in awarded funding if there are sufficient revenues and project demand.

If funding from other sources is provided for AQIP projects, funds will be allocated as needed for projects or as specifically required by the authorizing entity. Additionally, AQIP projects may be altered to accommodate any conditions placed upon the use of alternative sources of funding. ARB staff will consult with project work groups prior to making any changes to AQIP projects.

Conversely, ARB staff proposes the ability to reallocate funding from any project in the event that demand for a specific project does not materialize. Any changes in funding for a particular project category would be publicly vetted through AQIP project work groups.

**Minor Technical/Administrative Changes:** The proposed Funding Plan specifies all policy-related details regarding the projects to be funded. However, technical or administrative changes in implementation procedures may be needed from time to time to ensure these projects are successful. Staff proposes a transparent process in which minor changes to a project category would be publicly vetted through the AQIP project work groups that have been established to discuss the implementation details of each project. These changes would be within the Funding Plan parameters approved by the Board.

## CHAPTER 8: FISCAL YEAR 2014-15 PROJECT SOLICITATIONS

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Following Board approval of the proposed Funding Plan and after the final State Budget is signed; staff will release solicitations for each of the project categories in order to select a grantee to implement the projects in FY 2014-15. The solicitations will include all the programmatic details potential grantees need to apply for funds, in addition to the criteria upon which the applications will be evaluated and scored.

The public work groups established for each project category will continue to be the primary avenue for seeking input and feedback on solicitations and implementation manuals. Staff will monitor and evaluate AQIP projects over the course of the fiscal year and share project data with the work groups.

## CHAPTER 9: REFERENCES

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In developing the proposed Funding Plan, ARB staff relied on information from previous Board approved AQIP Funding Plans, AQIP Guidelines, the Energy Commission's AB 118 Investment Plans, and other various reports and publications. A list of references is provided below, with corresponding web links, as appropriate.

Air Resources Board. (2008). Staff Report: Initial Statement of Reasons for Proposed Rulemaking, Proposed AB 118 Air Quality Guidelines for the Air Quality Improvement Program and the Alternative and Renewable Fuel and Vehicle Technology Program, Released August 8, 2008.

<http://www.arb.ca.gov/regact/2008/aqipfuels08/aqipfuels08.htm>

Air Resources Board. (2009a). Proposed AB 118 Air Quality Improvement Program Funding Plan For Fiscal Year 2009-10. Approved April 24, 2009.

[http://www.arb.ca.gov/msprog/aqip/fundplan/aqip\\_FY09-10\\_approved.pdf](http://www.arb.ca.gov/msprog/aqip/fundplan/aqip_FY09-10_approved.pdf)

[http://www.arb.ca.gov/msprog/aqip/fundplan/aqip\\_FY09-10\\_FP\\_appendix.pdf](http://www.arb.ca.gov/msprog/aqip/fundplan/aqip_FY09-10_FP_appendix.pdf)

Air Resources Board. (2009b). Staff Report: Initial Statement of Reasons for Proposed Rulemaking, Proposed AB 118 Air Quality Improvement Guidelines, Released March 6, 2009.

<http://www.arb.ca.gov/regact/2009/aqip09/aqip09.htm>

Air Resources Board. (2010). Proposed AB 118 Air Quality Improvement Program Funding Plan For Fiscal Year 2010-11. Approved June 24, 2010.

[http://www.arb.ca.gov/msprog/aqip/fundplan/AQIP\\_FP\\_JUNE%202010-FINAL.pdf](http://www.arb.ca.gov/msprog/aqip/fundplan/AQIP_FP_JUNE%202010-FINAL.pdf)

Air Resources Board. (2011a). 2011 Biennial Report to the Legislature on AB 118 Air Quality Improvement Program. January 11, 2011.

[http://www.arb.ca.gov/msprog/aqip/leg\\_reports.htm](http://www.arb.ca.gov/msprog/aqip/leg_reports.htm)

Air Resources Board. (2011b). Carl Moyer Program Guidelines; Approved Revisions 2011. Released April 1, 2011.

[http://www.arb.ca.gov/msprog/moyer/guidelines/2011gl/2011cmpgl\\_04\\_01\\_14.pdf](http://www.arb.ca.gov/msprog/moyer/guidelines/2011gl/2011cmpgl_04_01_14.pdf)

Air Resources Board. (2011c). Proposed AB 118 Air Quality Improvement Program Funding Plan For Fiscal Year 2011-12. Approved July 21, 2011.

[http://www.arb.ca.gov/msprog/aqip/fundplan/final\\_approved\\_aqip\\_fy2011\\_funding\\_plan.pdf](http://www.arb.ca.gov/msprog/aqip/fundplan/final_approved_aqip_fy2011_funding_plan.pdf)

Air Resources Board. (2011d). Staff Report: Initial Statement of Reasons for Advanced Clean Cars; 2012 Proposed Amendments to the California Zero Emission Vehicle Program Regulations, Released December 7, 2011.

<http://www.arb.ca.gov/regact/2012/zev2012/zevisor.pdf>

Air Resources Board. (2012). Proposed AB 118 Air Quality Improvement Program Funding Plan For Fiscal Year 2012-13. Approved June 27, 2012.

[http://www.arb.ca.gov/msprog/aqip/fundplan/AQIP\\_FY2012\\_Funding\\_Plan-Approved.pdf](http://www.arb.ca.gov/msprog/aqip/fundplan/AQIP_FY2012_Funding_Plan-Approved.pdf)

- Air Resources Board. (2013a) Cap-and-Trade Auction Proceeds Investment Plan: Fiscal Years 2013-14 through 2015-16. Released May 14, 2013.  
[http://www.arb.ca.gov/cc/capandtrade/auctionproceeds/final\\_investment\\_plan.pdf](http://www.arb.ca.gov/cc/capandtrade/auctionproceeds/final_investment_plan.pdf)
- Air Resources Board. (2013b). Staff Report: Initial Statement of Reasons for Proposed Rulemaking; Proposed Greenhouse Gas (GHG) Regulations for Medium- and Heavy-Duty Engines and Vehicles, Optional Reduced Emission Standards for Heavy-Duty Engines, and Amendments to the Tractor-Trailer GHG Regulation, the Diesel-Fueled Commercial Motor Vehicle Idling Rule, and the Heavy-Duty Hybrid-Electric Vehicles Certification Procedures. Released December 12, 2013.  
<http://www.arb.ca.gov/regact/2013/hdghg2013/res13-50attache.pdf>
- Air Resources Board. (2013c). Vision for Clean Air: A Framework for Air Quality and Climate Planning; Public Review Draft. Released June 27, 2013.  
[http://www.arb.ca.gov/planning/vision/docs/vision\\_for\\_clean\\_air\\_public\\_review\\_draft.pdf](http://www.arb.ca.gov/planning/vision/docs/vision_for_clean_air_public_review_draft.pdf)
- Air Resources Board. (2013d). Vision for Clean Air: A Framework for Air Quality and Climate Planning; Public Review Draft. Appendix: Actions for Development, Demonstration, and Deployment of Needed Advanced Technologies. Released June 27, 2013.  
[http://www.arb.ca.gov/planning/vision/docs/vision\\_for\\_clean\\_air\\_appendix\\_public\\_review\\_draft.pdf](http://www.arb.ca.gov/planning/vision/docs/vision_for_clean_air_appendix_public_review_draft.pdf)
- Bakker, S. and Trip, J.J. (2013). Policy options to support the adoption of electric vehicles in the urban environment. *Transportation Research Part D: Transport and Environment* 25(0): 18-23.
- Beresteanu, A. and S. Li (2011). Gasoline Prices, Government Support, and the Demand for Hybrid Vehicles in the United States. *International Economic Review* 52(1): 161-182.
- Brand, C., et al. (2013). Accelerating the transformation to a low carbon passenger transport system: The role of car purchase taxes, feebates, road taxes and scrappage incentives in the UK. *Transportation Research Part A: Policy and Practice* 49(0): 132-148.
- Brown, E. (2012). Governor's Executive Order B-16-2012.  
<http://gov.ca.gov/news.php?id=17472>
- Brown, E. (2013). ZEV Action Plan: A roadmap toward 1.5 million zero-emission vehicles on California roadways by 2025; Governor's Interagency Working Group on Zero-Emission Vehicles.  
[http://opr.ca.gov/docs/Governor's\\_Office\\_ZEV\\_Action\\_Plan\\_\(02-13\).pdf](http://opr.ca.gov/docs/Governor's_Office_ZEV_Action_Plan_(02-13).pdf)
- Burke, A., and Zhao, H. (2012). Energy Saving and Cost Projections for Advanced Hybrid, Battery Electric, and Fuel Cell Vehicles in 2015-2030. Institute of

Transportation Studies, University of California, Davis, Research Report UCD-ITS-RR-12-05.

California Energy Commission. (2007). State Alternative Fuels Plan. Publication Number: CEC-600-2007-011-CMF.  
<http://www.energy.ca.gov/2007publications/CEC-600-2007-011/CEC-600-2007-011-CMF.PDF>

California Energy Commission. (2011). 2011 Integrated Energy Policy Report. Publication Number: CEC-100-2011-001-CMF  
<http://www.energy.ca.gov/2011publications/CEC-100-2011-001/CEC-100-2011-001-CMF.pdf>

California Energy Commission. (2014). 2014-2015 Investment Plan Update for the Alternative and Renewable Fuel and Vehicle Technology Program. Commission Final Report. Posted May 13, 2014. Publication Number: CEC-600-2013-003-CMF.  
<http://www.energy.ca.gov/2013publications/CEC-600-2013-003/CEC-600-2013-003-CMF.pdf>

California Fuel Cell Partnership. (2013). A Road Map for Fuel Cell Electric Buses in California: A zero-emission solution for public transit.  
[http://cafcp.org/sites/files/A\\_Roadmap\\_for\\_Fuel\\_Cell\\_Electric\\_Buses\\_in\\_California\\_FINAL.pdf](http://cafcp.org/sites/files/A_Roadmap_for_Fuel_Cell_Electric_Buses_in_California_FINAL.pdf)

Capitman, J., and Tyner, T. (2011). The Impacts of Short-term Changes in Air Quality on Emergency Room and Hospital Use in California's San Joaquin Valley. California State University, Fresno, Fresno CA.

Chandra, A., et al. (2010). Green drivers or free riders? An analysis of tax rebates for hybrid vehicles. *Journal of Environmental Economics and Management* 60(2): 78-93.

de Haan, P., et al. (2006). Does the hybrid Toyota Prius lead to rebound effects? Analysis of size and number of cars previously owned by Swiss Prius buyers. *Ecological Economics* 58(3): 592-605.

de Haan, P., et al. (2009). How much do incentives affect car purchase? Agent-based microsimulation of consumer choice of new cars—Part II: Forecasting effects of feebates based on energy-efficiency. *Energy Policy* 37(3): 1083-1094.

Department of Finance. (2014). Governor's Budget Summary 2014-15; Environmental Protection.  
<http://www.ebudget.ca.gov/2014-15/pdf/BudgetSummary/EnvironmentalProtection.pdf>

Diamond, D. (2008). Impact of High Occupancy Vehicle (HOV) Lane Incentives for Hybrids in Virginia. *Journal of Public Transportation* 11(4).

