

PROPOSED
FISCAL YEAR 2015-16 FUNDING PLAN
FOR
LOW CARBON TRANSPORTATION INVESTMENTS
AND
THE AIR QUALITY IMPROVEMENT PROGRAM

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EXECUTIVE SUMMARY

The Governor's proposed Fiscal Year (FY) 2015-16 State Budget includes \$350 million to the Air Resources Board (ARB or Board) from the Greenhouse Gas Reduction Fund (GGRF) for Low Carbon Transportation investments. This funding would reduce greenhouse gas (GHG) emissions and further the purposes of Assembly Bill 32 (AB 32) (Núñez, Chapter 488, Statutes of 2006) with a priority on benefiting disadvantaged communities. The Governor's proposed State Budget also includes \$23 million to ARB for the Air Quality Improvement Program (AQIP) which provides mobile source incentives to reduce criteria pollutant, air toxic, and GHG emissions. The Low Carbon Transportation investments build upon and greatly expand the technology advancing projects ARB has funded through AQIP since 2009.

This proposed *Fiscal Year 2015-16 Funding Plan for Low-Carbon Transportation Investments and AQIP* (FY 2015-16 Funding Plan) describes how these combined funds will be spent. The plan describes ARB's policy drivers and vision for advanced technology mobile source investments, eligible project categories and criteria, project funding allocations, and program implementation details. ARB staff has developed a joint plan for both funding sources as it did for the FY 2014-15 budget cycle to ensure continued synergistic investments between the programs while also ensuring that statutory requirements applicable to each are met. The investments proposed in this Funding Plan are predicated on the approval of the proposed FY 2015-16 State Budget.

California faces ambitious goals to reduce GHG emissions, improve air quality, deploy zero-emission vehicles (ZEVs), and reduce petroleum dependency. The investments identified in the proposed FY 2015-16 Funding Plan are pivotal to meeting these goals by accelerating the development and deployment of advanced mobile source technologies. ARB's *2014 Climate Change Scoping Plan Update* and the *2012 Vision for Clean Air* conclude that a transition to zero-emission and near-zero emission technologies and the use of the cleanest, lowest carbon fuels and energy across all vehicle and equipment categories is needed. More recently, ARB's *2015 Sustainable Freight: Pathways to Zero and Near-Zero Emission* discussion draft reiterates the need for this transition as well as a coordinated strategy to address California's multiple air quality and climate change goals. This coordinated approach is reflected in the following proposed Low Carbon Transportation and AQIP investments.

The Low Carbon Transportation and AQIP investments covered in the proposed FY 2015-16 Funding Plan represent just one part of California's portfolio of clean transportation incentives. These are complemented by other ARB programs, other State agency programs, and local air district programs. These programs include the Carl Moyer Program, Proposition 1B Goods Movement Emission Reduction Program, Enhanced Fleet Modernization Program (car scrap), the California Energy Commission's Alternative and Renewable Fuel and Vehicle Technology Program and clean energy research programs, other State agency Cap-and-Trade auction proceeds funded programs to reduce GHG emissions, and local air district and port air quality and technology advancement programs, among others. Each of these programs has its

own statutory and policy direction, but collectively they fit together to support California's multiple near-term and long-term public health, air quality, and climate change goals.

The Administration's *Cap-and-Trade Auction Proceeds Investment Plan: Fiscal Years 2013-14 through 2015-16* identifies zero-emission passenger transportation and low carbon freight transport as investment priorities as does the Governor's State Budget proposal. This direction guided the development of this proposed Funding Plan.

As background, ARB investments initiated under AQIP provide the foundation for the Low Carbon Transportation investments that now make up the vast majority of this proposed Funding Plan. AQIP is a voluntary, mobile source incentive program established through AB 118 (Núñez, Chapter 750, Statutes of 2007) to reduce criteria pollutant and toxics emissions with concurrent reductions in GHG emissions. ARB has focused AQIP investments on technology advancing projects that support California's long-term air quality and climate change goals in addition to providing immediate emission benefits. In recent years, funding has included rebates for zero and near-zero emission passenger vehicles through the Clean Vehicle Rebate Project (CVRP), vouchers for hybrid and zero-emission trucks and buses through the Hybrid and Zero-Emission Truck and Bus Voucher Incentive Project (HVIP), and the Truck Loan Assistance Program for small business truck owners in need of truck replacements or retrofits.

Cap-and-Trade auction proceeds provide GHG reductions and disadvantaged community benefits by increasing the investment in the technology advancing projects ARB has funded through AQIP. The FY 2014-15 State Budget appropriated \$200 million to ARB for Low Carbon Transportation projects to reduce GHG emissions with an emphasis on investments that benefit disadvantaged communities. These investments are being used to expand CVRP and HVIP to meet demand and add new light-duty pilot projects to benefit disadvantaged communities, zero-emission truck and bus pilot deployment projects, and demonstration projects to accelerate the introduction of advanced emission reduction technologies for the freight sector. The Governor's proposed FY 2015-16 State Budget continues to authorize this funding and grows these investments.

A key focus of the proposed FY 2015-16 Funding Plan is addressing the requirements of new legislation signed in 2014 that further refines ARB's implementation of these programs. Senate Bill 1275 (SB 1275) (De León, Chapter 530, Statutes of 2014) establishes the Charge Ahead California Initiative with the goals of placing one million zero-emission and near-zero emission vehicles in California by 2023 and increasing access to these vehicles for lower-income consumers and consumers in disadvantaged communities. SB 1275 requires changes to CVRP including limiting consumer eligibility by income and directs ARB to establish disadvantaged community focused programs.

SB 1204 (Lara, Chapter 524, Statutes of 2014) creates the California Clean Truck, Bus, and Off-Road Vehicle and Equipment Technology Program to fund the development, demonstration, precommercial pilot, and early commercial deployment of zero- and

near-zero emission technologies with priority given to projects that benefit disadvantaged communities. SB 1204 establishes specific requirements related to how ARB prioritizes project categories and selects projects.

Summary of Staff’s Proposal

Table ES-1 shows the proposed project funding allocations for Low Carbon Transportation and AQIP.

Table ES-1: Proposed FY 2015-16 Project Allocations¹

Project Category	AQIP (millions)	Low Carbon Transportation (millions or %)	
		Total	Minimum % To Benefit Disadvantaged Communities
Light-Duty Vehicle Projects			
CVRP	\$3	\$160	≥25% ²
Light-Duty Pilot Projects to Benefit Disadvantaged Communities	-	\$37	100%
Heavy-Duty Vehicle and Equipment Projects			
HVIP	\$2	\$10	≥50% ²
Low NOx Truck Incentives	\$2	\$5	≥50% ²
Zero-Emission Truck Pilot Commercial Deployment Projects	-	\$20	≥50%
Zero-Emission Bus Pilot Commercial Deployment Projects	-	\$45	≥50%
Advanced Technology Demonstration Projects	-	\$59	100%
Zero-Emission Freight Equipment Pilot Commercial Deployment Projects		\$9	≥50%
Truck Loan Assistance Program	\$15	-	N/A
Reserve for AQIP Revenue Uncertainty	\$1		
State Operations for Low Carbon Transportation	-	\$5	
Total	\$23	\$350	≥50% (≥\$180)

¹Final allocation predicated on the approval of the proposed FY 2015-16 State budget.

²Estimates for first-come, first-served projects. Actual funding spent in and to benefit disadvantaged communities will be calculated after rebates and vouchers are issued.

Disadvantaged Community Investment Targets: ARB is targeting at least 50 percent of the Low Carbon Transportation funds to benefit disadvantaged communities consistent with the direction in the Administration’s *Cap-and-Trade Auction Proceeds Investment Plan: Fiscal Years 2013-14 through 2015-16*. Table ES-1 shows how ARB’s proposed funding allocations meet this target. ARB is also targeting at least 10 percent of the Low Carbon Transportation funds to be invested in disadvantaged communities. Staff

proposes placing conditions in the solicitations and grant agreements for several of projects listed in Table 1 to ensure this target is met. Those details are described further in the Chapter 2 of this Funding Plan.

Light-Duty Vehicle Investments: Staff proposes a total of \$200 million for light-duty vehicle projects. These investments are aimed at supporting the long-term transformation of the light-duty fleet to one that is largely zero-emission by 2050 (and fueled by low carbon, renewable energy sources) while also providing immediate emission benefits. ARB's light-duty investment strategy includes two distinct, but complementary elements. CVRP supports increasing the number of ZEVs on California's roadways to meet deployment goals established by regulation, statute, and policy – including the Governor's goal for 1.5 million ZEVs by 2025. CVRP is complemented by a suite of pilot projects designed to increase access to these clean vehicles for disadvantaged communities and lower-income households. SB 1275 reaffirms both elements of the strategy by directing ARB to continue investing in each with refinements to CVRP.

Staff's proposed \$163 million CVRP allocation would meet the expected growth in demand projected for the upcoming year. Staff proposes to address the SB 1275 requirement to limit CVRP eligibility by income with a two pronged approach: (1) an income eligibility cap that would exclude the higher-income consumers most likely to purchase a ZEV without a CVRP rebate coupled with (2) higher rebate levels for lower income consumers most in need of financial incentives to purchase a CVRP eligible vehicle. Staff believes this approach would improve CVRP's effectiveness by targeting rebates where they are likely to have the greatest impact.

For light-duty vehicle pilot projects to benefit disadvantaged communities, staff proposes a \$37 million allocation to build upon last year's investments and fulfill statutory direction from SB 1275 to establish these types of programs. This would expand each of the four pilot projects currently being launched and add a new project targeting turnover of the agricultural worker vanpool fleet in the San Joaquin Valley. The four existing pilots include: increased incentives for public fleets to purchase CVRP-eligible vehicles; advanced technology car sharing and mobility options; increased vehicle replacement incentives through the Enhanced Fleet Modernization Program; and financing assistance.

Heavy-Duty Vehicle and Equipment Investments: Staff proposes a total of \$167 million for heavy-duty vehicle and equipment projects as shown in Table ES-1. These investments would support the demonstration and deployment of the zero-emission and near-zero emission heavy-duty freight and transportation technologies needed to meet GHG emission reduction targets and air quality goals. Investments would support the transformational changes called for in ARB's 2015 *Sustainable Freight: Pathways to Zero and Near Zero Emissions* discussion draft. These investments continue, expand, and add to projects started in previous funding cycles.

Staff proposes \$12 million for HVIP in total to continue encouraging commercial deployment of hybrid and zero-emission trucks and buses. As a complement to HVIP, ARB is launching new pilot projects to support larger-scale commercial deployments of zero-emission trucks and buses. For FY 2015-16, staff proposes \$20 million for pilot deployment of zero-emission trucks and \$45 million for pilot deployment of zero-emission buses, augmenting the \$25 million for these types of projects from last year's appropriation. Funding at this level is needed to increase vehicle production levels to the point where initial economies of scale can start to be realized.

As a new project category, staff proposes \$7 million in total for incentives to truck owners for the purchase of trucks certified to the optional low NOx standards adopted by the Board in 2013. These incentives would encourage engine manufacturers to bring these cleaner trucks to market and truck purchasers to buy them once they are commercially available. The vehicle incentive would be coupled with additional incentives for use of low carbon, renewable fuels to maximize GHG benefits.

Staff proposes allocating \$59 million for advanced technology demonstration projects building on the demonstrations being funded with last year's appropriation. These demonstrations support key technology development identified in ARB's *Sustainable Freight: Pathways to Zero and Near Zero Emissions* document. Priority demonstration categories include on-road trucks, freight locomotives, off-road freight equipment, off-road agricultural and construction equipment, and off-road passenger transportation.

Staff proposes \$9 million for a second new project, incentives for zero-emission off-road freight equipment, to accelerate deployment and drive consumer acceptance of this equipment in the early stages of commercialization. Possible eligible equipment includes zero-emission forklifts, transport refrigeration units, yard trucks, airport ground support, and cargo handling equipment. It is envisioned that this pilot will evolve into a first-come, first-served voucher project, like HVIP, in future years.

Finally, staff proposes \$15 million in AQIP funding to continue the Truck Loan Assistance Program. This program helps small business truckers to secure financing for newer trucks or diesel exhaust retrofits in advance of compliance deadlines for ARB's in-use truck and bus regulation. Participation in the program has increased in recent years, and the proposed allocation is needed to meet expected demand over the upcoming year.

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CHAPTER 1: INTRODUCTION AND BACKGROUND

The Governor's proposed Fiscal Year (FY) 2015-16 State Budget includes \$350 million to the Air Resources Board (ARB or Board) from the Greenhouse Gas Reduction Fund (GGRF) for Low Carbon Transportation investments. This funding would reduce greenhouse gas (GHG) emissions and further the purposes of Assembly Bill 32 (AB 32) (Núñez, Chapter 488, Statutes of 2006) with a priority on benefiting disadvantaged communities. The Governor's proposed State Budget also includes \$23 million to ARB for the Air Quality Improvement Program (AQIP) which provides mobile source incentives to reduce criteria pollutant, air toxic, and GHG emissions. The Low Carbon Transportation investments build upon and greatly expand the technology advancing projects ARB has funded through AQIP since 2009.

The proposed *Fiscal Year 2015-16 Funding Plan for Low-Carbon Transportation Investments and AQIP* (FY 2015-16 Funding Plan) describes how these combined funds will be spent. The plan describes ARB's policy drivers and vision for advanced technology mobile source investments, eligible project categories and criteria, project funding allocations, and program implementation details. The plan also addresses the requirements of new legislation signed in 2014 that refines ARB's implementation of these incentive programs.

ARB is using these incentives to accelerate development and deployment of the cleanest feasible vehicle technologies for all vehicle and equipment sectors, from light-duty passenger cars to heavy-duty trucks and off-road equipment to meet California's air quality, climate change, and petroleum reduction goals. These goals include:

- Reducing GHG emissions from the transportation sector to 80 percent below 1990 levels by 2050 as directed in Governor Brown's Executive Order B-16-2012.¹
- Reducing GHG emission to 40 percent below 1990 levels by 2030 as directed in Governor Brown's Executive Order B-30-2015.²
- Meeting the federal health-based ambient air quality standards for ozone (smog) by 2023 and 2031 as well as the fine particulate matter (PM2.5) air quality standards. ARB staff estimates meeting the 2031 ozone standard will require oxides of nitrogen (NOx) emission reductions of up to 90 percent compared to 2010 levels.
- Meeting the Governor's goal of deploying 1.5 million zero-emission vehicles (ZEVs) by 2025 as directed in Executive Order B-16-2012 and the related goal of

¹ Governor Brown's Executive Order B-16-2012: <http://gov.ca.gov/news.php?id=17472>

² Governor Brown's Executive Order B-30-2015: <http://gov.ca.gov/news.php?id=18938>

deploying 1 million ZEVs and near-zero emission vehicles by the start of 2023 as codified in Health and Safety Code Section 44258.4(b).

- Reducing petroleum use by 50 percent by 2030 as directed in Governor Brown's 2015 State of the State address.³
- A 10 percent reduction in the carbon intensity of California's transportation fuels by 2020 as required by the Low Carbon Fuel Standard (LCFS).
- Continuing to reduce health risks from exposure to toxic air contaminants such as diesel particulate matter, particularly in disadvantaged communities where exposures can be substantial.

ARB's 2014 *Climate Change Scoping Plan Update*⁴ and 2012 *Vision for Clean Air*⁵ conclude that many of the same actions are needed to meet GHG, smog forming, and toxic pollutant emission reduction goals – specifically, a transition to zero-emission and near-zero emission technologies and use of the cleanest, lowest carbon fuels and energy across all vehicle and equipment categories. More recently, ARB's 2015 *Sustainable Freight: Pathways to Zero and Near-Zero Emission* discussion draft reiterates the need for this transition as well as a coordinated strategy to address California's multiple air quality and climate change goals.⁶ To support this transition, the Administration's *Cap-and-Trade Auction Proceeds Investment Plan: Fiscal Years 2013-14 through 2015-16* identifies zero-emission passenger transportation and low carbon freight transport as investment priorities.⁷

ARB is developing its Low Carbon Transportation and AQIP investment strategy in a coordinated manner. The Low Carbon Transportation investments from GGRF build upon and greatly expand many of the types of projects that ARB has funded through AQIP since 2009. The investment strategy is also coordinated with other State agencies that are administering GGRF funding. ARB staff has developed a joint proposed FY 2015-16 Funding Plan for both funding sources as it did for the FY 2014-15 budget cycle to ensure continued synergistic investments between the programs while also ensuring that statutory requirements applicable to each are met.