Diamond, D. (2009). The impact of government incentives for hybrid-electric vehicles: Evidence from US states. *Energy Policy* 37(3): 972-983.

- Eppstein, M. J., et al. (2011). An agent-based model to study market penetration of plug-in hybrid electric vehicles. *Energy Policy* 39(6): 3789-3802.
- Gallagher, K., and Muehlegger, E. (2010). Giving green to get green? Incentives and consumer adoption of hybrid vehicle technology, *J. Environ. Econ. Manage.* doi:10.1016/j.jeem.2010.05.004  
<http://fletcher.tufts.edu/CIERP/research/~media/Fletcher/Microsites/CIERP/Publications/2011/Gallagher11GivingGreenGetGreen.pdf>
- Greene, D., et al. (2014). Transitioning to Electric Drive Vehicles: Public Policy Implications of Uncertainty, Network Externalities, Tipping Points and Imperfect Markets. University of Tennessee and Oak Ridge National Laboratory. White Paper 1.14.  
[http://www.theicct.org/sites/default/files/publications/Greene\\_Transition-to-Edrive\\_jan2014.pdf](http://www.theicct.org/sites/default/files/publications/Greene_Transition-to-Edrive_jan2014.pdf)
- Hidrue, M. K., et al. (2011). Willingness to pay for electric vehicles and their attributes. *Resource and Energy Economics* 33(3): 686-705.
- Jenn, A., et al. (2013). The impact of federal incentives on the adoption of hybrid electric vehicles in the United States. *Energy Economics* 40(0): 936-942.
- Kahn, M. E. (2007). Do greens drive Hummers or hybrids? Environmental ideology as a determinant of consumer choice. *Journal of Environmental Economics and Management*. 54(2): 129-145.
- Lowe, M., et al. (2009). Manufacturing Climate Solutions: Carbon-Reducing Technologies and U.S. Jobs; Chapter 9, Hybrid Drivetrains for Medium- and Heavy-Duty Trucks. Duke University; Center on Globalization Governance and Competitiveness.  
[http://www.cggc.duke.edu/environment/climatesolutions/greeneconomy\\_Ch9\\_HybridDrivetrainsforTrucks.pdf](http://www.cggc.duke.edu/environment/climatesolutions/greeneconomy_Ch9_HybridDrivetrainsforTrucks.pdf)
- McKinney, J., et al. (2011). Benefits Report for the Alternative and Renewable Fuel and Vehicle Technology Program, Staff Draft Report. California Energy Commission, Fuels and Transportation Division. Publication CEC-600-2011-008-SD  
<http://www.energy.ca.gov/2011publications/CEC-600-2011-008/CEC-600-2011-008-SD.pdf>
- Miller KA, et al. (2007). Long-term exposure to air pollution and incidence of cardiovascular events in women. *N Engl J Med* 356(5):447–458.  
<http://dx.doi.org/10.1056/NEJMoa054409>.
- National Research Council. (2013). Overcoming Barriers to Electric-Vehicle Deployment: Interim Report. Washington, DC: The National Academies Press.
- Northeast States for Coordinated Air Use Management (NESCAFF) et al. (2009). Reducing Heavy-Duty Long Haul Combination Truck Fuel Consumption and CO2 Emissions; Final Report.  
[http://www.nescaum.org/documents/heavy-duty-truck-ghg\\_report\\_final-200910.pdf](http://www.nescaum.org/documents/heavy-duty-truck-ghg_report_final-200910.pdf)

- Ozaki, R. and K. Sevastyanova (2011). Going hybrid: An analysis of consumer purchase motivations. *Energy Policy*. 39(5): 2217-2227.
- Pearson J., et al. (2010). Association between fine particulate matter and diabetes prevalence in the U.S.. *Diabetes Care* 33(10):2196–2201  
<http://care.diabetesjournals.org/content/33/10/2196.full.pdf+html>
- Sallee, J. M. (2011). The Surprising Incidence of Tax Credits for the Toyota Prius. *American Economic Journal: Economic Policy*. 3(2): 189-219.
- Schwarzenegger, A. (2005) Governor’s Executive Order S-3-05.  
<http://gov.ca.gov/news.php?id=1861>
- Sierzchula, W., et al. (2014). The influence of financial incentives and other socio-economic factors on electric vehicle adoption. *Energy Policy* 68(0): 183-194.
- Smith, C., and McKinney, J. (2012). 2012-2013 Investment Plan Update for the Alternative and Renewable Fuel and Vehicle Technology Program Lead Commissioner Report. California Energy Commission, Fuels and Transportation Division. Publication CEC-600-2012-001-LCR  
<http://www.energy.ca.gov/2012publications/CEC-600-2012-001/CEC-600-2012-001-LCF.pdf>
- Smith, C., and McKinney, J. (2013). 2013-2014 Investment Plan Update for the Alternative and Renewable Fuel and Vehicle Technology Program Lead Commissioner Report. California Energy Commission, Fuels and Transportation Division. Publication CEC-600-2012-008-CMF  
<http://www.energy.ca.gov/2012publications/CEC-600-2012-008/CEC-600-2012-008-CMF.pdf>
- Sun Q., et al. (2009). Ambient air pollution exaggerates adipose inflammation and insulin resistance in a mouse model of diet-induced obesity. *Circulation* 119(4):538–546  
<http://dx.doi.org/10.1161/CIRCULATIONAHA.108.799015>.
- Tal, G., and Nicholas, M.A. (2013). Studying the PEV Market in California: Comparing the PEV, PHEV and Hybrid Markets. Institute of Transportation Studies, University of California, Davis, Research Report UCD-ITS-RR-13-22.  
[http://www.arb.ca.gov/html/ca\\_pevmarket\\_study\\_ucdits.pdf](http://www.arb.ca.gov/html/ca_pevmarket_study_ucdits.pdf)
- Tal, G. and Nicholas, M.A. (2014). Evaluating the Impact of High Occupancy Vehicle (HOV) Lane Access on Plug-In Vehicles (PEVs) Purchasing and Usage in California. Institute of Transportation Studies, University of California, Davis.  
[http://www.its.ucdavis.edu/wp-content/themes/ucdavis/pubs/download\\_pdf.php?id=2097](http://www.its.ucdavis.edu/wp-content/themes/ucdavis/pubs/download_pdf.php?id=2097)
- Tal, G., et al. (2013). Who Is Buying Electric Cars in California? Exploring Household and Vehicle Fleet Characteristics of New Plug- in Vehicle Owners. Research Report–UCD-ITS-RR-13-02.  
[http://www.its.ucdavis.edu/wp-content/themes/ucdavis/pubs/download\\_pdf.php?id=1839](http://www.its.ucdavis.edu/wp-content/themes/ucdavis/pubs/download_pdf.php?id=1839)

U.S. Environmental Protection Agency and U.S. Department of Transportation. (2011). Final Rulemaking to Establish Greenhouse Gas Emissions Standards and Fuel Efficiency Standards for Medium- and Heavy-Duty Engines and Vehicles; Regulatory Impact Analysis. Publication EPA-420-R-11-901  
<http://www.epa.gov/otaq/climate/documents/420r11901.pdf>

U.S. Environmental Protection Agency. (2012a). EPA's Final Rulemaking for 2017-2025 Light-Duty Vehicle Greenhouse Gas Emission Standards and Corporate Average Fuel Economy Standards. Publication EPA-420-R-12-016  
<http://www.epa.gov/otaq/climate/documents/420r12016.pdf>

U.S. Environmental Protection Agency. (2012b). PM Health Outcomes.  
<http://www.epa.gov/research/airscience/air-pmhealthoutcomes.htm>

U.S. Department of Energy. (2014). EV Everywhere Grand Challenge; Road to Success.  
[http://energy.gov/sites/prod/files/2014/02/f8/eveverywhere\\_road\\_to\\_success.pdf](http://energy.gov/sites/prod/files/2014/02/f8/eveverywhere_road_to_success.pdf)

## Appendix A

### AB 8 Project Scoring Criteria: Methodology

# AQIP PROJECT SCORING CRITERIA: METHODOLOGY

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## Overview

Assembly Bill (AB) 8 (Perea, Chapter 401, Statutes of 2013) refined the evaluation criteria for projects funded by fees that support the Air Quality Improvement Program (AQIP). This appendix describes the AB 8 project scoring criteria analysis found in the Fiscal Year (FY) 2014-15 Funding Plan for AQIP and Low Carbon Transportation Greenhouse Gas Reduction Fund Investments (Funding Plan) and provides additional details on the methodology developed and assumptions used. This is the first annual Funding Plan since passage of AB 8 to include the scoring criteria analysis, and ARB anticipates updating and revising the analysis in each subsequent Funding Plan as new data and methodologies are developed. This scoring criteria analysis, along with the information presented in the Funding Plan, provide the basis for public comment on the selection of projects for funding, and ultimately Board consideration and approval of the Funding Plan.

### *Assembly Bill 8*

The analysis and methodology in this appendix describe ARB implementation of the AB 8 provisions that require ARB to assign preference to projects with a higher benefit-cost score. AB 8 extended the funding for AQIP until January 1, 2024, refined the evaluation criteria for projects supported by AQIP, and introduced the following requirements that staff followed to develop the project scoring 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 Program.<sup>1</sup>
- “Benefit-cost score” means the reasonably expected or potential criteria pollutant emission reductions achieved per dollar awarded by the board for the project<sup>2</sup>.
- The state board also may give additional preference based on the following criteria, as applicable, in funding awards to projects<sup>3</sup>:
  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.

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<sup>1</sup> Health & Safety Code Section 44274(b)

<sup>2</sup> Health & Safety Code Section 44270.3(e)(1)

<sup>3</sup> Health & Safety Code Section 44274(b)

## 6. Ability to leverage private capital investments.

ARB must annually evaluate potential project categories for AQIP funding, based upon the specific criteria identified above. As a result, staff's analysis and evaluation methodology was applied to all of the proposed projects identified in the FY 2014-15 Funding Plan to determine project-specific benefit cost scores and consistency with the additional preference criteria.

### **Methodology**

To determine the benefit-cost score for potential AQIP projects to be funded during FY 2014-15, staff developed a standardized analysis to apply to each potential project. Staff then conducted emissions and cost evaluations in order to determine the near-term and potential long-term benefit-cost scores. This appendix provides additional information regarding the emission factors used in the quantification of emissions benefits, near-term and potential long-term project costs, analysis to support the additional preference criteria, and scoring methodology. The analysis expands on the components of analysis that were used in the development of the benefit-cost scores. This appendix provides information on the following:

- Criteria Emissions Reduction Analysis
- Cost Analysis
- Benefit-Cost Score Analysis
- Additional Preference Criteria
- Total Benefit Index

#### *Criteria Emission Reduction Analysis*

Staff determined that a well-to-wheel (WTW) analysis for emission reductions is the most appropriate methodology to determine emission benefits. A well-to-wheel emission analysis allows staff to analyze the emissions produced from the production, distribution and usage of the different fuel types, including hydrogen and electricity, and any associated exhaust emissions. As part of the analysis, near-term emission reductions (i.e., the direct emission reductions expected from the project) and potential long-term emission benefits (i.e., those expected to be realized in the future as a result of current project investments), when applicable, were quantified for each proposed project. In projects where new fuels and advanced technologies are not involved, such as loan guarantees for diesel trucks, analysis of only exhaust emissions was performed because new alternative fuels or advanced technologies are not introduced. Staff calculated the near-term and expected future oxides of nitrogen (NO<sub>x</sub>), particulate matter (PM) 2.5, and hydrocarbons (HC) emissions, along with GHG emissions benefits for vehicle technologies/fuel types in each project.

As discussed in the FY 2014-15 Funding Plan, staff based the analysis of PM emissions on PM 2.5 instead of PM 10 due to the difference in adverse health impacts associated

with PM emissions of different sizes. In order to provide direct comparisons between the projects by comparing similar criteria emissions, PM 2.5 was selected as the corresponding PM emissions component. Moreover, due to the toxicity of PM 2.5, staff proposes to assign a greater weight for PM 2.5 by weighing it by 20 times due to its health impacts.

### Emission Factors

Based on the proposed project types under AQIP, staff developed WTW emissions factors for four different vehicle classes:

- Light-duty vehicles (LDV)
- Medium-duty vehicles (MDV)
- Heavy-duty vehicles (HDV)
- Urban buses

To support the analysis of criteria emission reductions from the proposed projects, staff developed a set of emission factors for the four different vehicle classes shown above. The emission factors and assumptions used in the analysis were derived from a number of sources such as Argonne National Laboratory's Greenhouse Gases, Regulated Emissions, and Energy Use in Transportation (GREET) Model<sup>4</sup>, ARB's Emission Factor (EMFAC) Model<sup>5</sup>, information from ARB regulation staff reports<sup>6,7</sup>, publically available technical reports, and staff assumptions. Additionally, staff analyzed greenhouse gas emissions utilizing carbon intensity data from ARB's Low Carbon Fuel Standard Program<sup>8</sup> (LCFS). To quantify WTW emission factors, the analysis combined two pieces of data: upstream (well-to-tank) emission factors and vehicle usage emission factors (tank-to-wheel).

For upstream emission factor development, staff developed fuel economy values for the various classes of vehicles proposed for funding. Fuel economy is critical in upstream emissions analysis as associated emissions are based on the amount of fuel used during the production and delivery stages. Evaluations were performed by comparing the vehicles supported by the proposed AQIP projects to a new conventional baseline vehicle. Moreover, staff analyzed the near-term and the long-term potential emissions benefits from the various technologies by accounting for fuel economy improvements for conventional vehicles in later years due to anticipated improvements in engine efficiency. Table A-1 summarizes the baseline fuel and fuel economy estimates used in the near-term and potential long-term of conventional vehicles in the analysis.

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<sup>4</sup> <https://greet.es.anl.gov/>

<sup>5</sup> <http://www.arb.ca.gov/emfac/>

<sup>6</sup> <http://www.arb.ca.gov/regact/2012/zev2012/zevisor.pdf>

<sup>7</sup> <http://www.arb.ca.gov/regact/2012/leviighg2012/levisor.pdf>

<sup>8</sup> [http://www.arb.ca.gov/fuels/lcfs/lu\\_tables\\_11282012.pdf](http://www.arb.ca.gov/fuels/lcfs/lu_tables_11282012.pdf)

**Table A-1. Fuel economy values of baseline conventional vehicles**

Vehicle Class		2010	2015	2020	2025
LDV	Fuel Economy - Gasoline (mpg)	22.7	26.0	29.4	34.1
MDV	Fuel Economy - Diesel (mpg)	13.8	14.5	15.1	15.9
HDV	Fuel Economy - Diesel (mpg)	5.7	6.2	6.6	6.9
Urban Buses	Fuel Economy - Diesel (mpg)	3.3	3.4	3.6	3.8

Upstream emission factors were generated based on the fuel economy values. Staff then added the upstream emission factors to exhaust emissions based on data from the ARB EMFAC model to generate the complete WTW emission factors for criteria emissions. Staff also used data from LCFS to generate greenhouse gas emission factors. WTW emission factors were developed for advanced technology vehicles supported by the proposed programs, along with near-term and projected future emission factors for new conventional vehicles. For the analysis, staff calculated the near-term and expected future NO<sub>x</sub>, PM 2.5, and HC emissions, along with GHG emissions benefits for vehicle technologies/fuel types in each project.

As discussed in the Funding Plan, preliminary data show that attaching a hybrid driveline to a vehicle without careful integration with the engine plus aftertreatment system can have the unintended consequence of increasing criteria pollutant emissions. Subsequently, the emission factors for hybrid MDVs, HDVs, and Urban Buses are based on a certified vertically integrated hybrid vehicle. Moreover, improved fuel economy<sup>9</sup> from the use of a hybrid system provides improvements in the WTW emission factors as less fuel is used and the well-to-tank emissions are reduced.

Tables A-2 through A-5 provide an overview of the emission factors generated for each vehicle category.

**Table A-2. WTW Emission Factors for LDVs**

	Gasoline (2015)	Gasoline (2020)	Plug-in hybrid (PHEV20)	Battery-Electric	Fuel cell vehicle
NO <sub>x</sub> (g/mi)	0.25	0.21	0.12	0.03	0.10
PM (g/mi)	0.065	0.062	0.048	0.032	0.052
HC Total (g/mi)	0.18	0.16	0.09	0.01	0.02
GHG (g/mi)	498	425	234	76	127

<sup>9</sup> Hybrid vehicle fuel economy improvement based on Climate Change Scoping Plan, Measure Documentation Supplement

**Table A-3. WTW Emission Factors for MDVs**

	Diesel (2015)	Diesel (2025)	Plug-in hybrid (PHEV20)	Electric vehicle	Fuel cell vehicle	Hybrid (2015)	Hybrid (2025)
NOx (g/mi)	1.31	1.29	0.81	0.08	0.28	1.12	1.12
PM (g/mi)	0.17	0.165	0.100	0.078	0.115	0.105	0.105
HC Total (g/mi)	0.15	0.15	0.10	0.02	0.05	0.13	0.13
GHG (g/mi)	971	917	622	241	348	734	734

**Table A-4. WTW Emission Factors for HDVs**

	Diesel (2015)	Diesel (2025)	Plug-in hybrid (PHEV20)	Electric vehicle	Fuel cell vehicle	Hybrid (2015)	Hybrid (2025)
NOx (g/mi)	2.48	2.41	1.41	0.19	0.65	2.07	2.07
PM (g/mi)	0.34	0.33	0.21	0.14	0.25	0.21	0.21
HC Total (g/mi)	0.34	0.330	0.271	0.020	0.107	0.280	0.280
GHG (g/mi)	2268	2093	1379	552	796	1675	1675

**Table A-5. WTW Emission Factors for Urban Buses**

	Diesel (2015)	Diesel (2025)	Plug-in hybrid (PHEV20)	Electric vehicle	Fuel cell vehicle	Hybrid (2015)	Hybrid (2025)
NOx (g/mi)	3.36	3.36	1.94	0.38	1.31	2.83	2.83
PM (g/mi)	0.56	0.56	0.33	0.22	0.45	0.35	0.35
HC Total (g/mi)	0.50	0.502	0.374	0.020	0.216	0.418	0.418
GHG (g/mi)	4230	4220	2748	1114	1606	3377	3377

Emission factors were also developed specifically for the Truck Loan Assistance Program. The Truck Loan Assistance Program aids small business truckers affected by ARB's In-Use Truck and Bus Regulation by providing financing assistance for fleet owners to upgrade their fleets with newer trucks or with diesel exhaust retrofits. Based on historical data from the program, a majority of funds were directed towards the replacement of a non-compliant diesel truck to a model year (MY) 2007 truck. Therefore, staff used the model year information from truck replacements as the basis for the emission factors used in the benefit-cost score analysis for this fiscal year. However, staff anticipates that next year's analysis will account for the expected increase of MY 2010 trucks into the fleet through the loan program, consistent with the analysis performed for the recent amendments to the Truck and Bus Regulation. Additionally, as new fuels or advanced technologies are not supported by the program, staff analyzed only the exhaust emissions of the vehicles typically funded by the program. A WTW analysis is not applicable as the upstream (well-to-tank) emissions are not affected and the only criteria emissions benefits are due to exhaust emission improvements. As a result, emission factors were developed with data from EMFAC. Finally, PM reduction is not included in the benefit-cost score as PM reductions are

required by the In-Use Truck and Bus Regulation. Table A-6 below summarizes the emission factors used for the truck loan program.

**Table A-6. Exhaust Emission Factors for Truck Loan Program\***

	Diesel (1997)	Diesel (2007)
NOx (g/mi)	16.92	6.16
HC Total (g/mi)	0.32	0.31

\*Average of EMFAC categories: T6 instate heavy and T7 tractors

With the emission factors generated for each of the vehicle types, staff then analyzed the criteria emissions benefits for each of the proposed projects. Staff performed analyses on the following projects with the corresponding vehicle class emission factors:

- Classic CVRP (Emission Factors: LDV)
- HVIP (Emission Factors: MDV)
- Advanced Technology Freight Demonstrations (Emission Factors: HDV)
- Zero-Emission Truck and Bus Pilots (Emission Factors: Urban Bus)
- Pilot Projects in Disadvantaged Communities (Emission Factors: LDV)
- Truck Loan Assistance Program (Emission Factors: Truck Loan Program)

As described in the Funding Plan, Advanced Technology Freight Demonstration Projects consists of Zero-Emission Drayage Truck Projects and Multi-Source Facility Projects. Details regarding the vehicles and equipment to be included in the demonstration projects will not be known until applications are received, therefore staff utilized emission factors for zero-emission drayage trucks as the basis for the Advanced Technology Freight Demonstration Projects benefit-cost score.

### Supported Vehicles

Using the information identified above, staff utilized past project data and experience to determine the vehicles or equipment that may be supported by the projects to provide near-term emissions reductions for each of the projects in FY 2014-15. Table A-7 summarizes the vehicles that were used in the analysis to calculate the near-term emissions benefits.

**Table A-7. Near-term Supported Technology Types by Proposed Projects**

Proposed Programs	Supported Technology Types	Comments
Truck Loans	Replacement of a MY1997 with a MY2007 truck	Assumption based on project data
Classic CVRP	Plug-in hybrid and battery-electric	50/50 split of the two technology types based on historical CVRP rebate data
HVIP	Hybrid and battery-electric	50/50 split of the two technology types based on HVIP data
Advanced Technology Freight Demonstrations	Fuel cell and battery-electric	Eligible technologies
Zero-Emission Transit Bus Pilot	Fuel cell and battery-electric	Eligible technologies
Targeted Car Sharing Project	Plug-in hybrid and battery-electric	50/50 split of the two technologies assumed
Vehicle Retirement and Replacement Plus-up	Plug-in hybrid and battery-electric	50/50 split of the two technologies assumed
Public Fleets in Disadvantaged Communities	Plug-in hybrid and battery-electric	50/50 split of the two technologies assumed

Consistent with AB 8, staff also calculated the potential long-term emissions reductions generated by each of the proposed projects, when applicable, and defined the vehicle technology types that may be funded in later years. Table A-8 summarizes the types of vehicles and technologies that may be supported by the projects in future years that are used in the potential long-term emissions benefit analysis.