The remainder of this introductory chapter provides background on Low Carbon Transportation and AQIP, recent legislation guiding implementation of these programs, and a summary of projects funded to date. This is followed by chapters covering

³ Governor Brown's January 15, 2015 State of the State address: <http://gov.ca.gov/news.php?id=18828>

⁴ ARB, *First Update to the Climate Change Scoping Plan: Building on the Framework Pursuant to AB 32 The California Global Warming Solutions Act of 2006*, May 2014
http://www.arb.ca.gov/cc/scopingplan/2013_update/first_update_climate_change_scoping_plan.pdf

⁵ ARB, *Vision for Clean Air: A Framework for Air Quality and Climate Planning*, June 2012,
<http://www.arb.ca.gov/planning/vision/vision.htm>

⁶ ARB, *Sustainable Freight: Pathways to Zero and Near-Zero Emission*, Discussion Draft, April 2015,
http://www.arb.ca.gov/gmp/sfti/Sustainable_Freight_Draft_4-3-2015.pdf

⁷ Cap-and-Trade Auction Proceeds Investment Plan: Fiscal Years 2013-14 through 2015-16:
http://www.arb.ca.gov/cc/capandtrade/auctionproceeds/final_investment_plan.pdf

proposed FY 2015-16 funding allocations, light-duty vehicle investments, heavy-duty vehicle investments, contingency provisions, and the project solicitation and award process.

AQIP BACKGROUND

ARB investments initiated under AQIP provide the foundation for the Low Carbon Transportation investments that now make up the vast majority of the proposed Funding Plan. AQIP is a voluntary, mobile source incentive program that focuses on reducing criteria pollutant and diesel particulate emissions with concurrent reductions in GHG emissions. AQIP was created in 2007 by AB 118, the California Alternative and Renewable Fuel, Vehicle Technology, Clean Air, and Carbon Reduction Act of 2007 (Núñez, Chapter 750, Statutes of 2007). AB 8 (Perea, Chapter 401, Statutes of 2013) reauthorized the fees that support AQIP through 2023. AB 8 also requires ARB to provide preference to projects with higher benefit-cost scores when considering projects for AQIP funding. A detailed discussion of the benefit-cost analysis and selection process for AQIP projects is provided in Appendix A.

ARB adopted regulations in 2008 and 2009 that establish the administrative procedures for implementing AQIP in order to ensure that the program is run efficiently, with transparency and public input, and complements California's existing air quality and climate change programs. Central to these program 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 investments. AQIP guidelines also establish the rules and requirements for soliciting projects and awarding funds.

Funding for AQIP comes primarily from the smog abatement fee assessed annually by the Department of Motor Vehicles (DMV) during a vehicle's first six registration years in lieu of a biennial smog inspection. In addition, a small portion of AQIP funding comes from two additional sources: an initial registration fee for new watercraft and a special equipment identification plate fee for certain types of equipment. Annual funding for AQIP projects is generally \$20-25 million, depending on the revenues generated from these fees. For FY 2015-16, the Governor's State Budget proposal appropriates \$23 million to ARB for AQIP projects.

ARB has focused AQIP investments on technology advancing projects that support California's long-term air quality and climate change goals in addition to providing immediate emission benefits. AQIP investments have concentrated on three main categories:

- Commercial Deployment of Clean Vehicles: Most AQIP funding to date has been directed to commercial deployment projects for 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. These incentives are aimed at accelerating 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. These include rebates for zero and near-zero emission passenger vehicles through the Clean Vehicle Rebate Project (CVRP) and vouchers for hybrid and zero-emission trucks and buses through the Hybrid and Zero-Emission Truck and Bus Voucher Incentive Project (HVIP).

- *Precommercial Advanced Technology Demonstrations*: AQIP funds have also been directed to precommercial advanced technology demonstrations aimed at bringing the next generation of emission control technology to market. The demonstration projects funded now could transition to deployment projects if the technology proves successful. The advanced technology element of AQIP has historically been small, due to the program's limited budget, but Low Carbon Transportation funding is being used to greatly expand the scope of ARB's advanced technology demonstration investments.
- *Finance Assistance to Small Trucking Fleets*: AQIP also provides financing assistance to small business and individual truck owners in need of truck replacements or retrofits in advance of compliance deadlines for ARB's In-Use Truck and Bus regulation through the Truck Loan Assistance Program. An increasing fraction of AQIP funds is being directed to this category as demand continues to grow, and AQIP remains the only source of ARB funding to support this program.

Table 1, later in this chapter, lists AQIP investments to date in each of these categories.

GGRF AND LOW CARBON TRANSPORTATION BACKGROUND

Cap-and-Trade auction proceeds provide an additional funding source for ARB's clean transportation incentive programs, greatly expanding the technology advancing projects ARB has funded through AQIP. In 2012, the Legislature passed and Governor Brown signed into law 3 bills – AB 1532 (Pérez, Chapter 807), Senate Bill 535 (SB 535) (de León, Chapter 830), and SB 1018 (Budget and Fiscal Review Committee, Chapter 39) – that establish GGRF to receive Cap-and-Trade auction proceeds and to provide the framework for how the auction proceeds will be administered to further the purposes of AB 32. In addition, the use of auction proceeds must comply with the requirements of SB 862 (Committee on Budget and Fiscal Review, Chapter 36, Statutes of 2014).

The primary purpose of programs funded with auction proceeds is achieving GHG emission reductions. Statute 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. This legislation also establishes complementary goals for auction proceeds investments in addition to the goal of reducing GHG emissions in California including maximizing economic, environmental, and public health benefits to the state, among others.

Disadvantaged Community Investment Requirements: SB 535, one of the implementing statutes for auction proceeds, directs that at least 25 percent of funding from GGRF be allocated toward projects that benefit California's most disadvantaged communities and at least 10 percent be allocated toward projects located in these disadvantaged communities in order to provide economic benefits as well as health benefits through additional emission reductions. The California Environmental Protection Agency (Cal/EPA) identified disadvantaged communities for the purposes of SB 535 using the California Communities Environmental Health Screening Tool (CalEnviroScreen2.0). More information on the CalEnviroScreen model and the identification of disadvantaged communities is available on Cal/EPA's website.⁸

In 2014, ARB approved *Investments to Benefit Disadvantaged Communities: Interim Guidance to Agencies Administering Greenhouse Gas Reduction Funding Monies* that establishes the criteria for determining whether projects qualify as being located in or benefiting a disadvantaged community.⁹ This guidance also identifies approaches for implementing State agencies to maximize the funding to benefit disadvantaged communities, while recognizing additional priorities identified by disadvantaged communities (in addition to reducing GHG emissions) that State agencies should strive to achieve with their investments. These include reducing health harms and exposure to toxic air contaminants among other needs. This direction to achieve air quality and health cobenefits factors into ARB's investment decisions and provides additional rationale to consider Low Carbon Transportation and AQIP investments together.

Auction Proceeds Allocation Process: The implementing statute 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 *Cap-and-Trade Auction Proceeds Investment Plan: Fiscal Years 2013-14 through 2015-16* was submitted to the Legislature in May 2013. The investment plan identified Low Carbon Transportation as a potential investment that could be implemented by ARB including development, demonstration, and deployment of zero-emission and near-zero emission heavy-duty vehicles and equipment and rebates for zero-emission and near-zero emission passenger cars, and it established a target that 50 percent of the Low Carbon Transportation funding benefit disadvantaged

⁸ <http://www.calepa.ca.gov/EnvJustice/GHGInvest/>

⁹ ARB, *Investments to Benefit Disadvantaged Communities: Interim Guidance to Agencies Administering Greenhouse Gas Reduction Fund Monies*, release date November 3, 2014.
<http://www.arb.ca.gov/cc/capandtrade/auctionproceeds/final535-interim-guidance-11-3-2014.pdf>

communities.¹⁰ The investment plan identified AQIP as an existing program that could provide a framework to build upon for these Low Carbon Transportation investments. Funding is appropriated to State agencies by the Legislature through the annual Budget Act, consistent with the investment plan.

ARB Low Carbon Transportation Appropriations: The FY 2014-15 State Budget appropriated a total of \$832 million in Cap-and-Trade auction proceeds to 12 State agencies for programs that will reduce GHG emissions and meet the SB 535 disadvantaged communities investment requirements consistent with the Administration's investment plan. Of this total, ARB received \$200 million for Low Carbon Transportation projects that expand existing efforts with the following direction:

Low Carbon Transportation: \$200 million for ARB to accelerate the transition to low carbon freight and passenger transportation, with a priority for disadvantaged communities. This investment will also support the Administration's goal to deploy 1.5 million zero-emission vehicles in California by 2025. The Board administers existing programs that provide rebates for zero-emission cars and vouchers for hybrid and zero-emission trucks and buses. These expenditures will respond to increasing demand for these incentives, as well as provide incentives for the precommercial demonstration of advanced freight technology to move cargo in California, which will benefit communities near freight hubs.¹¹

The Governor's proposed State Budget for FY 2015-16, as revised in May 2015, would appropriate \$350 million to ARB for Low Carbon Transportation building upon the FY 2014-15 appropriation by continuing and expanding funding for the types of projects identified in the FY 2014-15 State Budget.

RECENT LEGISLATION

SB 1275 (De León, Chapter 530, Statutes of 2014) establishes the Charge Ahead California Initiative with the goals of placing one million zero-emission and near-zero emission vehicles in California by 2023 and increasing access to these vehicles for lower-income consumers and consumers in disadvantaged communities. SB 1275 directs ARB to make a number of changes to CVRP including limiting consumer eligibility based on income, ensuring that rebate levels can be phased down, and conducting various planning and technology assessment activities, among other provisions. SB 1275 also directs ARB to establish programs to increase access to electric transportation for disadvantaged, low-income, and moderate-income communities and consumers. Staff's proposals to address the requirements of SB 1275 are discussed in greater detail in Chapter 3.

¹⁰ See page B-7 of Investment Plan:

http://www.arb.ca.gov/cc/capandtrade/auctionproceeds/final_investment_plan.pdf

¹¹ California State Budget Summary 2014-15, Cap and Trade Expenditure Plan:

<http://www.ebudget.ca.gov/2014-15/pdf/Enacted/BudgetSummary/CapandTradeExpenditurePlan.pdf>

SB 1204 (Lara, Chapter 524, Statutes of 2014) creates the California Clean Truck, Bus, and Off-Road Vehicle and Equipment Technology Program, funded with auction proceeds from GGRF, to support the development, demonstration, precommercial pilot, and early commercial deployment of zero-emission and near-zero emission technologies with priority given to projects that benefit disadvantaged communities. SB 1204 establishes specific requirements related to how ARB prioritizes project categories and selects projects. Staff's proposals to address the requirements of SB 1204 are discussed in greater detail in Chapter 4 and Appendix B.

INVESTMENTS TO DATE

Table 1 provides an overview of the investments to date for Low Carbon Transportation from GGRF and AQIP. In the first seven years of AQIP, investments totaled just over \$250 million, with most of the funding directed to CVRP, HVIP, and the Truck Loan Assistance Program and smaller investments in advanced technology demonstrations. Each of these projects is described in greater detail along with status updates in Chapters 3, 4, and 5.

Low Carbon Transportation funding greatly expands the scale of ARB's advanced technology mobile source investments. The \$225 million in FY 2014-15 funding nearly equals the total amount of funds invested over the first seven years. This additional funding comes at a time when the demand for advanced technology incentives is growing significantly, and in prior years, many of these projects were oversubscribed. As an example, annual demand for passenger vehicle rebates through CVRP has grown from about 11,000 in 2012, to 29,000 in 2013, to over 44,000 in 2014. The additional funding enables substantially larger investments in expanding access to cleaner vehicles for disadvantaged communities as well as developing and demonstrating the next generation of clean technologies through precommercial demonstration projects. Both of these are critical to the long-term transformation of the vehicle and equipment fleet to zero-emission and near-zero emission technologies.

Table 1: Summary of Low Carbon Transportation and AQIP Funding to Date

Project	FY 2008-09 → FY 2013-14 (AQIP only) ^{1,2} (millions)	FY 2014-15 (AQIP + GGRF) (millions)	Total through FY 2014-15 (millions)
Ongoing Projects			
Light-Duty Vehicle Projects			
CVRP	\$123 ¹	\$121 ³	\$244
Pilots to Benefit Disadvantaged Communities	-	\$9	\$9
Heavy-Duty Vehicle and Equipment Projects			
HVIP	\$69 ²	\$10	\$79
Zero-Emission Truck and Bus Commercial Pilot Deployments	-	\$25	\$25
Advanced Technology Demonstrations	\$6	\$50	\$56
Truck Loan Assistance Program	\$54	\$10	\$64
Past Projects			
Past AQIP Funded Projects: -Lawn and Garden Equipment Replacement -Off-Road Hybrid Equipment Pilot -Zero-Emission Agricultural Utility Vehicles	\$5	-	\$5
TOTAL	\$258	\$225	\$483

Columns may not add to totals due to rounding.

¹Includes \$19.5 million from Energy Commission's Alternative and Renewable Fuel and Vehicle Technology Program, \$24.55 million from Energy Commission's Alternative and Renewable Fuel and Vehicle Technology Fund, and \$20 million appropriated from GGRF by SB 862 (2014) for CVRP.

²Includes \$4 million from Energy Commission's Alternative and Renewable Fuel and Vehicle Technology Program and \$10 million appropriated from GGRF by SB 862 (2014) for HVIP.

³Includes \$5 million for CVRP from Energy Commission's Alternative and Renewable Fuel and Vehicle Technology Program.

The California Energy Commission (Energy Commission) has augmented the funds directly appropriated to ARB by previously providing an additional \$53 million from its Alternative and Renewable Fuel and Vehicle Technology Program and Fund for CVRP and HVIP to meet consumer demand. In addition to these direct investments, the Energy Commission's investments in fueling infrastructure for both electric vehicle charging stations and hydrogen fueling stations, vehicle manufacturing, and advanced technology vehicle demonstrations as part of the Alternative and Renewable Fuel and Vehicle Technology Program provide critical support to the deployment of these zero-emission vehicles. Furthermore, the Alternative and Renewable Fuel and Vehicle Technology Program also provides key investments in low carbon biofuel production and infrastructure, natural gas vehicle deployment, and workforce training and development which further progress towards California's climate change, air quality, and petroleum reduction goals.

The Low Carbon Transportation and AQIP investments covered in this Funding Plan represent just one part of California's portfolio of clean transportation incentives. These are complemented by other ARB programs, other State agency programs, and local air district programs including the Carl Moyer Program, Proposition 1B Goods Movement

Emission Reduction Program, Enhanced Fleet Modernization Program (car scrap), other State agency Cap-and-Trade auction proceeds funded programs, local air district and port technology advancement programs, among others.

VISION FOR LOW CARBON TRANSPORTATION AND AQIP INVESTMENTS

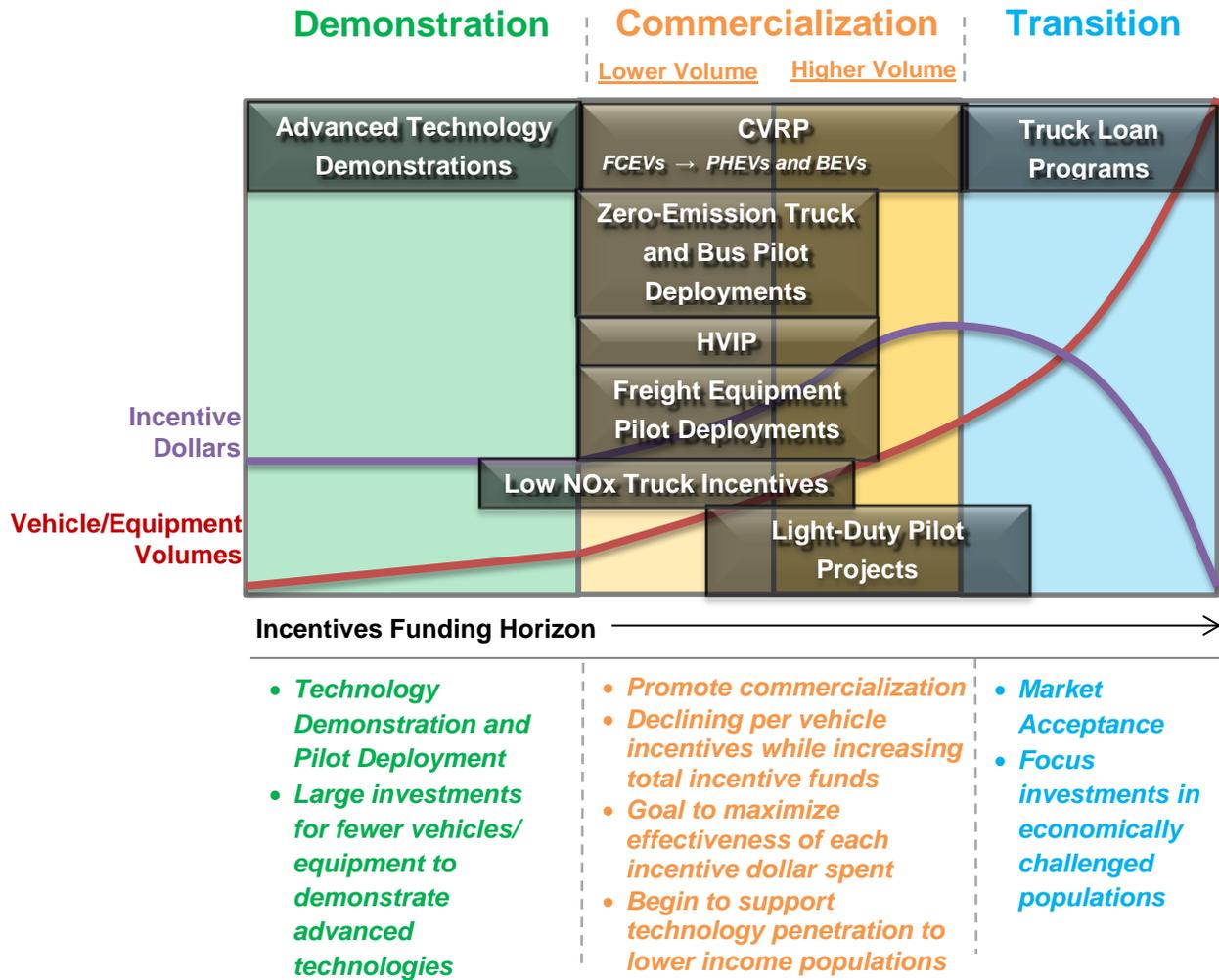
Low Carbon Transportation and AQIP provide a down payment on the advanced technologies needed to meet long-term climate change and air quality goals, with a focus on reducing GHG, criteria pollutant, and toxics emissions by stimulating the widespread use of these technologies. Projects provide both immediate 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.

As part of the FY 2014-15 Funding Plan, the Board approved a long-term vision for the role of ARB advanced technology investments in programs such as Low Carbon Transportation and AQIP as well as a number of conceptual metrics of success. Staff proposes to carry forward this vision in the proposed FY 2015-16 Funding Plan. A short summary is provided below, but the full discussion can be found in the approved FY 2014-15 Funding Plan.¹²

The approved vision includes a description of the role incentives play in supporting the three phases of technology advancement from (1) development and precommercial demonstration to (2) the commercial phase where a technology is ready for sale starting with small scale early commercial pilot deployment and growing to full-scale commercialization and then ultimately to (3) a transition to widespread deployment where the technology is a mainstream consumer option and incentives focus on expanding its reach to underserved populations. This is shown in Figure 1. In addition, these incentives are intended to help accelerate the advancement of technologies across sectors, from the light-duty sector to heavier, on- and off-road vehicles and equipment with more demanding duty cycles.

¹² ARB, *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 (see pp 6-11): http://www.arb.ca.gov/msprog/aqip/fundplan/final_fy1415_aqip_ggrf_fundingplan.pdf

Figure 1: Vision of the Role of Incentives



Staff is using this vision of incentives to serve as the overarching direction for technology development and deployment that is required under SB 1204. As such, this is also described in greater detail in the introduction to Chapter 4 and Appendix B where staff presents its proposals to address the requirements of SB 1204.

This vision of using Low Carbon Transportation and AQIP incentives to support the development and commercialization of new technologies and the ultimate transition to reach underserved populations is consistent with the goals and direction of SB 1275. SB 1275 establishes goals to deploy one million ZEVs by 2023 to establish a self-sustaining market as well as increase access for disadvantaged communities and lower income consumers.

Technology Metrics of Success: This proposed Funding Plan continues the process laid out in the FY 2014-15 Funding Plan of working with stakeholders to identify appropriate metrics of success for each project. As noted in the FY 2014-15 Funding Plan, metrics of success for projects should convey concepts such as: level of market

penetration, manufacturer diversity, technology cost, consumer acceptance, or other indicators of market health.

For light-duty vehicles, the FY 2014-15 Funding Plan included technology milestones and metrics measuring the success of CVRP.¹³ Metrics of success include:

- The state of ZEV market as indicated by measures such as ZEVs sold as percent of car market, CVRP rebate demand, and progress toward meeting the Governor's goal to deploy 1.5 million ZEVs by 2025.
- Household ownership patterns including number of new households purchasing ZEVs and income distribution of ZEV purchasers.
- Manufacturer achievements such as the number of manufacturers producing ZEVs and vehicle model diversity.

Staff is proposing to continue following these metrics in this Funding Plan. As shown in Chapter 3, progress is being made toward each of these metrics, but ZEV market is still in the early stages with deployment totals not yet at one tenth of the Governor's goal of 1.5 million ZEVs by 2025, so continued investment remains a priority in supporting ZEV market growth. These will be refined over the next year along with technology evaluation milestones that would inform possible future phase down of rebates as part of the light-duty zero-emission market and technology evaluation that SB 1275 requires be included in the FY 2016-17 Funding Plan. Staff discusses its plans for this evaluation further in Chapter 3.

The heavy-duty vehicle market is at a far earlier stage of development because vehicle technology typically migrates from light-duty passenger cars to heavier on- and off-road vehicles and equipment with more demanding duty cycles. However, as part of the FY 2014-15 Funding Plan, staff identified longer-term metrics that could be used to evaluate projects' success, and staff is proposing to continue following these metrics in this Funding Plan. These are listed for each heavy-duty project in Chapter 5 under the "long-term plan" section of each project description. These metrics include, among other concepts:

- Number of vehicles or equipment sold.
- Diversity in both number of manufacturers and number of eligible vehicles or equipment.
- Incremental cost relative to conventional vehicles or equipment.
- Measures of functionality such as zero-emission range.
- Reliability, vehicle maintenance and operation cost.
- Consumer acceptance.

In addition to these metrics, staff is proposing performance criteria for evaluating heavy-duty projects and measuring their success. These include evaluating: potential for statewide and local emission reductions and health benefits; potential for technology

¹³ See pages 40-41 of the FY 2014-15 Funding Plan for more details.

viability; and broad market acceptance. These are discussed more fully in Chapter 4, and Appendix B of the Funding Plan describes staff's evaluation of each heavy-duty vehicle and equipment project proposed for funding relative to these criteria.

CHAPTER 2: PROPOSED FUNDING ALLOCATIONS FOR FY 2015-16

The Governor's FY 2015-16 State Budget proposals for Low Carbon Transportation and AQIP, as revised in May 2015, are shown below.

Low Carbon Transportation: The Governor's proposed FY 2015-16 State Budget includes \$350 million to ARB from GGRF for Low Carbon Transportation investments that reduce GHG emissions with a priority for disadvantaged communities.¹⁴ The Governor's proposal would continue and expand ARB's Low Carbon Transportation investments from the FY 2014-15 budget cycle by supporting rebates, vouchers, and advanced technology freight demonstrations that accelerate the transition to low carbon freight and passenger transportation with a priority for disadvantaged communities. These investments would also support the Administration's goal to deploy 1.5 million ZEVs in California by 2025 and to reduce petroleum consumption by up to 50 percent by 2030.

The Governor's State Budget proposal, as revised in May 2015, increases the Low Carbon Transportation appropriation from \$200 million funding level originally in the January 2015 State Budget proposal. Throughout the workshop process, ARB staff took input from stakeholders on how additional funding should be directed if the program budget were increased, and staff considered this input in developing its proposal.

AQIP: The Governor's proposed State Budget provides \$23 million for AQIP projects. This funding level, dictated by revenues from motor vehicle fees, is similar to recent years' available funding. Staff has incorporated into its AQIP allocations a \$1 million reserve to address revenue uncertainty as it did in last year's Funding Plan.

PROJECT ALLOCATIONS

Table 2 below outlines staff's proposed project categories and funding allocations based on funding levels identified in the Governor's proposed FY 2015-16 State Budget. Table 2 also illustrates how ARB's Low Carbon Transportation appropriation will support disadvantaged community benefits and investments. The details of each of these projects and rationale for these proposals are described more fully in Chapters 3, 4, and 5. In addition, Appendix A describes the evaluation process for AQIP projects including a detailed discussion of the AB 8 required benefit-cost analysis, and Appendix B describes performance criteria evaluation for heavy-duty projects as required by SB 1204.

¹⁴ 2015-16 Governor's Budget Summary, May Revision, Cap-and-Trade Expenditure Plan (page 65): <http://www.ebudget.ca.gov/2015-16/pdf/Revised/BudgetSummary/CapandTradeExpenditurePlan.pdf>

Table 2: Proposed Project Allocations for FY 2015-16¹

Project Category	AQIP (millions)	Low Carbon Transportation (millions or %)	
		Total	Minimum % To Benefit Disadvantaged Communities
Light-Duty Vehicle Projects			
CVRP	\$3	\$160	≥25% ²
Light-Duty Pilot Projects to Benefit Disadvantaged Communities	-	\$37	100%
Heavy-Duty Vehicle and Equipment Projects			
HVIP	\$2	\$10	≥50% ²
Low NOx Truck Incentives	\$2	\$5	≥50% ²
Zero-Emission Truck Pilot Commercial Deployment Projects	-	\$20	≥50%
Zero-Emission Bus Pilot Commercial Deployment Projects	-	\$45	≥50%
Advanced Technology Demonstration Projects	-	\$59	100%
Zero-Emission Freight Equipment Pilot Commercial Deployment Projects		\$9	≥50%
Truck Loan Assistance Program	\$15	-	N/A
Reserve for AQIP Revenue Uncertainty	\$1		
State Operations for Low Carbon Transportation	-	\$5	
Total	\$23	\$350	≥50% (≥\$180)

¹Final allocation predicated on the approval of the proposed FY 2015-16 State budget

²Estimates for first-come, first-served projects. Actual funding spent in and to benefit disadvantaged communities will be calculated after rebates and vouchers are issued.

Disadvantaged Community Investment Targets: ARB is targeting at least 50 percent of the Low Carbon Transportation funds to benefit disadvantaged communities consistent with the direction in the Administration's *Cap-and-Trade Auction Proceeds Investment Plan: Fiscal Years 2013-14 through 2015-16*. ARB is also targeting at least 10 percent of the Low Carbon Transportation funds to be invested in disadvantaged communities.

Table 2 shows how ARB's proposed funding allocations would meet the 50 percent target by directing at least \$180 million of Low Carbon Transportation investments to projects that benefit disadvantaged communities. Staff proposes that all light-duty pilot project funding, all the heavy-duty advanced technology demonstration project funding, and at least half of the zero-emission truck and bus pilot commercial deployment project funding be invested to benefit disadvantaged communities as shown in Table 2.

Three projects – CVRP, HVIP, and Low NOx Truck Incentives – are designed to provide first-come, first-served rebates or vouchers for consumers or fleet owners statewide. Hence, the amount of funding that benefits disadvantaged communities can only be

calculated after rebates and vouchers are issued. Because of this project design, staff used historical CVRP and HVIP data to estimate potential disadvantaged community benefits for these projects. As listed in Table 2, staff conservatively estimates that at least 25 percent of CVRP funding and at least 50 percent of HVIP and Low NOx Truck Incentives funding would benefit disadvantaged communities. These estimates are low compared to observed historical disadvantaged community benefits of 37 percent for CVRP and 75 percent for HVIP as reported in the March 2015 *Annual Report to the Legislature on Investments of Cap-and-Trade Auction Proceeds*.¹⁵ If these historical levels continue in the upcoming funding cycle as expected, ARB would even further exceed the 50 percent disadvantaged community benefit investment target.

To meet the goal of investing at least 10 percent of Low Carbon Transportation funds in disadvantaged community census tracts, staff proposes placing conditions in the solicitations and grant agreements for several of projects listed in Table 2 to ensure that at least \$38 million (nearly 11 percent of total funding) is invested within disadvantaged community census tracts. These commitments include staff proposals that:

- At least \$22.5 million of the Zero-Emission Bus Pilot Commercial Deployment Project funding (half the total project funding) be directed to fund buses that provide service in disadvantaged community census tracts.
- At least \$10 million of the Advanced Technology Demonstration Projects fund equipment to be operated in disadvantaged community census tracts.
- At least \$5.5 of the light-duty pilot project funds be invested in disadvantaged community census tracts as a condition of the grant agreements for the Agricultural Worker Vanpool in the San Joaquin Valley Project and the Increased Incentives for Public Fleets Project, each described in Chapter 3.

Staff expects that at least a portion of funding in every project category will be invested in disadvantaged community census tracts in addition to the specific projects listed above. These investments will be calculated and reported after project funding is awarded and spent. When those funding totals are reported, ARB expects to exceed the 10 percent target by a considerable margin. For example, about 6 percent of CVRP and 45 percent of HVIP funds spent to date provided rebates and vouchers to vehicles registered or domiciled in disadvantaged community census tracts as reported in the *Annual Report to the Legislature on Investments of Cap-and-Trade Auction Proceeds*.

To evaluate projects for funding and calculate benefits for disadvantaged communities, ARB will follow the criteria established in *Investments to Benefit Disadvantaged Communities: Interim Guidance to Agencies Administering Greenhouse Gas Reduction Funding Monies*.

¹⁵ *Annual Report to the Legislature on Investments of Cap-and-Trade Auction Proceeds (Greenhouse Gas Reduction Fund Monies)*, March 2015. See Table 7 for funding in and benefitting disadvantaged communities and Table 8 for total funding spent through January 31, 2015.
<http://www.arb.ca.gov/cc/capandtrade/auctionproceeds/2015ggrf-annual-report-to-legislature.pdf>

FUNDING PLAN DEVELOPMENT PROCESS

To develop the recommendations presented in the proposed FY 2015-16 Funding Plan, staff held three public workshops, six public work group meetings, and numerous individual meetings with interested stakeholders. This outreach is listed below.

- On November 7, 2014, staff began the formal Funding Plan development process by holding a public workshop to present a program overview, status update on implementation of the FY 2014-15 funding, and an introduction to the two new laws passed in the 2014 Legislative session (SB 1275 and SB 1204) guiding the development of the Funding Plan.
- On January 23, 2015, staff held a second public workshop to present an overview of the Governor's proposed State Budget for Low Carbon Transportation and AQIP, its initial recommendations on project categories, and initial concepts for addressing SB 1275 and SB 1204 requirements. Staff released a handout about a week before the workshop summarizing its initial recommendations.
- In February and March 2015, staff held six focused public work group meetings where staff presented information and gathered input on the following topics:
 - CVRP (2 meetings) covering funding needs for the FY 2015-16 funding cycle and project modifications to address SB 1275 requirements.
 - Light-Duty Pilot Projects to Benefit Disadvantaged Communities (2 meetings) covering updates on the projects being launched with FY 2014-15 funding and recommendations for pilot projects for the FY 2015-16 funding cycle.
 - SB 1204 Framework and Metrics for FY 2015-16 Heavy-Duty Vehicle and Equipment Investments (1 meeting) covering recommendations to address the SB 1204 requirements.
 - Heavy-Duty Vehicle Projects (1 meeting) covering recommendations for potential projects and priorities for the FY 2015-16 funding cycle.
- On March 26, 2015, staff held a third public workshop to present its recommended project categories, funding allocations, and modifications to project criteria including those intended to address the requirements of SB 1275 and SB 1204. Staff released a discussion document about a week before the workshop summarizing its recommendations. At the workshop, stakeholders provided input on where additional funding should be directed if the program appropriations are increased in the final State Budget.

Throughout the process, staff also met individually with interested stakeholders to gather input, ideas, and data. Staff also continues to work closely with the Energy Commission to ensure coordination between these ARB programs and the Alternative and Renewable Fuel and Vehicle Technology Program.

CHAPTER 3: LIGHT-DUTY VEHICLE INVESTMENTS

Policy and Statutory Drivers and SB 1275 Requirements

As highlighted in ARB's AB 32 2014 *Climate Change Scoping Plan Update* and 2012 *Vision for Clean Air*, the light-duty fleet will need to become largely zero-emission by 2050 (and fueled by low carbon, renewable energy sources) with a mix of battery electric and fuel cell vehicles in order to meet California's long-term climate change and air quality emission reductions goals. In addition to this long-term goal, there are a number of regulatory, policy, and statutory drivers that set interim milestones along the path to this transformation of the light-duty fleet. Light-duty ZEV deployment is identified as an investment priority in the Administration's *Cap-and-Trade Auction Proceeds Investment Plan: Fiscal Years 2013-14 through 2015-16*.

The introduction and deployment of ZEVs in California was first driven by, and continues to be driven, by ARB's ZEV regulation which requires auto manufacturers to produce increasing numbers of ZEVs for sale in California. Under this regulation, one out of seven new cars sold in California in 2025 will be zero-emission or plug-in hybrid.

The Governor and Legislature have both established ZEV deployment targets that complement and build upon ARB's ZEV regulation. In Executive Order B-16-2012, Governor Brown set a goal deploying 1.5 million ZEVs in California by 2025. The Governor's ZEV Action Plan identifies specific actions for State agencies to help meet this goal, including the types of investments proposed in this Funding Plan.¹⁶

With SB 1275, the Legislature created the Charge Ahead California Initiative and codified in statute the goals of:

- Deploying 1 million ZEVs and near-zero emission vehicles by the start of 2023.
- Establishing a self-sustaining California market where these vehicles are a mainstream option.
- Increasing access for disadvantaged, low-income, and moderate-income communities and consumers to these vehicles.