**Table A-8. Potential Long-term Supported Technology Types by Proposed Projects**

Proposed Programs	Supported Technology Types	Comments
Truck Loans	NA	The Truck Loan Assistance Program does not fund advanced technology vehicles for potential long-term emission reductions
Classic CVRP	Plug-in hybrid, battery-electric, and fuel cell	Staff assumed an even split between the three technology types
HVIP	Hybrid, battery-electric, and fuel cell	Staff assumed an even split between the three technology types
Advanced Technology Freight Demonstrations	Fuel cell and battery-electric	Eligible technologies
Zero-Emission Transit Bus Pilot	Fuel cell and battery-electric	Eligible technologies
Targeted Car Sharing Project	NA	Long-term benefits not quantified for pilot projects in disadvantaged communities
Vehicle Retirement and Replacement Plus-up	NA	Long-term benefits not quantified for pilot projects in disadvantaged communities
Public Fleets in Disadvantaged Communities	NA	Long-term benefits not quantified for pilot projects in disadvantaged communities

Staff developed vehicle usage assumptions (annual miles traveled) through literature review for each of the vehicle types evaluated, or actual usage data when available. Table A-9 summarizes the annual mileage assumptions used for emissions benefit analysis.

**Table A-9. Annual Usage Assumptions**

Proposed Programs	Annual Mileage Assumptions (miles per year)	Details
Truck Loans	20,000	Staff Assumption <sup>10</sup>
Classic CVRP	EV: 11,059	Based on 30.3 miles per day <sup>11</sup>
	PHEV: 14,855	Based on 40.7 miles per day <sup>12</sup>
	FCEV: 14,855	Same as PHEV
HVIP	22,000	Climate Change Scoping Plan, Measure Documentation Supplement, Measure T-7 <sup>13</sup>
Advanced Technology Freight Demonstrations	30,000	Staff Assumption <sup>14</sup>
Zero-Emission Transit Bus Pilot	35,000	NREL Technical Report NREL/TP-7A2-47919 <sup>15</sup>
Targeted Car Sharing Project	10,000	Derived from similar car share program (Buffalo Car Share <sup>16</sup> )
Vehicle Retirement and Replacement Plus-up	Same as CVRP	
Public Fleets in Disadvantaged Communities	10,647	California Department of General Services Fleet Report <sup>17</sup>

### Annual Emissions Reductions

Based on the emission factors and additional information provided above, the criteria emissions reductions (NOx, HC, and PM 2.5) for each vehicle were calculated by multiplying the assumed annual mileage by the emission factors for the various technologies supported by the proposed projects and then averaged. Annual criteria emissions benefit analysis was based on a per average vehicle basis using the following formula.

Total Criteria Emissions Reductions (tons) = annual vehicle miles traveled x (emission factors for new conventional vehicle – emission factor for supported advanced technology vehicles)

<sup>10</sup> Average annual VMT of 1997 EMFAC categories used is ~25,000 miles. Staff assumed lower annual miles traveled as pre-1997 trucks replaced may have lower usage.

<sup>11</sup> Smart, J. and Schey, S., "Battery Electric Vehicle Driving and Charging Behavior Observed Early in The EV Project," *SAE Int. J. Alt. Power.* 1(1):37-33, 2012, doi:10.4271/2012-01-0199. (<http://papers.sae.org/2012-01-0199/>)

<sup>12</sup> Smart, J., Powell, W., and Schey, S., "Extended Range Electric Vehicle Driving and Charging Behavior Observed Early in the EV Project," SAE Technical Paper 2013-01-1441, 2013, doi:10.4271/2013-01-1441. (<http://avt.inel.gov/pdf/EVProj/2013-01-1441.pdf>)

<sup>13</sup> [http://www.arb.ca.gov/cc/scopingplan/document/measure\\_documentation.pdf](http://www.arb.ca.gov/cc/scopingplan/document/measure_documentation.pdf)

<sup>14</sup> Drayage trucks may travel as much as 40,000 to 50,000 miles annually. Due to the use of advanced technologies, staff lowered the annual VMT for this analysis.

<sup>15</sup> <http://www.afdc.energy.gov/pdfs/47919.pdf>

<sup>16</sup> <http://www.buffalocarshare.org/Buffalo%20CarShare%202yr%20report%20-%20print.pdf>

<sup>17</sup> <http://www.documents.dgs.ca.gov/ofa/FleetReduction/FleetReduction-FinalReport-July2010.pdf>

Table A-10 summarizes both the near-term and potential long-term annual emissions benefits from the vehicles and equipment supported by the projects.

**Table A-10. Potential Near- and Long-Term Annual Emission Benefits (tons/year)**

Proposed Projects	Supported Technologies	Average Vehicle Annual Emissions Reductions (tons/year)			
		Near-term	Near-term Average	Long-term	Long-term Average
Truck Loan Assistance Program	Replacement of a MY1997 with a MY2007 truck	0.20	0.20	NA	NA
Classic CVRP	Battery-electric	0.013	0.011	0.011	0.009
	Plug-in Hybrid	0.009		0.007	
	Fuel Cell	NA		0.007	
HVIP	Battery-electric	0.075	0.055	0.072	0.053
	Hybrid	0.035		0.037	
	Fuel Cell	NA		0.048	
Advanced Technology Freight Demonstrations	Battery-electric	0.22	0.17	0.21	0.21
	Fuel Cell	0.13		0.12	
Zero-Emission Truck and Bus Pilots	Battery-electric	0.32	0.23	0.30	0.22
	Fuel Cell	0.15		0.14	

Pilot projects are proposed to facilitate the early initial deployment of advanced technologies in lower-income households and disadvantaged communities. Since the proposed pilot projects are not intended to directly support the long-term deployment of these technologies (as they are expected over time to be shifted to other low-carbon transportation projects), staff only analyzed the near-term emission benefits of the proposed projects. Table A-11 summarizes both the near-term annual emissions benefits from the vehicles supported by the proposed pilot projects in disadvantaged communities.

**Table A-11. Potential Near-Term Annual Emission Benefits from Pilot Projects in Disadvantaged Communities**

Proposed Projects	Supported Technologies	Average Vehicle Annual Emissions Reductions (tons/year)		
		Near-term	Near-term Average	
Pilot Projects in Disadvantaged Communities	Targeted Car Sharing Project	Battery-electric	0.012	0.009
		Plug-in Hybrid	0.0062	
	Public Fleets in Disadvantaged Communities	Battery-electric	0.016	0.015
		Plug-in Hybrid	0.014	
	Vehicle Retirement and Replacement Plus-up	Battery-electric	0.013	0.011
		Plug-in Hybrid	0.0092	

## *Project Costs*

Since AQIP is intended to support long-term market transformation toward clean technologies, staff analyzed both the expected near-term and the potential long-term cost of the projects. Because AQIP project funding levels are directly related to the incremental cost of advanced technologies, staff estimated potential future incremental cost reductions of advanced technologies based on available information for light-duty<sup>18</sup> and heavy-duty vehicles<sup>19</sup>. The analysis then considered lower future incentive per-project funding levels to reflect potential long-term cost reductions.

The project cost analysis groups the proposed projects into three categories:

- Development Phase Projects
- Commercialization Phase Projects
- Pilot Projects in Disadvantaged Communities
- Transition Phase Projects

### Development Phase Projects

As discussed in the long-term vision of the FY 2014-15 Funding Plan, manufacturers are developing, testing, and proving technologies in the development phase. Incentives are provided to help fund the development of these advanced technologies through demonstration projects focused on single vehicle prototypes to pilot projects ranging between 10-50 vehicles in order to help the technology evolve to the commercialization phase. In the development phase, per-vehicle incentives are high because manufacturing is not standardized and is focused on smaller batches of vehicles.

For projects in the development phase, the high near-term project costs were based on the potential funding amount, assumed by staff, to be allocated to the proposed advanced technology pilot/demonstration projects. Long-term project incentive amounts reflect the associated funding support after the advanced technology vehicles and equipment have been demonstrated in the development phase and transitioned into the commercialization phase projects, such as CVRP or HVIP. For the proposed pilot demonstration projects proposed in the FY 2014-15 Funding Plan, the potential long-term incentive amounts are associated with the voucher amounts the vehicles would receive under HVIP, as all of the projects involve heavy-duty vehicles. Table A-12 and Table A-13 summarize the near-term and potential long-term incentive amounts for the developmental projects. Note that total vehicle costs are generally much higher than the incentive amount.

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<sup>18</sup> Air Resources Board. (2011d). Staff Report: Initial Statement of Reasons for Advanced Clean Cars; 2012 Proposed Amendments to the California Zero Emission Vehicle Program Regulations.

<sup>19</sup> U.S. Environmental Protection Agency and U.S. Department of Transportation. (2011). Final Rulemaking to Establish Greenhouse Gas Emissions Standards and Fuel Efficiency Standards for Medium- and Heavy-Duty Engines and Vehicles; Regulatory Impact Analysis.

**Table A-12. Near-Term (2015) Potential Incentive Amounts for Deployment Phase Projects**

Proposed Projects	Supported Technologies	Near-term	Near-term Average	Additional Details
Advanced Technology Freight Demonstrations	Battery-electric	\$250,000	\$250,000	Staff Assumptions
	Fuel Cell	\$250,000		
Zero-Emission Truck and Bus Pilots	Battery-electric	\$500,000	\$500,000	Assumes 50% match. Projects will leverage other available fund such as Federal Transit Administration (FTA) grants <sup>20</sup>
	Fuel Cell	\$500,000		

**Table A-13. Long-Term (2025) Potential Incentive Amounts for Deployment Phase Projects**

Proposed Projects	Supported Technologies	Long-term	Long-term Average	Additional Details
Advanced Technology Freight Demonstrations	Battery-electric	\$75,000	\$80,000	Long-term incentive amounts based on potential HVIP amounts for technology type and vehicle weight class
	Fuel Cell	\$75,000		
Zero-Emission Truck and Bus Pilots	Battery-electric	\$90,000	\$90,000	Long-term incentive amounts based on potential HVIP amounts for technology type and vehicle weight class
	Fuel Cell	\$90,000		

Commercialization Phase Projects

For commercialization phase projects, funding support provided by AQIP projects are assumed to be directly related to the incremental cost of advanced technologies. For example, HVIP currently provides vouchers to address the higher costs associated with advanced technology vehicles by offsetting a portion of incremental costs. Near-term program costs were determined through historical or assumed incentive funding amounts for each project. For the potential long-term incentive funding levels, staff assumed that as sales grow and economies of scale are achieved the incremental costs associated with advanced vehicle technologies are reduced. As a result, the incentive funding levels were adjusted to reflect the potential future cost reductions.

To account for the future incremental cost reductions, staff defined future manufacturing costs and lowered the current incentives by a proportional amount to reflect the potential long-term cost reductions to generate potential long-term incentive amounts. Table A-14 illustrates the potential CVRP long-term rebate amounts for BEVs and

<sup>20</sup> [http://www.fta.dot.gov/grants/13093\\_3561.html](http://www.fta.dot.gov/grants/13093_3561.html)

PHEVs based on manufacturing cost information provided in ARB’s California Zero Emission Vehicle Program Regulation: Staff Report<sup>21</sup>.