To help meet these goals, SB 1275 establishes specific requirements for CVRP and directs ARB to establish programs that further increase access to and benefits for disadvantaged, low-income, and moderate-income communities and consumers from electric transportation.

¹⁶ Governor's Interagency Working Group on Zero-Emission Vehicles, *2013 ZEV Action Plan: A roadmap toward 1.5 million zero-emission vehicles on California roadways by 2025*. [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)
Draft 2015 ZEV Action Plan, http://gov.ca.gov/docs/DRAFT_2015_ZEV_Action_Plan_042415.pdf

ARB's light-duty vehicle investments are aimed at supporting the long-term transformation of the fleet and meeting each of the policy, statutory, and regulatory goals and requirements summarized above. There are two distinct, but complementary elements to ARB's advanced technology light-duty investments:

- CVRP supports increasing the number of ZEVs on California's roadways to meet these deployment goals and achieve the large scale transformation of the fleet.
- A suite of pilot projects that complement CVRP are aimed at increasing access to these clean vehicles in disadvantaged communities and lower-income households. These pilot projects provide consumer exposure to clean vehicles in these communities through car sharing and other mobility improvement programs and opportunities for ownership through purchase incentives and financing.

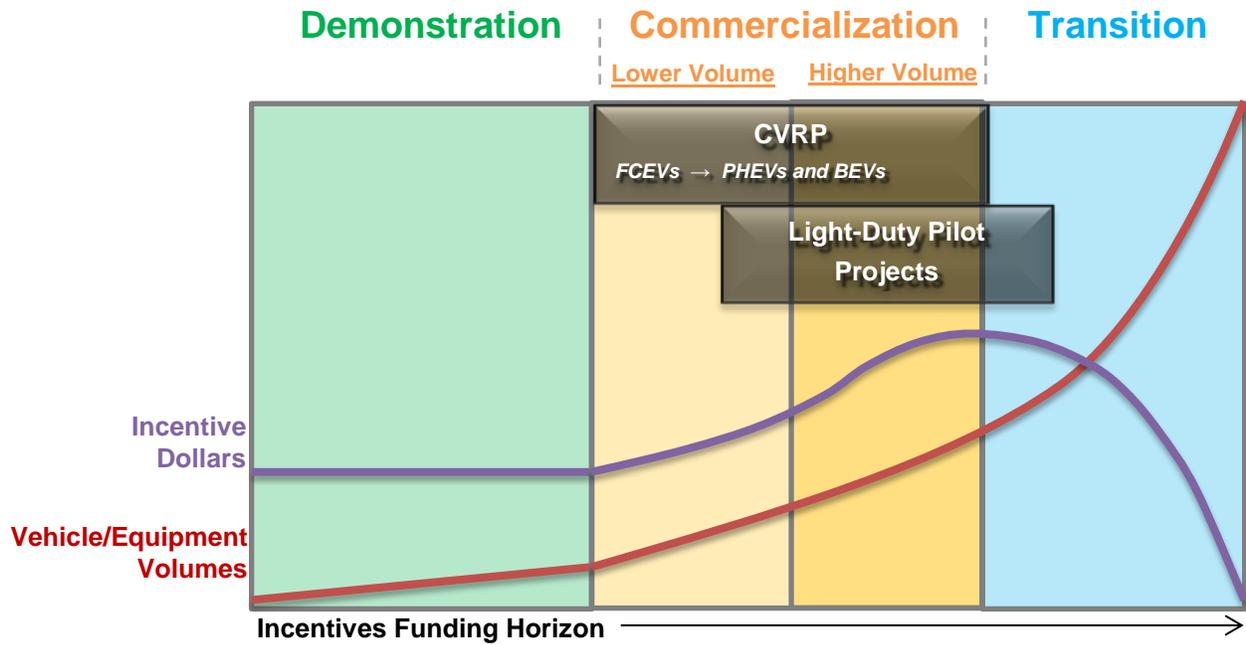
With SB 1275, the Governor and the Legislature reaffirmed both these elements of ARB's light-duty vehicle investment strategy. First, SB 1275 directs ARB to continue funding CVRP with refinements to improve the project and ensure it can support ZEV deployment goals over the longer term. Second, SB 1275 requires ARB to develop and implement the types of disadvantaged community focus programs ARB is already launching with FY 2014-15 Low Carbon Transportation funding. ARB's proposed FY 2015-16 light-duty investments are intended to meet these SB 1275 directions.

ARB's light-duty vehicle deployment investments are complemented by parallel Energy Commission investments in the necessary ZEV charging and fueling infrastructure. The Energy Commission has invested \$38 million in electric vehicle charging infrastructure for over 9,000 charging stations and \$85 million for 48 hydrogen fueling stations through the Alternative and Renewable Fuel and Vehicle Technology Program. For FY 2015-16, the Energy Commission allocated an additional \$17 million for electric vehicle charging infrastructure and \$20 million for hydrogen fueling infrastructure.¹⁷ The Energy Commission also provides funding to support the development of regional readiness plans to help regions prepare for and expedite deployment of ZEVs.

¹⁷ California Energy Commission, *2015-16 Investment Plan Update for the Alternative and Renewable Fuel and Vehicle Technology Program*, May 2015. <http://www.energy.ca.gov/2014publications/CEC-600-2014-009/CEC-600-2014-009-CMF.pdf>

The remainder of this chapter provides staff's FY 2015-16 proposals for CVRP and the Light-Duty Pilot Projects to Benefit Disadvantaged Communities shown in Figure 2.

Figure 2: FY 2015-16 Light-Duty Vehicle Investments



CVRP

Proposed project allocation: \$163 million Low Carbon Transportation – \$160 million AQIP – \$3 million

PROJECT OVERVIEW AND GOALS

CVRP offers consumer rebates on a first-come, first-served basis for the purchase or lease of new light-duty ZEVs, plug-in hybrid electric vehicles (PHEV), zero-emission motorcycles (ZEM), and neighborhood electric vehicles (NEV). CVRP helps get the cleanest vehicles on the road in California by providing incentives to partially offset the higher initial cost of these advanced technologies. Currently, rebates are offered at \$5,000 for fuel cell electric vehicles (FCEV), \$2,500 for battery electric vehicles (BEVs), \$1,500 for PHEVs, and \$900 for ZEMs and NEVs. The current grantee that oversees administration of CVRP is the Center for Sustainable Energy.

The objective of CVRP is to support the widespread commercialization of the cleanest vehicles by helping to motivate consumer purchase 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. In addition to supporting the goals of ARB's light-duty vehicle investments, CVRP also plays an important role in educating consumers and incentivizing the purchase of ZEVs to help manufacturers build volumes that will bring down vehicle costs over time.

The California market accounts for about 40 percent of the nation's ZEV sales due in part to the State's strong support of ZEV deployment through CVRP and ZEV charging and fueling infrastructure investments. ZEV sales in California are exceeding those required under ARB's ZEV regulation, providing one indication of the project's success.

CURRENT PROJECT STATUS

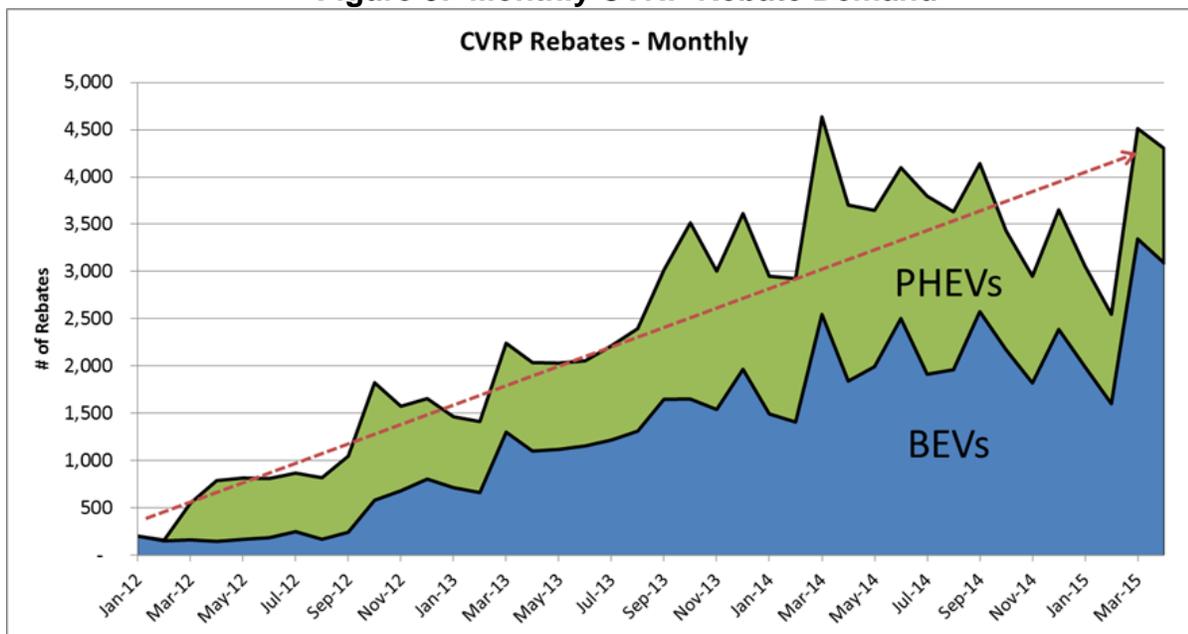
Since the project's launch in 2010, rebates for over 100,000 vehicles totaling over \$200 million have been issued. While CVRP rebate demand is continuing to grow, the market for advanced clean vehicles is still in the early stages of commercialization and currently makes up about 3.2 percent of all light-duty vehicle sales in California.¹⁸ Figure 3 shows the monthly rebate demand and the significant growth of CVRP in the last three years, a measure of the project's success. The number of CVRP rebates issued in 2014 nearly equals the total number of rebates issued between 2010 and 2013, another indication of the growth of the market.

Figure 3 also helps to illustrate the significant fluctuations in demand each month. For example, in the last quarter of 2014, staff observed a slowdown in rebate demand

¹⁸ Based on data from the California New Car Dealers Association
http://www.cncda.org/CMS/Pubs/Cal_Covering_4Q_14.pdf

beginning in October. That slowdown was followed by a surge in rebate demand in March and April 2015 with over 4,300 rebates issued each month (the second and third highest monthly demand in CVRP's history). In such a dynamic market, it is not always clear what drives these fluctuations. Factors that may affect rebate uptake include fuel prices, introduction of new models, vehicle price changes, and availability of vehicles, among others.

Figure 3: Monthly CVRP Rebate Demand



January 2012 - April 2015

CVRP has supported the growth of a diverse advanced technology light-duty vehicle market. In the first two years of the project, only four passenger vehicle models were eligible. Today, there are more than 25 models of eligible vehicles available, and more vehicle introductions are planned by a variety of manufacturers. Growth in number of manufacturers and number of vehicle models available are metrics staff has identified for gauging the success of the project.

As shown in Figure 3, there is growing consumer interest in both BEVs and PHEVs. BEVs account for about 57 percent of the rebates issued to date while PHEVs account for about 43 percent as shown in Table 3 which provides a summary of rebates issued by vehicle type and model. As the clean vehicle market grows, staff anticipates that consumer choices in vehicle models, price ranges, and options will continue to expand.

Table 3. Rebates by Vehicle Types and Model

Vehicle Type and Model	Rebates	Total Dollars	% of Rebates
Battery Electric Vehicles	58,231	\$149,421,681	68.68%
BMW 1 Series Active E	70	\$52,500	0.02%
BMW i3	545	\$1,362,500	0.63%
BMW i3 REx	954	\$2,383,250	1.10%
Chevrolet Spark EV	1,886	\$4,715,000	2.17%
CODA	49	\$122,500	0.06%
FIAT 500e	8,566	\$21,407,666	9.84%
Ford Focus Electric	2,038	\$5,082,806	2.34%
Honda Fit EV	434	\$1,083,750	0.50%
Kia Soul EV	393	\$982,500	0.45%
Mercedes-Benz B-Class Electric Drive	761	\$1,905,000	0.88%
Mitsubishi i-MiEV	218	\$469,061	0.22%
Nissan LEAF	23,303	\$62,275,514	28.62%
smart Electric Fortwo	1,990	\$4,793,000	2.20%
Tesla Model S	14,481	\$36,177,444	16.63%
Tesla Roadster	160	\$670,000	0.31%
Th!nk City	53	\$126,037	0.06%
Toyota RAV4 EV	1,766	\$4,403,653	2.02%
Volkswagen e-Golf	562	\$1,405,000	0.65%
Wheego LiFe	2	\$4,500	0.00%
Plug-In Hybrid Electric Vehicles	44,215	\$66,277,343	30.47%
Cadillac ELR	171	\$256,500	0.12%
Chevrolet Volt	19,726	\$29,578,601	13.60%
Ford CMAX Energi	4,066	\$6,094,283	2.80%
Ford Fusion Energi	5,086	\$7,629,300	3.51%
Honda Accord Plug-In	358	\$536,050	0.25%
Toyota Prius Plug-in Hybrid	14,808	\$22,182,609	10.20%
Fuel Cell Electric Vehicles	96	402,500	0.19%
Honda FCX Clarity	17	\$67,500	0.03%
Hyundai Tucson Fuel Cell	55	\$275,000	0.13%
Mercedes-Benz F-CELL	24	\$60,000	0.03%
Neighborhood Electric Vehicles	147	\$151,150	0.07%
Zero-Emission Motorcycles	318	\$311,100	0.14%
Commercial Vehicles¹	49	\$980,000	0.45%
Total	103,056	\$217,543,774	100%

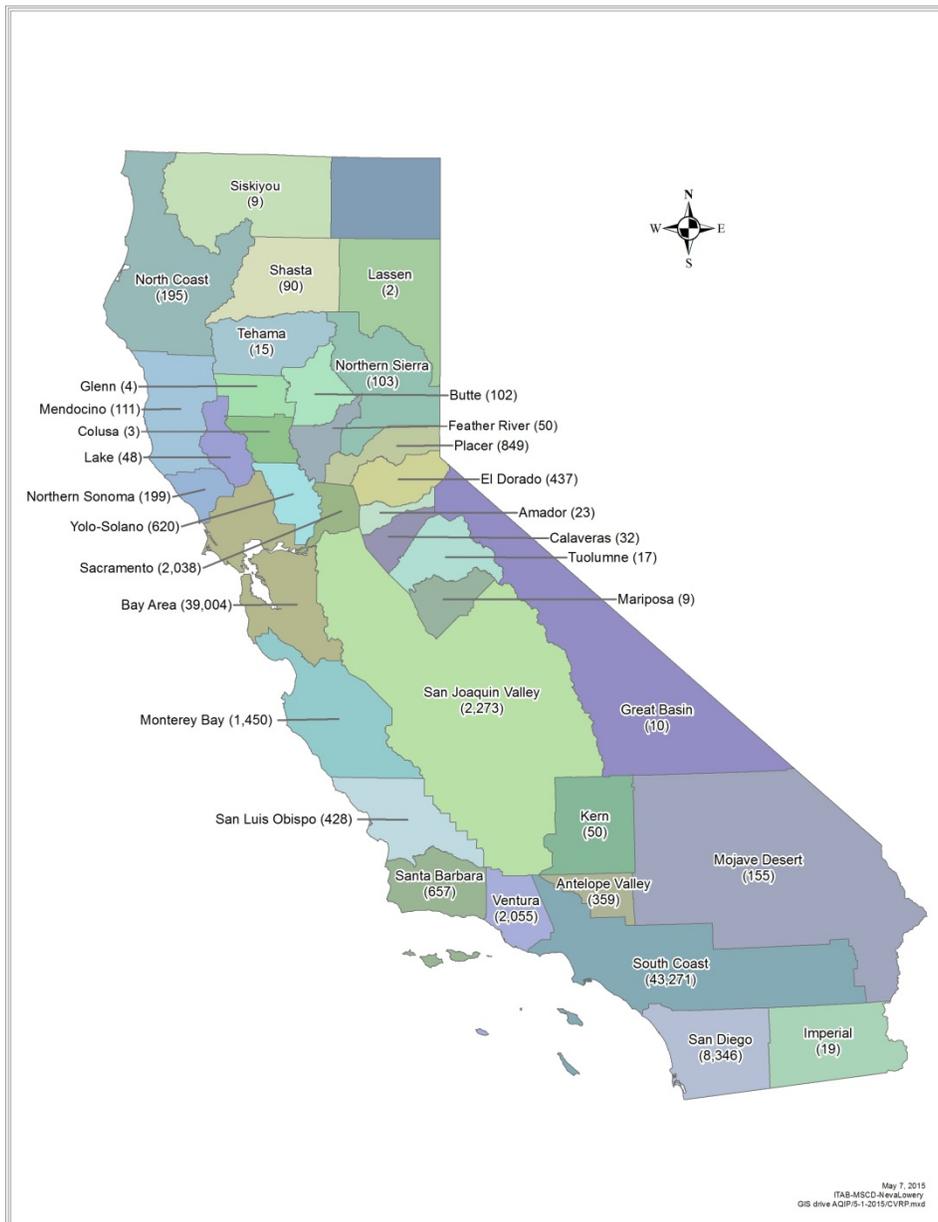
Through April 30, 2015

¹Commercial vehicles were only eligible in the first year of CVRP, and subsequently transitioned to HVIP.

Figure 4 shows the statewide distribution of rebates by air district. Historically, the majority of rebates have been issued to consumers in the South Coast, Bay Area, and

San Diego air districts. These urbanized areas are naturally suited to early ZEV adoption due to population density and driving patterns. Efforts are currently underway at ARB to increase participation in other parts of California, especially in and near California’s disadvantaged communities including those in the San Joaquin Valley. These efforts include investments in pilot projects to benefit disadvantaged communities as well as proposed changes to CVRP discussed in the next several pages.

Figure 4: Distribution of CVRP Rebates by Air District



Based on data through April 30, 2015.

Growth in CVRP rebate demand, growth in number of eligible vehicles and participating manufacturers, and ZEV sales rates exceeding those required under ARB’s ZEV

regulation are all positive early signs for the ZEV market in California and measures of CVRP’s success. However, the ZEV market is still in the early stages with deployment totals not yet at one tenth of the Governor’s goal of 1.5 million ZEVs by 2025, so continued investment in CVRP remains key in supporting ZEV market growth.

STAFF PROPOSAL FOR FY 2015-16

Staff proposes a \$163 million allocation for CVRP as shown in Table 4. This is about a 35 percent increase in funding relative to FY 2014-15. Staff’s proposal includes project changes designed to address the requirements of SB 1275 and ensure that expected demand aligns with the proposed funding allocation.

Table 4: Proposed CVRP Funding for FY 2015-16

FY 2014-15 Allocation (million)	Proposed FY 2015-16 Allocation (million)
\$121 ¹	\$163

¹Includes \$5 million from the Energy Commission.

As part of the public process for developing the CVRP proposal, staff met with vehicle manufacturers and other interested stakeholders and held two CVRP-focused public work group meetings in addition to the three public workshops on the Funding Plan.

Among other requirements, SB 1275 directs ARB to adopt revisions to the criteria and other requirements for CVRP by June 30, 2015 to ensure the following:

- Rebate levels can be phased down in increments based on cumulative sales levels as determined by ARB.
- Consideration of the conversion to prequalification and point-of-sale rebates or other methods to increase participation rates.
- Eligibility is limited based on income.

Staff’s proposal for addressing each of these requirements are discussed below followed by a discussion of the proposed CVRP budget.

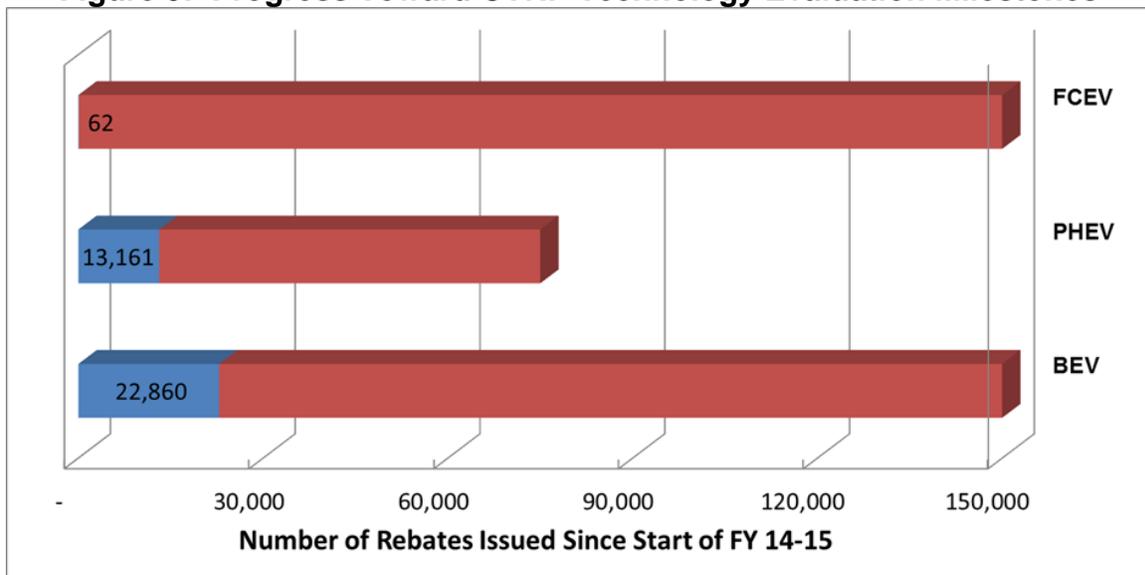
Ensure Rebate Levels Can Be Phased Down in Increments Based on Cumulative Sales Levels as Determined by ARB: ARB already has the authority to modify CVRP rebate levels as needed and has previously used this authority on several previous occasions. For example, the Board lowered per vehicle rebate levels from \$5,000 for ZEVs to \$2,500 and from \$3,000 for a PHEV to \$1,500 in the FY 2011-12 Funding Plan. Similarly, the Board increased the per vehicle rebate level for FCEVs from \$2,500 to \$5,000 in the FY 2014-15 Funding Plan.

In addition, the Board approved technology evaluation milestones as part of the FY 2014-15 Funding Plan that will be used to help guide the evaluation that will inform a

systematic phase down of rebate levels.¹⁹ These milestones were set with the purpose of evaluating the state of the three main eligible passenger vehicle technology types as they approach specific levels of consumer adoption in the commercialization process. The Board-approved technology evaluation milestones were set at 150,000 rebates for BEVs, 150,000 rebates for FCEVs, and 75,000 rebates for PHEVs, measured from the start of FY 2014-15 when the Board put the milestones in place. The evaluation regarding whether to reduce rebates also includes an analysis of metrics described earlier in this document – the state of the ZEV market, household ownership patterns, and manufacturer achievements.

While the ZEV market continues to grow, vehicle sales have not yet reached these technology evaluation milestones as shown in Figure 5, so staff does not recommend lowering CVRP rebate levels at this time. Throughout the Funding Plan development process, staff heard from a broad range of stakeholders that the market is not yet at a state where rebates should be phased down, so there is general support for staff’s recommendation.

Figure 5: Progress Toward CVRP Technology Evaluation Milestones



Staff will continue to assess the state of the market and develop a long-term plan for CVRP in the FY 2016-17 Funding Plan as required by SB 1275. As part of that assessment, staff will reevaluate the milestone and metrics established in the FY 2014-15 Funding Plan and the appropriate time to start a phase down of rebates.

Consideration of the Conversion to Prequalification and Point-of-Sale Rebates or Other Methods to Increase Participation Rates: In developing past Funding Plans, staff has previously considered transitioning CVRP to a prequalification or point-of-sale model and continues to evaluate the merits of such changes relative to the current project

¹⁹ For full discussion, see pages 40-41 of the FY 2014-15 Funding Plan: http://www.arb.ca.gov/msprog/aqip/fundplan/final_fy1415_aqip_ggrf_fundingplan.pdf

design. Participation in CVRP is high among California ZEV purchasers, and CVRP participants generally rate their experience positively in surveys. Based on a review of DMV data, CVRP has supported the purchase or lease of approximately 70 percent of all advanced clean cars in California, leaving around 30 percent of consumers who did not apply for a rebate. Possible reasons may be that consumers were not eligible because they did not meet the minimum CVRP ownership requirements, consumers decided they did not need a rebate, or consumers were not aware of CVRP.

Converting CVRP to a point-of-sale model would likely increase participation, but may lead to providing rebates to consumers who would have purchased or leased advanced technology vehicles without CVRP, further increasing the funding demand. In addition, CVRP is popular due to its simplicity and user friendliness. The introduction of income eligibility limits as required by SB 1275 already adds one significant change to CVRP. Modifying the project further at this time could add complexities, confuse consumers, and add to dealer responsibilities. Also, staff believes the current centralized rebate application process provides the most effective approach to implement the income eligibility limits being introduced this year in order provide appropriate oversight and the ability to make adjustments as necessary.

Staff recognizes, however, there are benefits to a point-of-sale rebate structure, especially for lower-income consumers. Some stakeholders have commented that a point-of-sale rebate model would help lower-income consumers by reducing the upfront cost the consumer incurs while waiting for the CVRP rebate to be issued. Staff will work with stakeholders to evaluate the potential for point-of-sale or prequalification approach for future funding cycles. Further, staff will continue to investigate other approaches that promote the sale of ZEVs and PHEVs at the dealer level and expand the opportunities for lower income consumers to participate.

Eligibility is Limited Based on Income: To establish an income eligibility limit, staff reviewed other programs that defined income thresholds, analyzed CVRP survey data, and considered stakeholder feedback during the public process. Staff used two guiding principles in developing the proposal:

- The income eligibility limit should support continued growth of the ZEV market to meet the broader SB 1275 goals to deploy 1 million ZEVs by 2023 and establish a self-sustaining market and the Governor's goal of 1.5 million ZEVs by 2025. To meet this principle, staff is striving to establish income eligibility for the project in a way that targets incentives towards those likely to value the rebate most in deciding to make a ZEV purchase.
- Take a simple approach for the first year. Stakeholders continue to comment that one of the keys to the success of CVRP is its simplicity. It is easy for consumers to access rebates, and the rules are easy to understand. To meet this principle, staff is aiming to limit eligibility by income in a way that is both simple to understand and straightforward to implement. If necessary, requirements can be modified in the future.

Staff proposes a two pronged approach for establishing income eligibility limits: (1) an income cap that would exclude the higher-income consumers most likely to purchase a ZEV without a CVRP rebate coupled with (2) higher rebate levels for low- and moderate-income consumers most in need of financial incentives to purchase a CVRP eligible vehicle. Staff believes this approach meets the SB 1275 direction while improving CVRP’s effectiveness by targeting rebates where they are likely to have the greatest impact.

Table 5 summarizes the proposed CVRP rebate amounts for BEVs, PHEVs, and FCEVs under this two pronged approach. The rationale for these proposals is discussed further below.

Table 5: Summary of Proposed CVRP Rebate Amounts

	Filing Status	Income Level	Vehicle Type		
			FCEVs	BEVs	PHEVs
Increased Rebates for Low/Moderate Income	< 300 percent of federal poverty level (FPL)		\$6,500	\$4,000	\$3,000
Standard Rebate	Individual	300% of FPL to \$250K	\$5,000	\$2,500	\$1,500
	Head-of-Household	300% of FPL to \$340K			
	Joint	300% of FPL to \$500K			
Income Cap	Individual	> \$250K	\$5,000	Not Eligible	
	Head-of-Household	> \$340K			
	Joint	> \$500K			

Income Cap for Higher-Income Consumers: Staff proposes to establish income eligibility limits consistent with Proposition 30, a ballot initiative approved by California voters in 2012. Proposition 30 temporarily increased taxes on higher-income tax payers. It provides a case where the voters of California established a definition of what could be considered “higher income” levels. Staff proposes setting a CVRP income eligibility cap at the same income thresholds established in Proposition 30. Consumers would not be eligible for CVRP rebates if their gross annual incomes are above the following thresholds:

- \$250,000 for single filers
- \$340,000 for head-of-household filers
- \$500,000 for joint filers

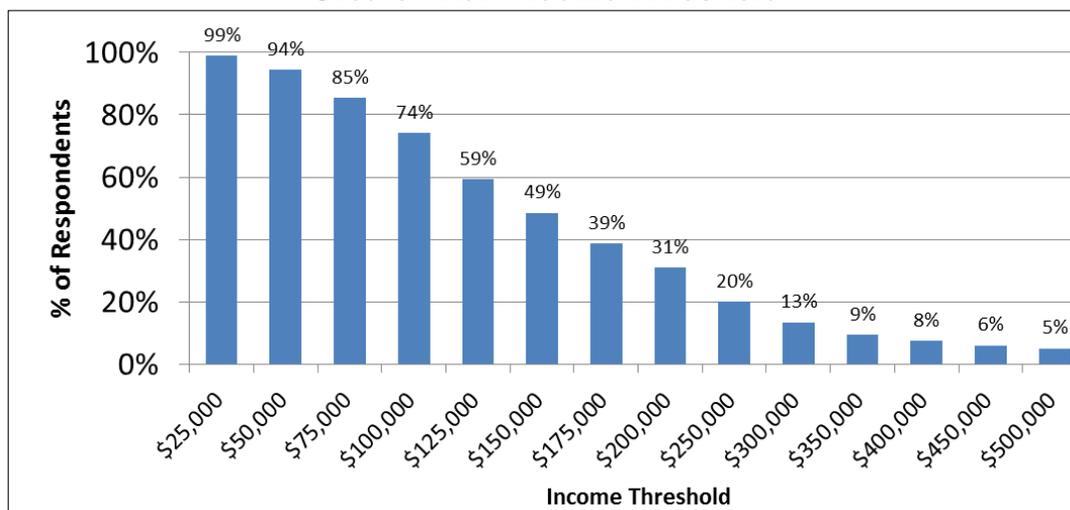
By aligning with Proposition 30, staff is relying on an already established program to set an income cap for higher income consumers, while taking into account recommendations of stakeholders during the public process. Staff proposes to apply the income cap to all eligible vehicle types except FCEVs (as shown in Table 4 and

discussed below). Moreover, the income cap may be adjusted in future funding cycles, and staff will evaluate the impact after implementation when more data become available.

Staff evaluated demographics data and purchase motivation information provided by CVRP survey respondents to assess the impact of an income cap. The data show that while consumers in all income brackets value the CVRP rebate in their purchase decisions, it has a greater value at lower household income levels.

Based on the distribution of CVRP survey respondents by household income shown in Figure 6, the proposed income cap would only exclude a small percentage CVRP participants. Thus, the potential impact to market growth should be minimized, meeting staff's first guiding principle for designing the proposal for limiting CVRP eligibility by income.

Figure 6: Percentage of CVRP Survey Respondents with Household Income Greater than Income Threshold



Staff proposes exempting FCEV consumers from the income cap for the next three funding cycles, with an annual Board reevaluation of the exemption based on a review of FCEV sales. FCEVs are at a much earlier phase of commercialization than BEVs or PHEVs, but manufacturers are planning a larger rollout of FCEVs in the near future. To support the initial commercial FCEVs deployment, the Board approved an increased rebate amount of \$5,000 for FCEVs in the FY 2014-15 Funding Plan consistent with the rebate levels offered to BEVs when these vehicles were in the same stage of commercialization. At this very early stage of commercialization, staff wants to ensure the same level of State support afforded to BEVs when they were first commercially released. Once FCEV sales reach higher volumes, staff believes income eligibility limits matching those for BEVs and PHEVs would be appropriate.

During the public process, staff received feedback from some stakeholders supporting income eligibility at levels matching those in Proposition 30, while others commented

that an income eligibility limit cap should be set at lower thresholds. Specifically, one stakeholder group suggested limiting CVRP participation to households earning less than \$400,000 and single filers earning less than \$250,000. Staff considered the recommendation for a household income threshold of \$400,000, but is concerned that if the limit is set too low it would limit growth of the ZEV market at this key early stage thereby impacting California's ability to meet the ZEV deployment targets established by SB 1275 and the Governor.

Increased Rebate Levels for Low- and Moderate-Income Consumers: To complement the income cap excluding higher-income consumers, staff proposes increased rebate levels for low- and moderate-income consumers as the second element of its two pronged approach for establishing the SB 1275-required income eligibility limits. This is aimed at supporting the purchase of advanced technology vehicles by low- and moderate-income consumers as well as helping offset the possible slowing of ZEV market growth associated with the proposed income eligibility limit. This approach was suggested by a number of stakeholders during the Funding Plan development process.

Better incentivizing low- and moderate-income consumers should increase the effectiveness of the program by supporting the purchase of advanced clean vehicles to consumers that value the rebates the most. Staff's proposal may also provide additional benefits to disadvantaged communities by increasing access for low- and moderate-income consumers to zero-emission and near-zero-emission vehicles, one of the key goals of SB 1275.

Staff proposes that eligibility for increased rebate amounts for low- and moderate-income consumers be open to consumers with household incomes less than or equal to 300 percent of the federal poverty level. Staff recommends basing eligibility on a percent of the federal poverty level because this is the same approach used for other low- and moderate-income based vehicle incentive programs. The Enhanced Fleet Modernization Program (EFMP) pilot retire and replace option offers differing incentive levels depending on whether an applicant's household income is less than 225 percent, 300 percent, or 400 percent of the federal poverty level. Basing CVRP eligibility on a percent of the federal poverty level would allow this element of CVRP to integrate most easily with these other programs. Staff chose the 300 percent level, matching the threshold for the middle tier of EFMP tiered incentive levels.