**Table A-14. Potential Long-Term Rebate Amounts for BEVs and PHEVs**

Year	BEV100 Battery Pack		PHEV20 Battery Pack	
	Manufacturing Cost	Adjusted CVRP Rebate Amount	Manufacturing Cost	Adjusted CVRP Rebate Amount
2015	\$17,094	\$2,000	\$6,462	\$1,000
2020	\$8,752	\$1,000	\$3,309	\$620

For HVIP, the near-term incentives are based on current voucher amounts<sup>22</sup> provided for the various technologies and vehicle classes supported by the program. For the potential long-term incentive amounts, staff applied the learning effects on technology costs found in EPA’s Regulatory Impact Analysis of the Final Rulemaking to Establish Greenhouse Gas Emissions Standards and Fuel Efficiency Standards for Medium- and Heavy-Duty Engines and Vehicles<sup>23</sup> to current HVIP voucher amounts of eligible technologies. The manufacturing learning curve depicted in the regulatory impact analysis describes the reduction in unit production costs based on the years after introduction to account for future technologies and staff adjusted the HVIP voucher amounts accordingly.

Based on the information provided above, staff utilized the data to determine the funding levels for technologies funded by the two commercialization projects, HVIP and CVRP. Table A-15 and Table A-16 below summarize the near-term and potential long-term funding levels provided for the two projects.

**Table A-15. Near-Term Funding Levels for Commercialization Phase Projects**

Proposed Projects	Supported Technologies	Near-term	Near-term Average	Additional Details
Classic CVRP (2015)	Battery-electric	\$2,000	\$1,500	Fuel cells not included in near-term costs as volumes are low
	Plug-in Hybrid	\$1,000		
HVIP (2015)	Battery-electric	\$40,000	\$30,000	HVIP voucher based on funding amounts identified in the HVIP Implementation Manual <sup>24</sup>
	Hybrid	\$20,000		

<sup>21</sup>2012 Proposed Amendments to the California Zero Emission Vehicle Program Regulations, Staff Report: Initial Statement of Reasons (<http://www.arb.ca.gov/regact/2012/zev2012/zevisor.pdf>)

<sup>22</sup> [http://www.californiahvip.org/docs/HVIP\\_Y4\\_Implementation%20Manual\\_2014-04-08.pdf](http://www.californiahvip.org/docs/HVIP_Y4_Implementation%20Manual_2014-04-08.pdf)

<sup>23</sup> <http://www.epa.gov/otaq/climate/documents/420r11901.pdf>

<sup>24</sup> [http://www.californiahvip.org/docs/HVIP\\_Y4\\_Implementation%20Manual\\_2014-04-08.pdf](http://www.californiahvip.org/docs/HVIP_Y4_Implementation%20Manual_2014-04-08.pdf)

**Table A-16. Long-Term Funding Levels for Commercialization Phase Projects**

Proposed Projects	Supported Technologies	Long-term	Long-term Average	Additional Details
Classic CVRP (2020 <sup>1</sup> )	Battery-electric	\$1,000	\$990	Staff assumed an even split between the three technology types
	Plug-in Hybrid	\$620		
	Fuel Cell	\$1,350		
HVIP (2025)	Battery-electric	\$15,000	\$14,500	Staff assumed an even split between the three technology types
	Hybrid	\$6,500		
	Fuel Cell	\$22,000		

<sup>1</sup>Due to LDV advanced technologies advancements, staff assumed the long-term funding level in 2020 as LDVs may shift out of the Commercialization Phase earlier than MDVs or HDVs.

**Pilot Projects in Disadvantaged Communities and Transition Phase Projects**

Since the proposed projects under these categories are primarily intended to provide near-term benefits, the analysis includes only the near-term costs. The incentive amounts for each of the proposed projects are provided in Table A-17.

**Table A-17. Average Incentive Amounts for Proposed Projects**

Proposed Projects	Supported Technologies	Incentive Amounts	Near-term Average	Additional Details
Truck Loan Assistance Program	Replacement of a MY1997 with a MY2007 truck	\$8,000	\$8,000	Based on average loan amount
Targeted Car Sharing Project	Battery-electric	\$15,000	\$15,000	Assumes 50% match on ~\$30K operating expenses per vehicle <sup>25</sup>
	Plug-in Hybrid	\$15,000		
Public Fleets in Disadvantaged Communities	Battery-electric	\$10,000	\$7,625	Based on proposed incentive amounts
	Plug-in Hybrid	\$5,250		
Vehicle Retirement and Replacement Plus-up	Battery-electric	\$5,000	\$5,000	Based on proposed incentive amounts
	Plug-in Hybrid	\$5,000		

*Cost-Effectiveness/Benefit-Cost Score*

Per AB 8, staff analyzed both the expected near-term and potential cost-effectiveness of the projects. To develop the cost-effectiveness scores for each project, the near-term and potential long-term NOx, PM 2.5, and HC reductions and costs were applied to a

<sup>25</sup> Data derived from Buffalo Car Share. Operating expenses for 1 year: \$383K for 2.5 FTE staff + indirect costs (11 vehicle fleet)= ~\$30K operating expenses per vehicle

<http://www.buffalocarshare.org/Buffalo%20CarShare%20yr%20report%20-%20print.pdf>

well-established incentive cost-effectiveness calculation methodology (consistent with that used in the Carl Moyer Program). In addition, to calculate cost-effectiveness, staff also applied an appropriate discount rate and utilized a capital cost recovery factor (CRF) in the analysis based on Carl Moyer Program Guidelines<sup>26</sup> to determine the annualized costs. Annualized cost is determined by the formula below:

$$\text{Annualized cost} = \text{CRF} * \text{incentive amounts for vehicles and equipment (\$)}$$

A two percent discount rate was used and the corresponding CRFs were determined based on the assumed usage life of the vehicles or equipment supported by the proposed programs. Table A-18 below shows the assumed vehicle or equipment usage life and the corresponding cost recovery factors used to determine the cost-effectiveness of the programs.

**Table A-18. Vehicle Usage and Corresponding Cost Recovery Factors**

Proposed Projects	Usage Life (Years)	CRF	Comments
Truck Loan Assistance Program	5	0.206	All 1999 or older model year engines are required to be replaced by January 1, 2020 <sup>27</sup>
Classic CVRP	15	0.072	Staff Assumption for light-duty vehicles <sup>28</sup>
HVIP	15	0.072	Staff Assumptions for Heavy-Duty Vehicles <sup>29</sup>
Advanced Technology Freight Demonstration Projects	15	0.072	Similar to HVIP, usage life based on HDV
Zero-Emission Transit and Bus Pilot	15	0.072	Based on assumed bus usage life <sup>30</sup>
Car Share Pilot	3	0.340	Car share vehicle operating life <sup>31</sup>
EFMP with EV Replacement Pilot	15	0.072	See CVRP
Zero-Emission Public Fleet Pilot	15	0.072	See CVRP

With the information presented above, a cost-effectiveness score can be calculated for each of the proposed projects. The cost-effectiveness of a project is determined by dividing the incentive amounts for the average vehicles or equipment supported by the proposed projects by the annual weighted emission reductions that as shown in the formula below:

<sup>26</sup> [http://www.arb.ca.gov/msprog/moyer/guidelines/2011gl/2011cmp\\_appg\\_04\\_01\\_14.pdf](http://www.arb.ca.gov/msprog/moyer/guidelines/2011gl/2011cmp_appg_04_01_14.pdf)

<sup>27</sup> <http://www.arb.ca.gov/msprog/onrdiesel/documents/FAQsmall.pdf>

<sup>28</sup> Project life is based on a 15 year vehicle life assumed by ARB staff. The assumption is based the median life for passenger cars in California, which is 14 years, or 186,000 miles and other factors.

<sup>29</sup> Staff assumed a conservative usage life of 15 years but trucks can have a useful life of over 20 years [http://www.calstart.org/Libraries/CalHEAT\\_Documents/Baseline\\_and\\_Preliminary\\_Pathways\\_Whitepaper.sflb.ashx](http://www.calstart.org/Libraries/CalHEAT_Documents/Baseline_and_Preliminary_Pathways_Whitepaper.sflb.ashx)

<sup>30</sup> 12 year minimum life transit buses have an average retirement age of 15.1 years.

[http://www.fta.dot.gov/documents/Useful\\_Life\\_of\\_Buses\\_Final\\_Report\\_4-26-07\\_rv1.pdf](http://www.fta.dot.gov/documents/Useful_Life_of_Buses_Final_Report_4-26-07_rv1.pdf)

<sup>31</sup> Shaheen, Susan and Adam Cohen, (2012). "Carsharing and Personal Vehicle Services: Worldwide Market Developments and Emerging Trends," International Journal of Sustainable Transportation, No. 7, pp. 5-34.

$$\text{Cost-Effectiveness (\$/ton)} = \frac{\text{Annualized Cost (\$/year)}}{\text{Annual Weighted WTW Emission Reductions (tons/yr)}}$$

Based on the above formula, Table A-19 provides the inputs and the resulting near-term cost-effectiveness of the proposed projects.

**Table A-19. Near-term cost-effectiveness inputs and cost-effectiveness score**

Proposed Projects	CRF	Near-term		
		Emissions Reduction (tons)	Incentive levels (\$)	Cost-Effectiveness (\$/ton)
Truck Loan Assistance Program	0.206	0.2	\$8,000	<b>8,200</b>
Classic CVRP	0.072	0.011	\$1,500	<b>9,800</b>
HVIP	0.072	0.055	\$30,000	<b>39,000</b>
Advanced Technology Freight Demonstrations	0.072	0.17	\$250,000	<b>11,000</b>
Zero-Emission Truck and Bus Pilots	0.072	0.23	\$500,000	<b>160,000</b>
Targeted Car Sharing Project	0.34	0.009	\$15,000	<b>570,000</b>
Public Fleets in Disadvantaged Communities	0.072	0.017	\$7,625	<b>37,000</b>
Vehicle Retirement and Replacement Plus-up	0.072	0.011	\$5,000	<b>33,000</b>

Table A-20 provides the inputs and the resulting potential long-term cost-effectiveness of the proposed projects.

**Table A-20. Potential long-term cost-effectiveness inputs and cost-effectiveness score**

Proposed Projects	CRF	Potential Long-term		
		Emissions Reduction (tons)	Incentive levels (\$)	Cost-Effectiveness (\$/ton)
Truck Loan Assistance Program	0.206	NA	NA	<b>NA</b>
Classic CVRP	0.072	0.009	\$990	<b>7,900</b>
HVIP	0.072	0.053	\$14,500	<b>20,000</b>
Advanced Technology Freight Demonstrations	0.072	0.21	\$80,000	<b>27,000</b>
Zero-Emission Truck and Bus Pilots	0.072	0.22	\$90,000	<b>29,000</b>
Targeted Car Sharing Project	0.34	NA	NA	<b>NA</b>
Public Fleets in Disadvantaged Communities	0.072	NA	NA	<b>NA</b>
Vehicle Retirement and Replacement Plus-up	0.072	NA	NA	<b>NA</b>

To account for the reasonably or expected potential criteria emission reductions achieved per dollar awarded for the proposed projects, the near-term and potential long-term cost effectiveness scores were averaged, when applicable, to generate the final cost-effectiveness score. In addition, the cost-effectiveness scores the cost-effectiveness scores are in units of dollars per ton of criteria emissions reduced (\$/ton).