Staff proposes to increase rebate amounts by \$1,500 per rebate for FCEVs, BEVs, and PHEVs for consumers with household incomes less than 300 percent of the federal poverty level. The federal poverty level is updated annually. For 2015, 300 percent of the federal poverty level translates to the incomes shown in Table 6.

Table 6: 300 Percent of Federal Poverty Level for 2015

Persons in Family/Household	300 Percent of Federal Poverty Level
1	\$35,310
2	\$47,790
3	\$60,270
4	\$72,750
5	\$85,230
6	\$97,710
7	\$110,190
8	\$122,670

For families/households with more than 8 persons, add \$12,480 for each additional person.

A coalition of stakeholders advocating for higher rebates for low- and moderate-income consumers recommended eligibility thresholds for \$37,500 for individuals and \$75,000 for households (without specifying differing levels based on number of people in the household). Staff's proposal is close to this general range. As noted above, staff prefers basing the household income on a percentage of the federal poverty level because it allows CVRP rebates to be coordinated more directly with the EFMP retire and replace option as well as the EFMP Plus-Up pilot described later in this chapter. It also allows for higher eligibility thresholds for larger household sizes.

Staff's proposed rebate increase of \$1,500 per vehicle is close to the level recommended by these same stakeholders. The coalition of stakeholders recommended BEV rebates of \$4,000 and PHEV rebates of \$3,500 for low- and moderate-income consumers compared to staff's proposal of \$4,000 for BEVs and \$3,000 for PHEVs. The coalition did not recommend a specific increase rebate level for FCEVs, whereas staff proposes \$6,500.

By providing higher rebate amounts for low- and moderate-income households, CVRP may help bridge the income difference between new conventional car buyers and advanced clean car buyers to increase adoption. This proposal may provide additional benefits to disadvantaged communities as CVRP survey and rebate data showed that consumers with lower incomes are more likely to live in a ZIP code containing a disadvantaged community. This proposal helps to support the SB 1275 goal to increase access and placement of advanced technology vehicles in disadvantaged, low-income, and moderate-income communities.

Staff received suggestions that increased rebate amounts for low- and moderate-income consumers should be separated from CVRP as a standalone pilot project. Staff did not incorporate this suggestion because it believes the current centralized, simple rebate application process would provide the most effective approach to implementing this proposal in its first year in order provide oversight and ability to make adjustments as necessary. CVRP is a statewide program with broad consumer outreach and dealer training elements already embedded to reach low- and moderate-income consumers without the need to develop a different outreach strategy.

For example, the application submission and project information was recently translated and are now available in Spanish on the updated CVRP website. The Center for Sustainable Energy (the CVRP administrator) is also planning to extend this to other languages to help increase participation. The Center for Sustainable Energy has already started targeted outreach in disadvantaged communities. Building on this, ARB will direct that additional CVRP outreach be focused on disadvantaged communities and lower-income populations in the FY 2015-16 grant agreement.

Implementation of Project Modifications: SB 1275 directs ARB to adopt the income eligibility limit by June 30, 2015. The new limits shown in Table 5 would go into effect approximately four to six months after the adoption of the FY 2015-16 Funding Plan to allow time to make the necessary project changes. These include consumer outreach and education, dealer training on the new requirements, updates to CVRP application and web site redesign, and development of data security procedures. During the four to six month period while programmatic changes and implementation strategies are being developed, CVRP will continue to operate without the income limit changes.

As mentioned previously, staff proposes to base the income limits on gross annual income for individual, head-of-household, and joint filers. Entities that are currently eligible for CVRP rebates include individuals, businesses, government entities, car share service providers, and rental car fleets. Staff proposes to apply the income eligibility limits to individuals only. All other entities (businesses, government entities, etc.) would be exempt from income eligibility and may still apply for CVRP rebates without the income restrictions. For these entities, the standard CVRP rebate shown in Table 5 would still apply (\$2,500 for BEVs, \$1,500 for PHEVs, and \$5,000 for FCEVs). As shown in Table 7, about 97 percent of CVRP rebates to date have been issued to individual consumers to date, so these exempt entities only account for about 3 percent of the CVRP participants.

Table 7: Rebates by Applicant Type

Applicant Type	Rebates	Total Dollars	Percentage of Total Dollars
Individual	99,611	\$209,768,263	96.7%
Business	2,994	\$6,894,811	2.9%
Local government agency	225	\$487,600	0.2%
State government agency	115	\$203,250	0.1%
Non-profit organization	82	\$152,150	0.1%
Federal government agency	29	\$37,700	0.0%
TOTAL	103,056	\$217,543,774	100%

Through April 30, 2015

As part of the CVRP application process and to determine income eligibility, applicants will provide information on their income, their federal tax filing status (individual, head-of-household, or joint), whether they are claimed as a dependent on someone else's tax

return, and household size. Applicants who are claimed as dependents would not be eligible for increased rebates regardless of their income.

To verify reported income, staff proposes random income verification evaluations during the application process prior to issuing rebate checks. The CVRP grantee would conduct random income verification checks as a part of their responsibilities and requirements for administering CVRP by contacting the randomly selected applicants and requesting documentation to verify the income and filing status reported on their application. This pre-rebate random verification approach is similar to the auditing approach used by the Bureau of Automotive Repair (BAR) in its Consumer Assistance Program.

In work group discussions, staff had considered other approaches such as requesting tax forms from all CVRP participants including the Internal Revenue Service Form 4506, *Request for Transcript of Tax Return* and Franchise Tax Board Form 3516, *Request for Copy of Personal Income Tax or Fiduciary Return*, which would allow for auditing after rebates are issued. However, staff believes at this time the pre-rebate verification approach described above would be an effective but less intrusive and burdensome approach. Staff will optimize the processes for verifying income during the four to six months staff proposed to implement modifications to the project.

Establishing Project Budget: As part of the Funding Plan development, staff estimated that rebate demand for the FY 2015-16 funding cycle is about 70,000 rebates based on projecting forward historical rebate demand. Staff acknowledges the inherent uncertainty in predicting demand during periods of dynamic growth currently being observed in the light-duty ZEV market. However, staff's estimates are consistent with independent estimates shared by various stakeholders. This translates to a funding need in the \$150 to \$160 million range before considering the proposed SB 1275 income eligibility changes.

The proposed income eligibility changes would impact rebate demand and funding need, but it is not possible to estimate the exact impact due to limited data. Staff estimates the proposed income cap would reduce rebate demand by a small amount based on the demographic distribution shown in Figure 6. This would be offset by the proposed higher rebates levels for low- and moderate-income consumers which would increase funding need and should increase demand for this consumer segment. However staff has no data upon which to estimate how much demand would increase. For the purposes of setting a proposed CVRP budget, staff made the following bounding assumptions to estimate potential impacts of the proposed changes and assumed these changes would be implemented for the second-half of the budget cycle:

- The income cap on higher incomes could reduce CVRP demand in the 5 percent range.

- Higher rebates for lower income consumers could increase CVRP demand among households with incomes less than 300 percent of the federal poverty level by 10 to 30 percent.

Factoring these assumptions together, staff expects a CVRP demand in the \$155 to \$165 million range for the FY 2015-16 matching the proposed \$163 million CVRP allocation.

Waiting List Provision: In past years, 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. Staff believes the proposed \$163 million budget will meet rebate demand for the full funding cycle, but acknowledges the uncertainties in its forecasts. Staff proposes that the Board provide the Executive Officer discretion to establish a waiting list to bridge the gap between budget years in the event that CVRP runs short of funding prior to the end of FY 2015-16.

Disadvantaged Community Benefits: CVRP will continue to be implemented on a first-come, first-served, statewide basis, so it is not possible to estimate in advance how much funding will benefit disadvantaged communities. However, a review of CVRP rebates issued to date indicates that about 37 percent of CVRP funding has provided benefits to disadvantaged communities, and about 6 percent of the funding has been spent in disadvantaged communities. Staff expects a similar percentage of future CVRP rebates will benefit these communities and perhaps the fraction will increase with the higher rebates for lower income consumers. As part of the reporting requirements associated with GGRF funding, ARB will track where these funds are spent, so it can calculate the portion that benefits disadvantaged communities. In Table 2 (Chapter 2), staff included a conservative estimate that at least 25 percent of the FY 2015-16 CVRP funding will benefit disadvantaged communities in order to demonstrate how ARB will meet its overall disadvantaged communities investment commitment.

Project Solicitation: ARB selected a grantee to administer FY 2014-15 CVRP funds via a 2-year competitive solicitation with the option of adding the FY 2015-16 funds with an updated grant agreement. ARB staff proposes to utilize this option, and therefore, ARB would not issue a new solicitation for the FY 2015-16 funds. All changes to CVRP criteria and requirements approved by the Board would be incorporated into the updated grant. In the event that ARB is unable to pursue this option, ARB would issue a new solicitation, as it has in each past funding cycle.

LONG-TERM PLAN

The ZEV market is continuing to grow dynamically and there is a clear need to evaluate the effectiveness of investments toward CVRP. As discussed at the beginning of the chapter, staff proposes to utilize the metrics of success identified in the FY 2014-15 Funding Plan as part of the process to inform CVRP's long-term plan. The metrics help

ensure that the project is sustainable and can adapt to a changing market with increasing participant demand while ensuring the project is as effective as possible in encourage continued transformation of California's clean vehicle market.

Also, as noted earlier, a longer-term plan for CVRP will be developed and included in the FY 2016-17 Funding Plan in part to address the SB 1275 direction that ARB incorporate into that plan a forecast of the projected funding needs for CVRP and related programs for the immediate fiscal year and two subsequent fiscal years, a market and technology assessment to inform funding decisions, and an assessment of when a self-sustaining market is expected.

Several efforts are currently underway to address these requirements. ARB is currently conducting a midterm review of the Advanced Clean Cars program. The review will evaluate all three components of the program: low emission vehicle criteria pollutant standards, focusing on particulate matter; California and national GHG standards; and the ZEV requirements for model years 2018 and beyond. As part of the review, staff plans to update technical assumptions for PHEVs, BEVs, and FCEVs, as well as cost assumptions for these technologies. As part of this effort, staff has also initiated studies on consumer attitudes and behavior to understand how the ZEV market may evolve and to better understand sales trends in California and partnering ZEV states. ARB will complete its midterm review of the Advanced Clean Cars program in late 2016.

ARB has initiated a new research effort to investigate factors that impact clean vehicle adoption, assess effectiveness of different financial incentive program structures, and evaluate efficient incentive funding levels for low- and moderate-income consumers. Staff is currently in the process of evaluating proposals. The results of the research will inform potential options for modifying ARB's incentive programs to ensure they make the best use of limited State resources, as well as provide benefits to underserved populations and disadvantaged communities. It is estimated that the completion of the potential research project, once selected, will be in the 2017 to 2018 timeframe.

The completion dates for the midterm review and the research efforts may run past the timelines for developing the FY 2016-17 Funding Plan which will be released in May 2016. However, staff anticipates that preliminary results from the evaluation efforts will help in the development of the longer-term plan. Staff will continue to refine CVRP each year as more information becomes available.

Light-Duty Pilot Projects to Benefit Disadvantaged Communities

Proposed project allocation: Low Carbon Transportation – \$37 million
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PROJECT OVERVIEW AND GOALS

The FY 2014-15 Funding Plan included a suite of four new light-duty pilot projects to benefit disadvantaged communities. These projects are aimed at increasing access to cleaner vehicle technologies for lower income consumers and disadvantaged communities and reducing GHG, criteria pollutant, and toxics emissions.

In parallel, SB 1275 directs ARB to establish programs to increase access to zero-emission and near zero-emission vehicles for lower income Californians and disadvantaged communities. Specifically, SB 1275 added Health and Safety Code Section 44258.4(c)(4) which directs ARB to:

(A) Establish programs that further increase access to and direct benefits for disadvantaged, low-income, and moderate-income communities and consumers from electric transportation, including, but not limited to, any of the following:

(i) Financing mechanisms, including, but not limited to, a loan or loan-loss reserve credit enhancement program to increase consumer access to zero-emission and near-zero-emission vehicle financing and leasing options that can help lower expenditures on transportation and prequalification or point-of-sale rebates or other methods to increase participation rates among low- and moderate-income consumers.

(ii) Car sharing programs that serve disadvantaged communities and utilize zero-emission and near-zero-emission vehicles.

(iii) Deployment of charging infrastructure in multiunit dwellings in disadvantaged communities to remove barriers to zero-emission and near-zero-emission vehicle adoption by those who do not live in detached homes. This clause does not preclude the Public Utilities Commission from acting within the scope of its jurisdiction.

(iv) Additional incentives for zero-emission, near-zero-emission, or high-efficiency replacement vehicles or a mobility option available to participants in the enhanced fleet modernization program, established pursuant to Article 11 (commencing with Section 44125) of Chapter 5.

(B) Programs implemented pursuant to this paragraph shall provide adequate outreach to disadvantaged, low-income, and moderate-income communities and consumers, including partnering with community-based organizations.

CURRENT PROJECT STATUS AND STAFF PROPOSAL FOR FY 2015-16

For FY 2015-16, staff proposes to build upon last year's investments and fulfill statutory direction from SB 1275 to establish these types of programs by allocating \$37 million for light-duty vehicle pilot projects that benefit disadvantaged communities, an increase of \$28 million over the \$9 million funding level provided in the FY 2014-15 Funding Plan. Staff proposes continuing and expanding each of the four pilot projects being launched with the FY 2014-15 appropriation with the addition of a new pilot project targeting turnover of the agricultural worker vanpool fleet in the San Joaquin Valley. These five projects are shown in Table 8 and described below.

Table 8: Proposed Light-Duty Pilot Projects to Benefit Disadvantaged Communities for FY 2015-16

Pilot Project	FY 2014-15 Allocation (million)	Proposed FY 2015-16 Allocation (million)
Increased Incentives for Public Fleets	\$3	\$5
Car Sharing and Mobility Options	\$2.5	\$5
Enhanced Fleet Modernization Program (EFMP) Plus-Up	\$2	\$20
Financing Assistance	\$1.5	\$4
Agricultural Worker Vanpools in the San Joaquin Valley (<i>new</i>)	\$0	\$3
TOTAL	\$9	\$37

ARB staff conducted an extensive public process to develop each of the four pilot projects funded in FY 2014-15 beginning in September 2014 through February 2015, with solicitations and project selections following. Parallel to those efforts, ARB also conducted a public process to develop the proposed 2015-16 Funding Plan. The input from interested stakeholders throughout both processes helped to inform and shape the following proposals. At these meetings, many stakeholders commented that an increase in funding from the \$9 million allocated in FY 2014-15 is needed to expand these projects.

Increased Incentives for Public Fleets Pilot Project

Public fleets are not always eligible for additional incentives, such as the federal tax credit, that bring down the higher prices associated with advanced clean cars. Because of this and other barriers, local and State government fleets make up a very small number of the total rebates reserved in CVRP. The Public Fleet Incentive Pilot Project offers rebates of up to \$15,000 for public fleets to reduce emissions in neighborhoods that are already disproportionately impacted by pollution. It is operated as a set aside within CVRP.

- Current status of FY 2014-15 project:
 - Funding level: \$3 million.
 - Grant agreement executed in October 2014.
 - Project launched in February 2015.
 - Rebates for 86 vehicles totaling \$430,000 reserved by April 30, 2015.
 - Project web site: <http://energycenter.org/public-fleet-project>

- Staff proposal for FY 2015-16:
 - Funding level: \$5 million.
 - Reserve at least 50 percent of the funding to those fleets that are located in a disadvantaged community (last year's project allowed fleets in or benefiting a disadvantaged community). To meet this requirement, the fleet vehicle must be registered or domiciled within one of the disadvantaged community census tracts identified by Cal/EPA.
 - The remaining 50 percent of funding would be open to fleets that don't meet the "in a disadvantaged community" requirement, but meet the "benefit a disadvantaged community" requirement by being registered in one of the ZIP codes identified by ARB as containing a disadvantaged community census tract.²⁰
 - Retain all the other eligibility requirements from FY 2014-15.
 - Amend FY 2014-15 CVRP grant agreement to include FY 2015-16 funds for this pilot project and continue to implement as a set-aside within CVRP.

Car Sharing and Mobility Options Pilot Project

Car sharing allows individuals to benefit from the use of private automobiles without the responsibility of car ownership costs. The Car Sharing and Mobility Option Pilot Project provides funding to establish advanced clean car sharing fleets in or near disadvantaged communities to offer an alternate mode of transportation and encourage the use of advanced technology cars, including PHEVs, BEVs, and FCEVs. This pilot project will gather data that could help support future larger scale advanced technology car share programs. Car sharing is identified as a potential disadvantaged community program for ARB to fund in Health and Safety Code Section 44258.4(4)(A)(ii). In addition, funding for infrastructure at multiunit dwellings (an eligible component for car sharing projects) is also identified as a potential funding category in Health and Safety Code Section 44258.4(4)(A)(iii).

- Current status of FY 2014-15 project:
 - Funding level: \$2.5 million.
 - Solicitation released in February 2015 and closed in April 2015.
 - 13 applications totaling over \$16 million were received (oversubscribed by \$13.5 million).
 - Project selection anticipated to take place in May 2015.

²⁰ Qualifying census tracts and ZIP codes are listed on ARB's web site at: <http://www.arb.ca.gov/cc/capandtrade/auctionproceeds/535investments.htm>

- Staff proposal for FY 2015-16:
 - Funding level: \$5 million.
 - Award grant funding via a new competitive solicitation.

Enhanced Fleet Modernization Program Plus-up Pilot Project

As an augmentation to ARB's EFMP, the EFMP Plus-up Pilot Project focuses on promoting advanced technology vehicle replacements (new or used) for lower-income consumers. This pilot project provides an additional incentive amount above the base incentive under district-run EFMP scrap and replace programs for lower-income consumers in and near disadvantaged communities who retire older, higher-emitting vehicles and replace them with used or new hybrid, plug-in hybrid, or zero-emission vehicles. These incentives may be combined with other incentive and financing programs, such as low-cost loans and CVRP rebates. In addition, this pilot project provides an additional incentive for the purchase and installation of electric vehicle supply equipment (EVSE) at single family residences or multiunit dwellings.

EFMP Plus-up is identified as a potential disadvantaged community program for ARB to fund in Health and Safety Code Section 44258.4(4)(A)(iv). During the Funding Plan development process, this project was identified by stakeholders as a top priority for additional funding beyond the \$2 million provided in FY 2014-15.

In the FY 2014-15 funding cycle, the EFMP Plus-Up Pilot Project was limited to the South Coast and San Joaquin Valley, the two regions identified to implement the EFMP scrap and replace programs in ARB's EFMP regulation.²¹ For FY 2015-16, staff proposes extending eligibility to any air district that implements a vehicle scrap and replacement program meeting the minimum requirements established in the EFMP regulation and requests to participate in the EFMP Plus-up Pilot Project. For the South Coast and San Joaquin Valley air districts, existing grants for the FY 2014-15 funding cycle will be amended to add funding from FY 2015-16. New grants will be created to award FY 2015-16 funding to air districts participating in the EFMP Plus-up Pilot Project for the first time.

The proposed \$20 million funding level was established based on input from interested air districts and other interested stakeholders. Staff will continue to coordinate with air districts to assess current demand and expected need for EFMP Plus-up Pilot Project funding for each air district.

- Current status of FY 2014-15 project:
 - Funding level: \$2 million.
 - Grant agreements with San Joaquin Valley Air Pollution Control District and South Coast Air Quality Management District to implement EFMP Plus-up programs anticipated to be signed in May or June 2015.

²¹ <http://www.arb.ca.gov/msprog/aqip/efmp/efmp.htm>

- Staff proposal for FY 2015-16:
 - Funding level: \$20 million.
 - Allow participation for all air districts that implement a vehicle scrap and replacement program that meets the minimum requirements established in the EFMP regulation.
 - Amend FY 2014-15 grant agreements with South Coast and San Joaquin Valley to include FY 2015-16 funds and enter into new grant agreements with additional air districts.
 - ARB will coordinate with all participating air districts to determine appropriate funding allocations for each air district based on existing and expected demand.

Financing Assistance Pilot Project

Vehicle financing is a significant barrier to vehicle ownership for some lower-income consumers. The Financing Assistance Pilot Project is intended to provide financing assistance, such as loan loss guarantees for financial institutions, interest rate buy-downs, or vehicle price buy downs through non-profit organizations that are already lending to lower income consumers, where the consumer is purchasing an advanced technology vehicle instead of a conventional gasoline vehicle. The goal of this pilot project is to improve financing options for lower income consumers living in or near disadvantaged communities who are interested in acquiring advanced technology vehicles. In addition to vehicle financing, this pilot project covers financing for the purchase and installation of EVSE at a residence, including multiunit dwellings. By helping consumers that would not typically qualify for conventional financing, this pilot project may help to increase the number of cleaner advanced technology vehicles in and near disadvantaged communities. Financing assistance is identified as a potential disadvantaged community program for ARB to fund in Health and Safety Code Section 44258.4(4)(A)(i).

- Current status of FY 2014-15 project:
 - Funding level: \$1.5 million.
 - Solicitation released in March 2015 and closed in May 2015.
 - Project selection anticipated to take place in June 2015.
- Staff proposal for FY 2015-16:
 - Funding level: \$4 million.
 - Award grant funding through a combination of a new competitive solicitation and a non-competitive interagency agreement with the State Treasurer.

Agricultural Worker Vanpools in the San Joaquin Valley Pilot Project

Vanpools benefiting disadvantaged communities were an eligible project type in the FY 2014-15 Car Sharing and Mobility Options Pilot Project. During the Funding Plan development process, stakeholders presented a compelling case for a new, standalone

pilot project to provide expanded access to cleaner transportation options for agricultural workers in the San Joaquin Valley's disadvantaged communities and much needed emission reductions. These stakeholders urged consideration of incentives to turn over the fleet of older, higher emitting vanpool vehicles that serve agricultural workers.

Based on this input, staff proposes a new pilot project for FY 2015-16 to incentivize the purchase of new HVIP-eligible zero-emission, plug-in hybrid, and hybrid passenger vans to turn over the existing fleet or to expand availability to new riders. Conversions of appropriate vehicles in the existing fleet to bring them to up to advanced clean technology, and EVSE for appropriate multi-unit dwellings may also be considered. Because this is proposed as a new standalone project, staff will use a public work group process with stakeholders to more fully develop the parameters for this project as it did in developing the pilot projects funding in FY 2014-15. As noted earlier in this section, car sharing is identified as a potential disadvantaged community program for ARB to fund in Health and Safety Code Section 44258.4(4)(A)(ii).

- Staff proposal for FY 2015-16:
 - Funding level: \$3 million.
 - Eligibility is limited to projects that serve disadvantaged community census tracts.
 - Use public work group process to develop project parameters, including assessment of optimal method to select projects and award grants.

Disadvantaged Communities Investment Targets

All of the \$37 million proposed for these pilot projects must benefit disadvantaged communities. However, to ensure that ARB meets its target that at least 10 percent of its Low Carbon Transportation investments are made in disadvantaged community census tracts, staff proposes that the full \$3 million Agricultural Worker Vanpools in the San Joaquin Valley Pilot Project and at least half of the \$5 million Increased Incentives for Public Fleets Pilot Project funding be reserved for applicants that meet the requirement of being located within a disadvantaged community census tract. ARB's *Investments to Benefit Disadvantaged Communities: Interim Guidance to Agencies Administering Greenhouse Gas Reduction Funding Monies* provides the criteria for evaluating benefits to disadvantaged communities. Staff will use this guidance document to determine whether potential projects meet the requirement for benefiting or being located in a disadvantaged community. (See Chapter 2 for a broader discussion on the disadvantaged community investment targets for ARB's Low Carbon Transportation appropriation.)

Other Projects Considered

Staff considered an incentives pilot project for the purchase of low rolling resistance tires to increase use of this technology in the replacement tire market. This technology holds promise for obtaining increased fuel efficiencies and emission reductions in the

light-duty fleet. However, staff does not recommend such a project at this time because low rolling resistance tires are not yet certified either nationally or in California (ARB does not have certification authority for this technology), so there is no uniform standard in place to identify tires as low rolling resistance tires or to verify emission reductions. More study is needed to verify potential fuel savings and emission reductions, and further analysis is needed regarding which vehicles are appropriate for low rolling resistance tires. ARB will monitor the National Highway Safety Traffic Administration's tire rating program and, if appropriate, reconsider this type of project in future funding cycles.

Staff also considered but does not recommend an incentives pilot project for hydrogen canister fuel cell neighborhood vehicles because these vehicles are not yet certified for sale in California. They may become eligible under CVRP once they are certified.

LONG-TERM PLAN

The coming years present several important goals for the penetration of ZEVs into California's light-duty vehicle fleet. These pilot projects are essential components of ARB's efforts to transform California's transportation fleet and meet ZEV deployment goals, 2031 ozone standard, and the State's longer-term 2050 GHG emission reduction goals. Staff estimates that the funding need for the currently proposed light-duty pilot projects will continue to grow over the next several years to ensure the light-duty fleet is in the best position to meet these challenges. Further, staff foresees a growing need for innovative new projects that are just on the horizon, such as increased emphasis on deploying EVSE infrastructure in multiunit dwellings in disadvantaged communities and new project opportunities that may become apparent.

CHAPTER 4: HEAVY-DUTY VEHICLE AND OFF-ROAD EQUIPMENT INVESTMENTS

Policy and Statutory Drivers

Like the light-duty sector, extensive deployment of zero-emission freight and passenger transportation technologies in the heavy-duty sector will be needed to meet GHG emission targets by 2050 and the federal health-based ozone standards in 2023 and 2031 as underscored in ARB's *2014 Climate Change Scoping Plan Update*, *2012 Vision for Clean Air*, and *2015 Sustainable Freight: Pathways to Zero and Near Zero Emissions* discussion draft. Achieving a significant penetration of zero-emission technologies into the California fleet requires investment directed at advancing the current state of transformative technologies by demonstrating emerging technologies, advancing commercial viability through pilot and deployment projects, and catalyzing further technological development by the private sector. This is the focus of ARB's Low Carbon Transportation and AQIP investments in the heavy-duty vehicle and off-road equipment categories.

In addition, these investments support Governor Brown's goal to transform public and private fleets as outlined in the *ZEV Action Plan*, including actions specific to zero-emission transit and freight. Investments made in zero-emission transit buses will also yield valuable information to support updates to the Advanced Clean Transit regulations currently under development and scheduled for Board consideration in 2016.

The heavy-duty vehicle and equipment investment strategy for the proposed FY 2015-16 Funding Plan is guided by the newly established provisions of SB 1204. SB 1204 creates the California Clean Truck, Bus, and Off-Road Vehicle and Equipment Technology Program to fund the development, demonstration, precommercial pilot, and early commercial deployment of zero- and near-zero emission technologies with priority given to projects that benefit disadvantaged communities. This new program supported with Low Carbon Transportation funding builds on prior Low Carbon Transportation and AQIP investments, as shown in Table 9.

Table 9: Heavy-Duty Vehicle and Equipment Projects

Project	FY 2014-15 (millions)	FY 2015-16 (millions)
HVIP	\$10	\$12
Low NOx Truck Incentives (<i>new</i>)	-	\$7
Zero-Emission Truck Pilot Commercial Deployment Projects	\$25	\$20
Zero-Emission Bus Pilot Commercial Deployment Projects		\$45
Advanced Technology Demonstration Projects	\$50	\$59
Zero-Emission Freight Equipment Pilot Commercial Deployment Projects (<i>new</i>)	-	\$9
Truck Loan Assistance Program	\$10	\$15
Total	\$95	\$167

The proposed heavy-duty vehicle and equipment investment strategy also draws upon the findings in ARB’s 2015 *Draft Heavy-Duty Technology and Fuels Assessment Overview*,²² discussed later in this chapter, and the importance of focusing investments on technologies and applications that can lead to the most efficient development and deployment of technologies to achieve air quality and climate goals.

SB 1204 IMPLEMENTATION

SB 1204 establishes specific program planning and project eligibility requirements and directs ARB to use the existing AQIP Funding Plan process to develop the guidance necessary to implement the program. This chapter and Appendix B includes staff’s proposal to address each of the following requirements of SB 1204:

- *Program Guidance:* Health and Safety Code Section 39719.2(d) lists 10 requirements that should be addressed in ARB’s guidance for the California Clean Truck, Bus, and Off-Road Vehicle and Equipment Technology Program. In Appendix B, these 10 requirements are listed followed by ARB’s proposal to address each. In addition to, Health and Safety Code Section 39719.2(e) lists eight characteristics that ARB should consider in evaluating projects to fund; staff’s proposal addresses this direction.
- *Program Vision:* Health and Safety Code Section 39719.2(f) directs ARB to create an annual framework and plan for implementation of the California Clean Truck, Bus, and Off-Road Vehicle and Equipment Technology Program. The plan must include an overall vision for technology development and deployment. In this Chapter, staff presents the proposed plan.

²² ARB, *Draft Heavy-Duty Technology and Fuels Assessment: Overview*, April 2015. http://www.arb.ca.gov/msprog/tech/techreport/ta_overview_v_4_3_2015_final_pdf.pdf

- *Investment Requirement for Existing Heavy-Duty Technology:* Health and Safety Code Section 39719.2(b)(1) requires that at least 20 percent of truck investments support early commercial deployment of existing zero- and near-zero emission heavy-duty truck technology. Staff's proposal meets this requirement.

HEAVY-DUTY TECHNOLOGY AND FUELS ASSESSMENT

ARB's *Draft Heavy-Duty Technology and Fuels Assessment Overview* is a snapshot of the current state of technology for many heavy-duty on- and off-road vehicle and equipment types, combined with a look toward the future to identify when new advanced technologies can be introduced that increase efficiency and reduce or eliminate GHG and criteria pollutant emissions. The wide breadth of technologies examined in the technology assessment includes on-road trucks, off-road equipment, locomotives, commercial harbor craft, ocean going vessels, and others.

ARB began an outreach and research effort for the technology assessment in 2014 that culminated in a series of public workshops held in September 2014 with focused presentations on each of the categories. Work on the category specific reports is ongoing. The *Draft Heavy-Duty Technology and Fuels Assessment Overview* includes an overview of each category assessment, and is the prelude to the release of individual category reports beginning with *Technology Assessment: Heavy-Duty Hybrid Vehicles* and *Technology Assessment: Engine/Powerplant and Drivetrain Optimization and Vehicle Efficiency*. Other reports will follow soon thereafter.

Staff has incorporated near-term investment opportunities identified in the technology assessment into the proposed FY 2015-16 Funding Plan, such as the proposed pilot deployments of zero-emission transit, school and shuttle buses and urban delivery trucks since those vehicles operate in a duty-cycle that is optimal for currently commercialized zero-emission technologies. In addition, many of the advanced technology demonstration project concepts described later in this chapter fill needs mentioned in the technology assessment. These include the demonstration of zero-emission technologies transferring from drayage trucks into short and regional haul trucks, the goal of zero-emission miles from locomotives, and integration of zero-emission and near-zero emission technologies in cargo handling equipment, port operations, among others.

The technology assessment also provides a foundation for near-term development of advanced heavy-duty vehicle and equipment technologies with a vision for technologies developed in one category later expanding into new vocations and categories. Finally, the technology assessment also identifies opportunities to implement new strategies to increase efficiency while reducing operational costs and emissions such as with port automation, truck-to-truck communications, and logistical optimization.

As the category specific reports are issued in support of the *Draft Heavy-Duty Technology and Fuels Assessment*, findings will be integrated into future funding plans.

SUSTAINABLE FREIGHT STRATEGY

ARB's April 2015 *Sustainable Freight: Pathways to Zero and Near-Zero Emissions* discussion draft document outlines strategies for reducing NOx, PM2.5, toxics, and GHG emissions attributed to the freight transport sector. It includes strategies for reducing both near-term and long-term air quality impacts associated with freight transport. Recommended immediate actions include increased enforcement efforts at and near freight hubs along with financial incentives to replace older trucks and freight equipment.

Beyond the immediate actions, the *Sustainable Freight* document outlines several near-term measures, including actions to promote cleaner combustion in trucks, ocean-going vessels, and locomotives, and accelerated penetration of zero-emission trucks, buses, and equipment.

Finally, the *Sustainable Freight* document details a long-term vision for transitioning the freight sector to near-zero and zero-emission, and lists strategies for overcoming barriers to commercialization. This Funding Plan's proposals for advanced technology freight demonstrations, low NOx engine incentives, and truck and bus pilots will support the *Sustainable Freight* document vision to overcome the technical and economic challenges with zero-emission technology advancement.

COMPLEMENTARY HEAVY-DUTY INVESTMENT PORTFOLIO

Development of advanced heavy-duty technologies is supported by a portfolio of incentive programs that provide funding for the range of technologies needed to achieve deep near-term and long-term emission reductions. For example, funding for near-zero emission technologies complements continued funding for zero-emission pathway technologies, such as hybrid-electric vehicles, as they continue to develop and advance. In this Funding Plan, staff is proposing funding for near zero-emission technologies, such as trucks equipped with low NOx engines using renewable fuels, which reduce GHG emissions, support the LCFS, and complement the Energy Commission's funding for the production of biofuels through its Alternative and Renewable Fuel and Vehicle Technology Program. However, near-zero emission vehicles that use renewable fuels are likely to require less funding to incentivize their purchase compared to zero-emission vehicle technologies, such as battery-electric and fuel cells that have much higher incremental costs. Staff's proposed FY 2015-16 investments are designed to primarily support technologies that provide a pathway to zero-emission, while also providing funding options for the near zero-emission technologies that support near-term emission reduction goals.