Per AB 8, the cost-effectiveness scores were converted to a benefit-cost score with the units of pound of criteria emission benefit per dollar (lbs/\$). Table A-21 summarizes the final cost-effectiveness and benefit-cost scores for each of the proposed projects.

**Table A-21. Final Cost-Effectiveness and Benefit-Cost Score**

Proposed Projects	Final Cost-Effectiveness (\$/ton)	Benefit-Cost Score (lbs/\$)
Truck Loan Assistance Program	6,900	0.29
Classic CVRP	8,900	0.22
HVIP	29,00	0.069
Advanced Technology Freight Demonstrations	67,000	0.030
Zero-Emission Truck and Bus Pilots	93,000	0.022
Targeted Car Sharing Project	570,000	0.004
Public Fleets in Disadvantaged Communities	37,000	0.054
Vehicle Retirement and Replacement Plus-up	33,000	0.061

Finally, the cost-effectiveness scores for each project were given points based on a scale from 1 to 5 points. Those projects with a cost-effectiveness of less than \$20,000 per ton of emissions reduced, received a high of 5 points, because this cost-effectiveness level is well within the range of allowable cost-effectiveness in other ARB incentive programs. The remaining bins were grown in \$20,000 increments with the least cost-effective projects, those projects over \$80,000 per ton of emissions reduced, receiving the lowest points possible. The cost-effectiveness scores for each project were then scored based on the scale to be used in the “Total Benefit Index” score, for AB 8 project selection. The cost-effectiveness of each proposed projects were scored based on the following scale and summarized in Table A-22.

- 5: Less than \$20,000/ton
- 4: Greater than or equal to \$20,000/ton and less than \$40,000/ton
- 3: Greater than or equal to \$40,000/ton and less than \$60,000/ton
- 2: Greater than or equal to \$60,000/ton and less than \$80,000/ton
- 1: Greater than \$80,000/ton

**Table A-22. Final Cost-Effectiveness/Benefit-Cost Score and Corresponding Scaled Score for Total Benefit Index**

Proposed Projects	Final Cost-Effectiveness (\$/ton)	Benefit-Cost Score (lbs/\$)	Scaled Score
Truck Loan Assistance Program	6,900	0.29	5
Classic CVRP	8,900	0.22	5
HVIP	29,00	0.069	4
Advanced Technology Freight Demonstrations	67,000	0.030	2
Zero-Emission Truck and Bus Pilots	93,000	0.022	1
Targeted Car Sharing Project	570,000	0.004	1
Public Fleets in Disadvantaged Communities	37,000	0.054	4
Vehicle Retirement and Replacement Plus-up	33,000	0.061	4

*Additional Preference Criteria*

The Additional Preference Criteria may be used to provide additional funding preference in conjunction with the benefit-cost score shown above. As discussed further below, staff also evaluated additional preference criteria, as identified in AB 8. These criteria included:

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.
4. Ability to achieve GHG 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.

Recognizing the range of potential benefits and to ensure a robust mix of proposed projects to be funded, for quantitative preference criteria 1, 2, and 4, staff analyzed the associated data and equally divided the results into scoring ranks between 0 to 5, according to the following steps:

- Results for each specific Additional Preference Criteria were quantified for each of the proposed projects.
- Scoring scale increments were established for each rank (0-5) to generate an equal distribution in points for the proposed projects. Additional information on the scales for each criterion is discussed below for each Additional Preference Criteria.
- The proposed projects are then ranked based on the scale (0-5) to be used in the “Total Benefit Index”

Staff anticipates that the scales for the quantitative Additional Preference Criteria may change each year depending on the mix projects proposed due to differences in the range of expected benefits or when additional information becomes available to refine the evaluation. The data and rationale used to establish each of the criteria weighting

The additional preference criteria and the data and rationale used to establish each of the criteria weighting factors for the associated scores are described below:

1. *Proposed or potential reduction of criteria or toxic air pollutants* – This analysis considered the magnitude of emission reductions by quantifying the direct lifetime criteria emission reductions expected per average vehicle or piece of equipment supported under each project. With the benefit-cost score analysis primarily driven by overall project incentive amounts, this additional criteria allowed staff to make direct comparisons of the emission reductions expected by the different proposed projects, independent of the associated incentive amounts. Staff analyzed the emission benefits on a per vehicle basis to account for differences in vehicle sale volumes and statewide populations of the various vehicles supported by AQIP. Resulting total lifetime emission reductions ranged from less than 0.1 tons to 3.5 tons of lifetime criteria emission reductions per vehicle. The scoring scale associated within each rank (1-5) for this criterion was established by calculating the range of lifetime tons between the highest and lowest value, and dividing that range by 5. As a result the, remaining bins were scaled in 0.7 ton increments. Projects with less than or equal to 0.7 tons of criteria emission reduced receive 1 point, while those projects with greater than 2.8 tons of criteria emission reductions reduced receive 5 points. Below is the resulting scale for criteria emission reductions per vehicle:

- 5: Greater than 2.8 tons
- 4: Greater than 2.1 tons and less than 2.8 tons
- 3: Greater than 1.4 tons and less than 2.1 tons
- 2: Greater than 0.7 tons and less than 1.4 tons
- 1: Less than 0.7 tons
- 0: No criteria emission reductions

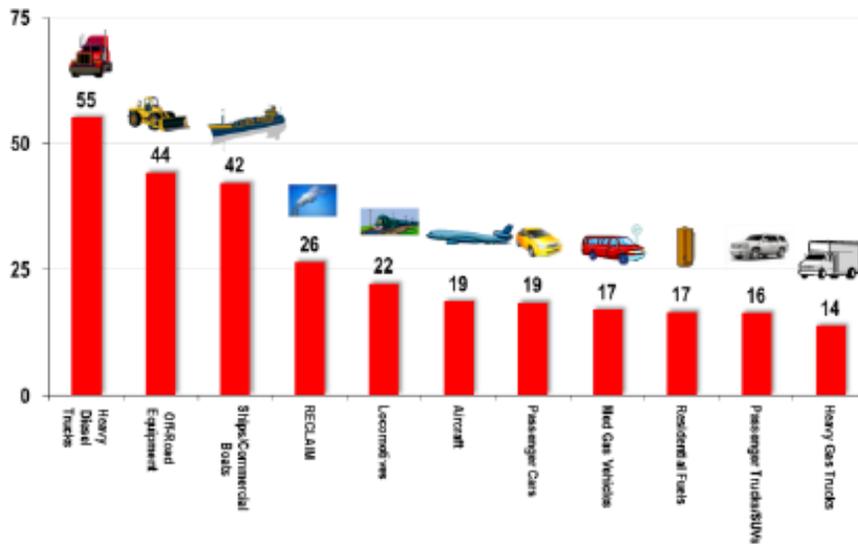
Based on the information described above, Table A-23 summarizes the results and the corresponding score for this additional preference criterion.

**Table A-23: Results for Additional Preference Criterion 1.**

Proposed Projects	Near-term Average	Project Life (years)	Total Lifetime Emissions Reduction (tons)	Score
Truck Loan Assistance Program	0.2	5	<b>1.0</b>	2
Classic CVRP	0.011	15	<b>0.17</b>	1
HVIP	0.055	15	<b>0.83</b>	2
Advanced Technology Freight Demonstrations	0.17	15	<b>2.6</b>	4
Zero-Emission Truck and Bus Pilots	0.23	15	<b>3.5</b>	5
Targeted Car Sharing Project	0.009	3	<b>0.03</b>	1
Public Fleets in Disadvantaged Communities	0.015	15	<b>0.23</b>	1
Vehicle Retirement and Replacement Plus-up	0.011	15	<b>0.17</b>	1

2. *Contribution to regional air quality improvement* – Staff developed a scoring scale based on the ARB emission inventory for regions federally designated as extreme non-attainment for ozone, and ranked projects based on their corresponding emission inventory contributions from highest to lowest. Specifically, staff used the NOx emission inventory in tons per day for 2023 in the South Coast Air Basin, found in ARB’s Vision for Clean Air: A Framework for Air Quality and Climate Planning<sup>32</sup>. The ranking scale is based on the emissions inventory shown in Figure A-1.

Figure A-1. Largest South Coast NOx Emission Sources in Tons Per Day



NOx emission sources were ranked in tons per day for various vehicle and equipment types, ranging from heavy gas trucks, at 14 tons per day, to heavy diesel trucks at 55 tons per day. The scoring scale associated with each rank (1-5) for this criterion was established by calculating the range of NOx emissions

<sup>32</sup> Air Resources Board. (2013d). Vision for Clean Air: A Framework for Air Quality and Climate Planning; Public Review Draft. Appendix: Actions for Development, Demonstration, and Deployment of Needed Advanced Technologies.

between the highest and lowest value, and dividing that range by five. As a result, the bins were rounded and scaled in 10 ton increments. Projects corresponding to inventory sources with less than or equal to 10 tons of NOx per day receive one point, while those projects with greater than 40 tons receive five points. The sources of emissions contribution were ranked based on the following scale:

- 5: Category contributes more than 40 tons of NOx per day
- 4: Category contributes between 31 and 40 tons of NOx per day
- 3: Category contributes between 21 and 30 tons of NOx per day
- 2: Category contributes between 11 and 20 tons of NOx per day
- 1: Category contributes between 1 and 10 tons of NOx per day

3. *Ability to promote the use of clean alternative fuels and vehicle technologies* – Clean alternative fuels are fuels that have a lower well-to-wheel emissions compared to conventional fuels, such as electricity, hydrogen, and renewable fuels. Clean vehicle technologies are technologies that emit zero tailpipe emissions, such as battery-electric and fuel cell vehicle technologies, or enabling technologies, such as hybrid or plug-in hybrid technologies. This qualitative analysis ranked projects by whether or not they used a clean low carbon alternative or renewable fuel or were clean vehicle technologies. Staff scored this preference criterion based on the following:

- 5: Technologies that use low carbon alternative fuels and are a clean vehicle technology.
- 3: Technologies that use low carbon alternative fuels or are a clean vehicle technology.
- 0: Technologies that do not use clean alternative fuels and are not a clean vehicle technology.

4. *Ability to achieve GHG reductions* – Similar to the methodology established in the first preference criterion, staff conducted a lifetime well-to-wheels GHG emissions analysis for the vehicles and equipment supported by the proposed projects. Staff determined expected GHG emission reductions per vehicle and piece of equipment funded by each proposed project. Due to the large difference in GHG emission benefits for the top two projects (zero-emission truck and bus pilots and advanced technology freight demonstrations) relative to the other projects proposed, staff assigned each of those a score of five and four respectively. The remaining bins were determined by taking the high and low resulting benefits, and calculating the range between them. The range of benefits was then divided by three. As a result, the remaining bins were rounded and scaled in 50 MTCO<sub>2</sub>e increments. Below is the resulting scale for GHG reductions per vehicle:

- 5: Greater than 1,000 MTCO<sub>2</sub>e
- 4: Greater than 500 MTCO<sub>2</sub>e and less than 1,000 MTCO<sub>2</sub>e

- 3: Greater than 150 MTCO<sub>2e</sub> and less than 500 MTCO<sub>2e</sub>
- 2: Greater than 50 MTCO<sub>2e</sub> and less than 100 MTCO<sub>2e</sub>
- 1: Less than or equal to 50 MTCO<sub>2e</sub>
- 0: No GHG emission reduction

Based on the information described above, Table A-24 summarizes the results and the corresponding score for this additional preference criterion.

**Table A-24: Results for Additional Preference Criterion 4.**

Proposed Projects	Supported Technologies	Near-term (MTCO <sub>2e</sub> )	Near-term Average (MTCO <sub>2e</sub> )	Vehicle Life (years)	Total GHG Emissions Reduction (MTCO <sub>2e</sub> )	Score
Truck Loan Assistance Program	No advanced technology or alternative fuels used	NA	NA	5	NA	0
Classic CVRP	Battery-electric	5.2	4.7	15	70	2
	Plug-in Hybrid	4.3				
HVIP	Battery-electric	16.7	11	15	170	3
	Hybrid	5.7				
Advanced Technology Freight Demonstrations	Battery-electric	56.3	52	15	780	4
	Fuel Cell	48.2				
Zero-Emission Truck and Bus Pilots	Battery-electric	94.0	87	15	1300	5
	Fuel Cell	80.0				
Targeted Car Sharing Project	Battery-electric	4.7	3.8	3	10	1
	Plug-in Hybrid	2.9				
Public Fleets in Disadvantaged Communities	Battery-electric	5.0	4.0	15	60	2
	Plug-in Hybrid	3.1				
Vehicle Retirement and Replacement Plus-up	Battery-electric	5.2	4.7	15	70	2
	Plug-in Hybrid	4.3				

5. *Ability to support market transformation of California’s vehicle or equipment fleet to utilize low carbon or zero-emission technologies* – Similar to number 3 above, this qualitative analysis ranked projects by whether or not they supported technologies that support market transformation. Staff used ARB’s Vision for Clean Air document, as referenced above, as a key reference in scoring technologies for this evaluation. Light-duty PHEVs, BEVs, and FCEVs, for example, are considered transformative technologies that will help the State meet its air quality goals. Staff scored this preference criterion based on the following:

- 5: Technologies that support market transformation
- 0: Technologies that do not support market transformation

6. *Ability to leverage private capital investments* – Staff is not proposing to include this criterion for FY 2014-15 as staff is working on developing methodologies to analyze the private capital investments leveraged by projects. Staff intends to identify information sources and may include this preference criterion in future years.

*Total Benefit Index*

Staff utilized the benefit-cost/cost-effectiveness scores of the proposed projects and the additional preference criteria in the consideration of the projects to be given funding preference. Staff developed the Total Benefit Index (TBI) score that preferentially weights the benefit-cost score (at 75 percent of the total weighting) with additional preference scores (weighted at 25 percent). Staff weighted the cost-effectiveness/benefit-cost scores in this manner because AB 8 identified the benefit-cost score as the primary metric to assign funding preference for proposed projects.

Table A-25 summarizes the Total Benefit Index score for all of the projects currently proposed in the FY 2014-15 Funding Plan.

**Table A-25. Total Benefit Index Score of Proposed Projects in FY 2014-15 Funding Plan for AB 8 Funding Preference**

Proposed Projects	Additional Preference Criteria					25% of TBI	75% of TBI	Total Benefit Index Score
	Proposed or potential reduction of criteria or toxic air pollutants.	Contribution to regional air quality improvement.	Ability to promote the use of clean fuels and technologies	Ability to achieve climate change benefits	Ability to support market transformation	Average of Additional Preference Criteria Score	Benefit Cost Score	
Classic CVRP	1	2	5	2	5	3	5	4.5
Truck Loan Assistance Program	2	5	0	0	0	1.4	5	4.1
HVIP	2	4	3	3	5	3.4	4	3.9
Public Fleets in Disadvantaged Communities	1	2	5	2	5	3	4	3.8
Vehicle Retirement and Replacement Plus-up	1	2	5	2	5	3	4	3.8
Advanced Technology Freight Demonstrations	4	5	5	4	5	4.6	2	2.7
Zero-Emission Truck and Bus Pilots	5	5	5	5	5	5	1	2.0
Targeted Car Sharing Project	1	2	5	1	5	2.8	1	1.5

## Appendix B

### Update on AQIP Advanced Technology Demonstration Projects

Project Title	Project Grantee	Technology Demonstrator	FY of Funds	AQIP Funds for Projects	Total Project Cost
Hybrid Tugboat Retrofit	Port of Long Beach	Foss Maritime Company and AKA Engineering	2009/10	\$1,000,000	\$2,391,000



**Status:** Project is complete; United States Environmental Protection Agency (U.S. EPA) Certification issued in June 2013 for technology verifying a 30 percent reduction in fuel usage with concurrent reductions in criteria pollutants. Vessel is currently in operation at the Ports of Los Angeles and Long Beach; with second tugboat hybrid retrofit planned for Foss Maritime's, *Alta June*.

**Project Goal:** Build off the momentum that Foss Maritime had generated with the building of the world's first new-build hybrid tugboat the Carolyn Dorothy, by retrofitting an existing tugboat, *Campbell Foss* with a hybrid system. The hybrid system has been proven to provide a 30 percent reduction in fuel usage, and a 30 percent reduction in oxides of nitrogen (NOx), 25 percent reduction in particulate matter (PM) and 15 percent reduction in hydrocarbons (HCs). With the issuance of U.S. EPA certification for this retrofit system, other tugboats can be retrofitted using the same technology as was applied to the *Campbell Foss* with a level of certainty that a similar magnitude of emission reductions can be realized utilizing the technology. The 30 percent reduction in fuel usage when applied to a typical California tugboat's duty cycle amounts to an annual 130,000 gallon reduction in consumption. With up to 150 tugboats currently in operation statewide, significant reductions in greenhouse gases (GHGs) could be realized cost effectively in the near term through significant deployment of the technology throughout the fleet. The cost effectiveness of the hybrid system is estimated at less than \$2000 per ton using the current Carl Moyer methodologies.

**Technology:** The *Campbell Foss* employs twin 3,000 horsepower main engines, 2 smaller auxiliary diesel generators, and a series of battery packs, to safely propel the vessel as the situation dictates. The hybrid technology on this project is different than what is typically found in on-road vehicles; there is not regenerative braking, but there is plug-in charging. This project took advantage of inherent efficiencies of operating diesel engines at their most efficient load and engine speed. In certain circumstances, it is not efficient to use twin 3,000 horsepower engines to operate the vessel, in these situations the *Campbell Foss* can be operated with batteries alone, thereby reducing main engine idling. For example, transiting the *Campbell Foss* around the harbor can be accomplished with the use of one auxiliary generator, rather than using the main engines under slight load. This project demonstrated the feasibility of the hybrid system in tugboats and the next objective is ARB's validation of the technology to facilitate additional tugboat hybrid retrofits. In operation within California, there are three other Dolphin Class tugboats, nearly identical to the *Campbell Foss*, which are good candidates for retrofit after the completion of this project. One additional Foss Dolphin Class tug, the *Alta June* is under retrofit after being awarded a federal Maritime Administration grant to install the system the *Campbell Foss* had demonstrated.

Project Title	Project Grantee	Technology Demonstrator	FY of Funds	AQIP Funds for Projects	Total Project Cost
Tier-4 PM Retrofit System for a three engine Genset Switcher Locomotive	Port of Los Angeles	Johnson Matthey and Union Pacific Railroad	2009/10	\$346,178	\$692,350



**Status:** Project is complete; Air Resources Board (ARB) retrofit Verification issued in February 2014 for the technology demonstrating with this project. The subject locomotive, UP 2755 is currently in-use with filters installed servicing the Ports of Los Angeles and Long Beach.

**Project Goal:** To demonstrate the utility and functionality of retrofitting all three engines on an in-use Genset switcher locomotive with a diesel particulate filter that reduced emissions of PM by 85 percent or more. The locomotive UP 2755, in service at the Ports of Los Angeles and Long Beach, collected real world durability data in support of an ARB Retrofit Verification from July 2011 to March 2013 with emission testing performed by Southwest Research Institute at the project start, zero hours, 1500 hours and at 3000 hours of operation. The ARB issued its official Verification of these devices in February 2014 thereby allowing public incentive dollars to provide a funding mechanism to retrofit the other 120 similar Genet switch locomotives currently in operation statewide.

**Technology:** This project retrofitted all three QSK-19 Cummins diesel engines in a National Railway Equipment Companies Genset switch locomotive with diesel particulate filters designed to reduce PM emissions by at least 85 percent. The filters, Johnson Matthey Locomotive Continuously Regenerating Technology DPFs withstood the rigors of switch locomotive operations at Union Pacific Railroad at the Intermodal Container Transfer Facility in service of the San Pedro Bay ports during durability hour accumulation in support of an ARB Verification Plan. With ARB verification signaling a successful completion of this project, the locomotive UP 2755 was sent for remanufacturing, extending its service life and was returned to revenue service at Intermodal Container Transfer Facility with the Johnson Matthey Locomotive Continuously Regenerating Technology retrofits still installed.

Project Title	Project Grantee	Technology Demonstrator	FY of Funds	AQIP Funds for Projects	Total Project Cost
Line-Haul Locomotive DPF Retrofit	Sac Metro AQMD	Electro-Motive Diesel and Union Pacific Railroad	2009/10	\$502,865	\$1,005,000



**Status:** Project is complete; the subject locomotive for this demonstration, UP 9900 is currently in operation in California assigned to Union Pacific’s railyard in Roseville and works primarily in northern California.

**Project Goal:** Demonstrate the functionality of retrofitting a modified Tier-2 Electro Motive Diesel series 710, 12 cylinder, 3,200 horsepower line-haul engine with diesel particulate filters

(DPFs), reducing emissions of PM to below Tier-4 emission levels. This project marks the first time a large, two-stroke locomotive diesel engine has been successfully retrofitted with a diesel particulate filter. The DPF system that was the subject of this demonstration could be used on up to 25 additional California based locomotives that use this same engine confirmation and has the potential to be transferred into new locomotive engine retrofit designs. UPY 9900, the subject locomotive for this project is still in operation with the DPFs installed and is currently in service in California.

**Technology:** This project utilized a prototype Tier 2, 12-710 engine to provide 25 percent increase in car body space to allow sufficient room for an EGR system along with a larger cooling system to reduce emissions to a manageable level that will allow for DPFs to further reduce PM emissions with aftertreatment technologies. The aftertreatment device consisted of diesel oxidation catalysts and DPF in series, integrated with the EMD 710, twelve-cylinder, 3200 hp, two-cycle engine. The experimental engine was designed for the exhaust gas recirculation system and included a new turbocharger with sufficient boost to accommodate the diesel oxidation catalyst/DPF.

Project Title	Project Grantee	Technology Demonstrator	FY of Funds	AQIP Funds for Projects	Total Project Cost
Retrofit a Tugboat with Hug Nauticlean DPF/SCR System	South Coast AQMD	Hug Filtersystems, and Sause Brothers	2010/11	\$439,000	\$878,000



**Status:** Baseline emission testing has been completed on the system and the 1000-hour field-testing phase has been started. The subject tugboat, *Apache*, is currently being operated in California waters with DPF/SCR system installed and functional, gaining durability hours on the retrofit system. At the time this project's grant amendment had expired, the final project milestones were not have been reached. This vessel is in-use at the San Pedro Bay ports and is still accumulating durability hours demonstrating

the feasibility of the DPF/SCR technology for use in tugboats.

**Project goal:** Demonstrate the feasibility of retrofitting an in-use tugboat's main engines with a diesel particulate filter and a selective catalytic reduction system to reduce emissions of particulate matter and oxides of nitrogen to levels beyond what is required by regulations thereby allowing for public funding to incentivize the use of this retrofit on other similar vessels through programs such as the Carl Moyer Program.

**Technology:** This project is utilizing a wall flow ceramic passive DPF to control particulate matter, a SCR catalyst and urea dosing system to reduce NOx, a diesel fuel burner to regenerate the DPFs, and a computer to monitor sensors and control the fuel burner and dosing system. Each propulsion engine has an independent DPF/SCR system and is targeted to reduce emissions from Detroit Diesel engines found in the Sause Brother Tug, *Apache*, to below Tier-4 levels.

Project Title	Project Grantee	Technology Demonstrator	FY of Funds	AQIP Funds for Projects	Total Project Cost
Wind Assist Marine Demonstration Project for Ferry Districts on San Francisco Bay	Bay Area AQMD	Wind + Wing Technologies, Proton Composites	2010/11	\$165,000	\$330,000



**Status:** Project is complete and demonstrates the feasibility of the wing sail technology to augment the power needs of marine vessels.

**Project Goal:** To evaluate the viability of using a wing-sail to provide motive power, either in whole or in part, to a vessel plying ferry routes on the San Francisco and San Pablo Bays. The San Francisco Bay Area Water Emergency Transportation Authority has proposed a significant expansion of ferry service in the Bay Area reaching communities not historical serviced by ferry service, such as the cities of Richmond, Berkley, Martinez, Redwood City

and Hercules. This project evaluates the wing-sail not the vessel, to determine the potential to reduce criteria pollutant and fuel usage and influence future ferry design. If the project is successful, it can provide confidence to the Bay Area ferry districts that a purpose built ferry with the wing-sail design would perform as expected.

**Technology:** Use of a wing-sail to augment the power needs of a vessel that is following the established Bay Area ferry routes. The wing-sail utilized wind energy and transferred that energy into motive force, propelling the vessel forward. The ease of use of the wing-sail when compared to conventional sail and the potential for cost effective emission reductions paired with reduced fuel consumption demonstrated the utility of this technology on existing and new ferry boats and as a retrofit on existing vessels.

Project Title	Project Grantee	Technology Demonstrator	FY of Funds	AQIP Funds for Projects	Total Project Cost
DPF Retrofit of a Genset Switcher: GTE Device	Bay Area AQMD	GT Exhaust (now part of IAC Acoustics) and BNSF Railroad	2010/11	\$229,000	\$458,000



**Status:** Project ended at the 1500-hour mark of its field durability testing due to the filter body manufacturer deciding to cease production due to economic reasons.

**Project Goal:** To reduce emissions of diesel PM beyond 85 percent to below U.S. EPA Tier-4 for PM in switch locomotives. However, Dow Chemical, the supplier of the filter body for inclusion in the DPF system stopped manufacturing the substrate and therefore, the ARB Verification Plan for

this device needed to be restarted with a new filter body and the commercialization argument for this device was diminished and therefore project was ended at its mid-point.

**Technology:** Utilized DPFs on each of the three diesel engines in the genset switcher, BNSF 1284 and provided the technology while in revenue service in Richmond California. The DPF retrofit devices took the place of the engine's silencer so there is no protrusion out of the locomotive car body. As a result the DPF that was the subject of this demonstration was a bolt on replacement for the engine's muffler, reducing the time and cost to retrofit additional genset switchers.

Project Title	Project Grantee	Technology Demonstrator	FY of Funds	AQIP Funds for Projects	Total Project Cost
Tier-4 NREC Genset Switcher Locomotive	Bay Area AQMD	National Railway Equipment Company and Richmond Pacific Railroad	2010/11	\$529,810	\$1,059,600



**Status:** Baseline emission testing and emission testing at the 1500 hours of field demonstration has been completed. Funding for this project is expiring and the final project milestones will likely not be met.

**Project Goal:** To design, build, and deploy the world's cleanest diesel-fueled locomotive. The technology demonstrator, National Railway Equipment Company, is combining two Cummins QSX 15 Tier-4 off-road engines, into a National Railway

Equipment Company's switch locomotive car body. The locomotive is now in the Bay Area Air Quality Management District for durability testing. That durability testing will be performed while in revenue service by Richmond Pacific Railroad, a family owned California company, at its facilities in Richmond, California. This project is ending at its mid-point due to delays in the projects timeline and the inability to carry over funds dedicated to this project into the next fiscal year. It is expected that this locomotive, NRE 2015, will carry on with its durability hour accumulation and reach its final project milestone, outside of the projects grant term, and have emission testing performed at 3,000 hours of operation, the projects original end point. Results of the final emission testing will be considered as an addendum to the project's final report once it is available.

**Technology:** Utilizing the genet switcher locomotive concept and employing the cleanest Tier-4 off-road diesel engines to produce the cleanest operating switch locomotive that is currently in revenue service.

Project Title	Project Grantee	Technology Demonstrator	FY of Funds	AQIP Funds for Projects	Total Project Cost
Demonstration of Commercial Zero-Emission Lawn and Garden Equipment	South Coast AQMD	Numerous Companies	2010/11	\$51,667	\$103,330
	Mojave Desert AQMD		2010/11	\$15,000	\$30,000
	San Joaquin Valley APCD		2010/11	\$250,000	\$500,000



Three separate projects were funded under this category. Each project took a different approach in demonstrating commercial zero emission lawn and garden equipment. A brief background on each project is provided below:

- South Coast Air Quality Management District partnered with Stanley Black & Decker Incorporated, Valley Crest Landscape Maintenance, and the Center for Environmental Research and Technology at University of California Riverside to test, collect, and evaluate data on Stanley Black & Decker Incorporated equipment.
- Mojave Desert Air Quality Management District partnered with the City of Hesperia, City of Victorville, Stanley Black & Decker Incorporated, and STIHL to evaluate the impact Mojave Desert's extreme climate may have on equipment performance.
- San Joaquin Valley Air Pollution Control District held an open solicitation for cordless commercial lawn and garden manufacturers to participate in this state funded demonstration project. Many manufacturers took advantage of this opportunity to demonstrate zero-emission line-trimmers, lawn mowers, riding lawn mower, edgers and other pieces of equipment.

**Status:** All projects are complete and results have been reported on the functionality and durability of cordless commercial lawn and garden equipment.

**Project Goals:** To foster market acceptance by reducing barriers of acceptance by commercial landscape firms. Those barriers include, but are not limited to, incremental cost for battery-electric equipment, confidence in the advanced technology and an existing sense of familiarity with gasoline powered equipment. Providing the end user an opportunity to operate zero-emission equipment without a large financial outlay allows the operator to see the benefits first-hand, such as, lower maintenance and operational costs, less noise during operation, zero pollution at job site and the presentation of an environmental company image.

**Technologies:** Battery-electric powered commercial lawn and garden equipment used in commercial settings to test the utility, durability and functionality of such equipment.

Project Title	Project Grantee	Technology Demonstrator	FY of Funds	AQIP Funds for Projects	Total Project Cost
Central Valley Electric School Bus Demonstration	Kings Canyon Unified School District	Motiv Power Systems and Trans Tech Bus	2011/12	\$496,696	\$1,000,000



**Status:** Project is complete with California Highway Patrol issuing its safety certification for the bus that was the subject of this demonstration. The buses that were funded are currently in-use in the San Joaquin Valley transporting students from home to school in Kings Canyon Unified School District.

**Project Goal:** To deploy two battery-electric school buses in the San Joaquin Valley that will be part of a shared pool of buses that many participating school districts could try

without a large individual capital investment. This project gets advanced technology buses into the fleets of participating school districts within the San Joaquin Valley by allowing them to operate the buses transporting students from home to school over a several week demonstration at no cost to the participating school district. This project is ending before completion of its final milestones to delays in the projects timeline and the inability to carry over funds dedicated to this project into the next fiscal year. Delays were caused by a change in the original electric school developer due to an inability to produce a vehicle in a timely manner, Motive Power Systems stepped into this project at a late stage and was able to overcome all obstacles to designing and production of the school bus. The two buses funded by this project are in-use in the San Joaquin Valley; transporting students from home to school and will be shared among interested districts.

**Technology:** Based on Ford's E450 chassis, Motiv Power Systems installed its drive system and Trans Tech Bus installed its school bus body to produce the only Type A/B all electric school bus in service transporting students from home to school in operation. The California Highway Patrol issued their safety certification for this bus in February 2014, signaling the completion of a major milestone in this project. This school bus model is now available for purchase by any interested school bus fleet.

Project Title	Project Grantee	Technology Demonstrator	FY of Funds	AQIP Funds for Projects	Total Project Cost
Economical Electric School Bus Project	San Diego APCD	TransPower	2011/12	\$503,304	\$1,000,000



**Status:** Project is complete with California Highway Patrol issuing its safety certification of the bus that was repowered as a result of this demonstration. The electric school bus is currently in service in San Diego County transporting students from home to school among several participating school districts.

**Project Goal:** To build and deploy a battery-electric school bus for use

transporting students from home to school. The bus that was developed is a Type-D bus, large enough to carry over 40 students, for use in daily operation by a school district and is the largest electric school bus in operation. This bus will be shared among several participating school districts over a period of several months to allow for a thorough evaluation by district school transportation officials. The objective of this project is to develop an electric school bus that can compete with diesel or alternative fueled buses of similar size and function on an economic basis.

**Technology:** Repowered an existing 2007 Thomas Built HDX school bus for all electric operations, with electric motors, battery packs and controllers, and other related equipment to facilitate student transportation. The California Highway Patrol issued its safety certification for this bus in February 2014, a major milestone for this project and the first time for an electric school bus repower. The bus is now transporting students in San Diego County from home to school. The technology utilized in this bus is now the subject of a larger demonstration funded by the Energy Commission incorporating vehicle to grid or V2G technologies.

Project Title	Project Grantee	Technology Demonstrator	FY of Funds	AQIP Funds for Projects	Total Project Cost
Electric Yard Truck Demonstration	Ports of LA/LB	TransPower	2012/13	\$1,000,000	\$2,000,000



**Status:** Project is underway and on schedule with the two yard trucks currently being manufactured.

**Project Goal:** To demonstrate the functionality and feasibility of an all-electric yard truck in revenue service at the Port of Los Angeles. Two trucks are being manufactured for this project for use at American Presidents Line Eagle Marine Terminal at the Port of Los Angeles. Trucks

for this project are currently under construction with deployment to the port expected by Fall 2014.

**Technology:** Utilizing technologies developed for the San Diego Economical Electric School Bus Project, an AQIP funded project, and applying it to freight movement at the ports with a much larger battery-pack and a more robust installation of the required equipment for the harsh environment of port operations. There is a companion project that is currently underway funded by San Joaquin Valley Air Pollution Control District for a single yard truck for operations in one of the valley's distribution centers.