As shown in Table 10, ARB and the Energy Commission have allocated significant investments in commercialized natural gas, hybrid, and zero-emission heavy-duty vehicles. However, no investments in near-zero emission technologies have occurred.

Table 10: Funding Allocated for Commercialized Advanced Technology Heavy-Duty Vehicles

Technology	Funding Amount* (Millions)
Conventional Natural Gas Vehicle Incentives	\$147
Near-Zero Emission Vehicle Incentives	\$0
Hybrid-Electric Vehicle Incentives	\$48
Battery-Electric Vehicle Incentives	\$13
Fuel Cell Vehicle Incentives	\$0

*Natural Gas Vehicle Incentives include \$60 million from the Energy Commission Alternative and Renewable Fuel and Vehicle Technology Program, \$23 million from ARB Goods Movement Emission Reduction Program, and \$64 million from ARB Lower Emission School Bus Program. Hybrid and Battery-Electric Vehicle Incentives expended by ARB Hybrid and Zero-Emission Truck and Bus Voucher Incentive Project for vehicles over 14,000 pounds gross vehicle weight rating

Because of the significant funding previously provided, staff does not recommend funding for conventional natural gas vehicles as part of this Funding Plan because of the significant need to support advancement of zero- and near zero-emission technologies. Funding for conventional natural gas vehicles currently remains available through the Energy Commission’s Alternative and Renewable Fuel and Vehicle Technology Program, including \$10 million allocated for FY 2015-16.

OVERARCHING VISION FOR HEAVY-DUTY VEHICLE INVESTMENTS

SB 1204 directs that the annual framework and plan required under Health and Safety Code Section 39719.2(f):

Articulate an overarching vision for technology development, demonstration, precommercial pilot, and early commercial deployments, with a focus on moving technologies through the commercialization process.

As described in Chapter 1, ARB included a vision in the FY 2014-15 Funding Plan that identifies how incentives support these phases of technology advancement. Staff proposes building on that vision and applying it to the California Clean Truck, Bus, and Off-Road Vehicle and Equipment Technology Program. This evolutionary role of incentives – through demonstration, pilot, commercialization, and transition – is described in Appendix B as part of the more detailed discussion of addressing SB 1204 requirements.

MEETING SB 1204 REQUIREMENTS FOR EARLY COMMERCIAL HEAVY-DUTY TRUCK DEPLOYMENTS

Health and Safety Code Section 39719.2(b)(1) requires that at least 20 percent of truck funding for California Clean Truck, Bus, and Off-Road Vehicle and Equipment Technology Program support early commercial deployment of existing zero-emission

and near-zero emission heavy-duty truck technology. This requirement does not apply to AQIP funded projects. Table 11 shows how staff's proposed funding allocations meet that requirement. A total of \$65 million from ARB's Low Carbon Transportation appropriation is proposed for heavy-duty truck projects, and \$35 million of that total, 54 percent, is proposed for early commercial truck deployment.

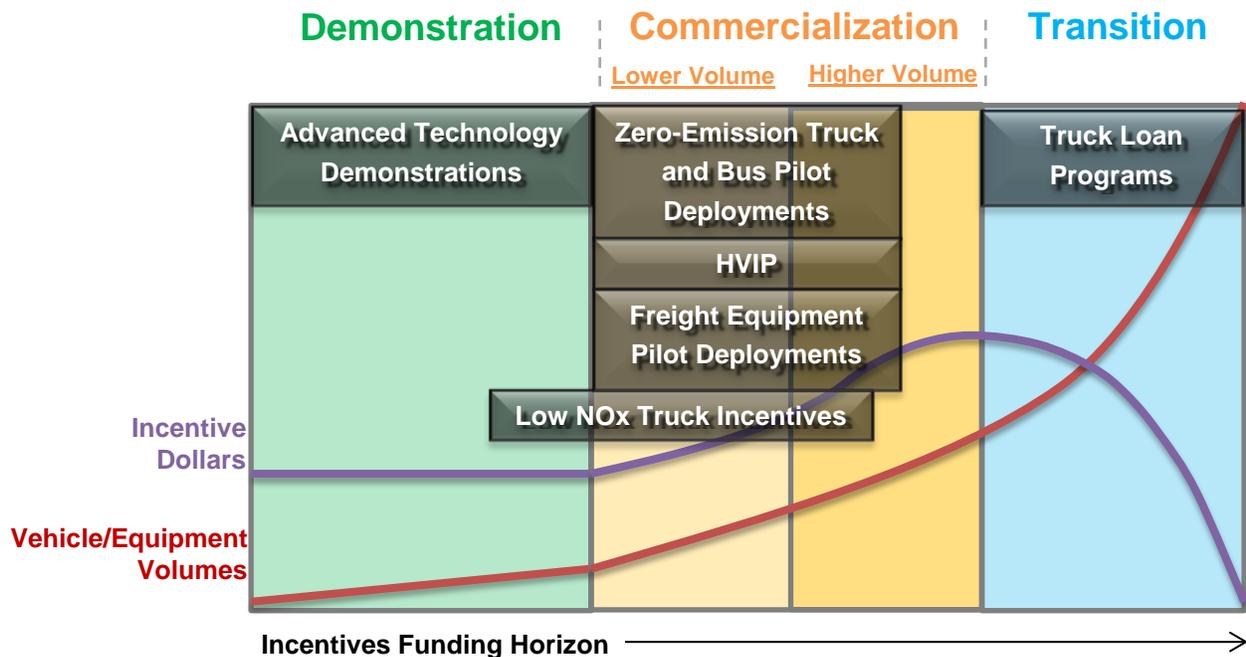
Table 11: Low Carbon Transportation Investments in Early Commercial Truck Deployments

Project	Proposed Low Carbon Transportation Funding (million)	Early Commercial?
HVIP	\$10 ¹	Yes
Low NOx Truck Incentives	\$5 ¹	Yes
Truck Pilot Commercial Deployment	\$20	Yes
Advanced Technology Demonstrations: On-Road Trucks	\$30	No

¹ This table includes Low Carbon Transportation funding. An additional \$2 million for HVIP and \$2 million for low NOx trucks is proposed from AQIP.

The remainder of this chapter provides staff's FY 2015-16 proposals for heavy-duty vehicle and equipment projects shown in Figure 7. These include HVIP, Zero-Emission Truck and Bus Commercial Deployment Projects, Low NOx Truck Incentives, Advanced Technology Demonstration Projects, and Zero-Emission Freight Equipment Commercial Pilot Deployment Project. Staff's proposal for the Truck Loan Assistance Program is provided in Chapter 5.

Figure 7: FY 2015-16 Heavy-Duty Vehicle and Equipment Investments



HVIP

Proposed project allocation:
Low Carbon Transportation – \$10 million
AQIP – \$2 million

PROJECT OVERVIEW AND GOALS

HVIP is the nation’s first program to directly reduce the up-front cost of hybrid or zero-emission trucks and buses, with fleets able to secure a voucher through their local participating dealership as part of their vehicle purchase order. HVIP incentives drive manufacturing production and fleet acceptance of the advanced heavy-duty vehicle technologies California must deploy to meet its long-term air quality and climate goals. Consumer incentives are needed because these products generally cost more than their 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.

HVIP is intended to encourage and accelerate the deployment of new hybrid and zero-emission trucks and buses in California. 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.

In the near-term, HVIP must incentivize more vehicle manufacturers to come to market with fully integrated hybrid truck and bus systems – in which the engine and driveline are specifically manufactured to work together seamlessly in a diversity of vocations and platforms – to maximize operational efficiency and ensure in-use emission benefits. Series hybrid technologies, where a vehicle is equipped with an electric drive system that is powered by an on-board generator, is particularly well-suited to help commercialize zero-emission technologies, provide zero emission miles, and serve as a pathway to help zero-emission technologies mature in the heavy-duty sector.

In addition, HVIP must continue to help accelerate demand for zero-emission trucks and buses, while increasing operation in disadvantaged communities.

CURRENT PROJECT STATUS

Since its launch in 2010, HVIP has provided over \$58 million to help California fleets purchase over 390 zero-emission and 1,720 hybrid trucks and buses. HVIP is also structured to enable leveraging of local, State, and federal funding. The Energy Commission (\$4 million), South Coast Air Quality Management District (\$2 million), Sacramento Metropolitan Air Quality Management District (\$500,000), and San Joaquin Valley Unified Air Pollution Control District (\$2 million) have all provided

voucher enhancements to accelerate fleet demand for hybrid and zero-emission trucks and buses. 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 growth.

HVIP provides vouchers of up to \$95,000 for California purchasers and lessees of zero-emission trucks and buses, and up to \$30,000 for eligible hybrid trucks and buses on a first-come, first-served basis. In addition, HVIP provides increased incentives for vehicles that provide benefits to disadvantaged communities. These vehicles qualify for vouchers up to \$110,000 for zero-emission trucks and buses.

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 hybrid trucks have driven recent hybrid truck demand increases. Tables 12 and 13 summarize 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 and attain health-based air quality standards.

Table 12: Vouchers Issued By Vocation

Vehicle Type	Vouchers Issued	Total Voucher Funds	Average Voucher	% of Total Vouchers
Parcel Delivery	829	\$20,888,000	\$25,197	39%
Beverage Delivery	440	\$14,680,000	\$33,364	21%
Other Truck	374	\$9,492,000	\$25,380	18%
Food Distribution	153	\$4,033,000	\$26,359	7%
Uniform & Linen Delivery	112	\$2,800,000	\$25,000	5%
Tow Truck	75	\$2,373,000	\$31,640	4%
LP Pick-up & Delivery	47	\$942,000	\$20,043	2%
Refuse Hauler	23	\$934,000	\$40,609	1%
School Bus	13	\$390,000	\$30,000	1%
Shuttle Bus	20	\$706,776	\$35,339	1%
Utility Truck	7	\$208,000	\$29,714	.3%
Urban Bus	19	\$1,375,000	\$72,368	.9%
Total	2,112	\$58,821,776	\$27,851¹	100%

Through April 30, 2015

¹Overall average for all HVIP vouchers issued to date.

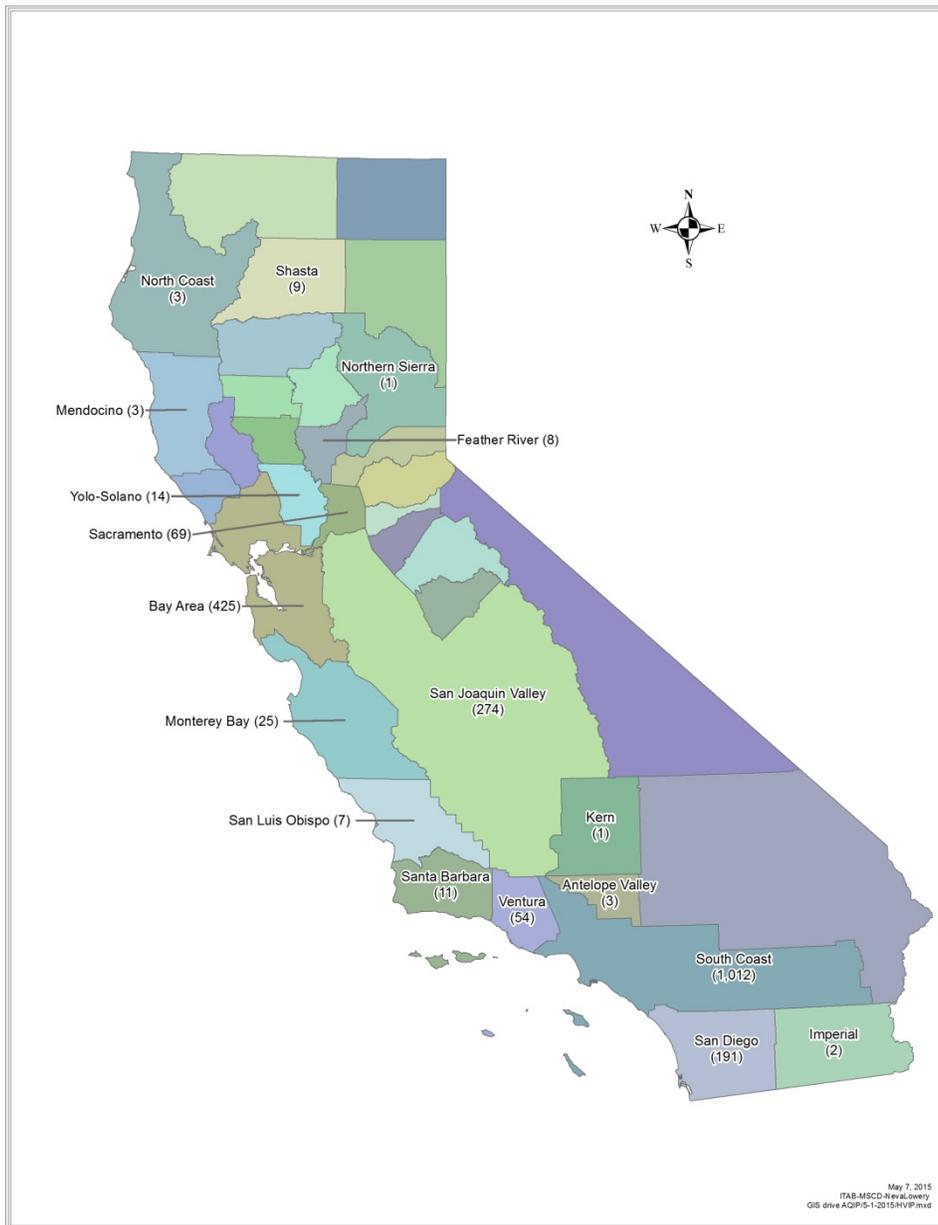
Table 13: Vouchers Issued By Gross Vehicle Weight Range

Gross Vehicle Weight Range	Vouchers Issued	Total Voucher Funds	% of Total Vouchers
5,001 – 6,000 lbs.	51	\$653,000	2%
6,001 – 10,000 lbs.	0	\$0	0%
10,001 – 14,000 lbs.	42	\$1,145,000	2%
14,001 – 19,500 lbs.	1,099	\$29,331,000	52%
19,501 – 26,000 lbs.	367	\$8,690,000	17%
26,001 – 33,000 lbs.	100	\$2,587,776	5%
>33,000 lbs.	453	\$16,415,000	21%
Total	2,112	\$58,821,776	100%

Through April 30, 2015

Figure 8 lists the distribution of vouchers by air district.

Figure 8: HVIP Funding by Air District



Through April 30, 2015.

Hybrid Vehicle Voucher Amounts and Certification Requirements: Table 14 lists the base per vehicle voucher amounts available for eligible hybrid trucks and buses.

Table 14: Eligible Hybrid Truck and Bus Voucher Amounts

Gross Vehicle Weight Rating (GVWR) (lbs) ¹	Base Vehicle Incentive	
	1 to 100 vehicles ²	101 to 200 vehicles
6,001 – 8,500 (plug-in hybrids only) ³	\$ 8,000	\$ 6,000
8,501 – 10,000 (plug-in hybrids only) ³	\$10,000	\$ 8,000
10,001 – 19,500	\$15,000	\$10,000
19,501 – 33,000	\$20,000	\$12,000
33,001 – 38,000	\$25,000	\$15,000
> 38,000	\$30,000	\$20,000

¹ Tractor trailers utilize Gross Combined Vehicle Weight for purposes of determining Base Vehicle Incentive.

² The first three HVIP 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 19,500 lbs; and \$10,000/vehicle if over 19,500 lbs.

³ Vehicle must be ARB-certified as an Ultra-Low Emission Vehicle. Voucher amount is increased by \$2,000 for each of the following: ARB-certification as a Super Ultra Low Emission Vehicle and ARB-certification for zero-evaporative emissions.

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 (On-Board Diagnostic), 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. 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.²³

For hybrid manufacturers unwilling to pursue the optional full vehicle certification, a second option for a hybrid vehicle to become HVIP-eligible is available. Hybrid vehicle manufacturers may perform in-use or chassis dynamometer emission testing. 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 for full vehicle certification. Staff expects, however, that full vehicle certification will be a requirement for HVIP-eligibility within the next few funding cycles.

Voucher enhancements for hybrid vehicles that are ARB certified or OBD compliant are listed in Table 16 and 17, respectively.

²³ ARB, 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, 2013. <http://www.arb.ca.gov/regact/2013/hdghg2013/hdghg2013.htm>

Zero-Emission Vehicle Voucher Amounts: Table 15 shows the voucher amounts for zero-emission trucks and buses. These include the extra incentives for vehicles operating in disadvantaged communities.

Table 15: Zero-Emission Truck and Bus Voucher Amounts

GVWR (lbs)	Base Vehicle Incentive		
	1 to 100 vehicles ¹		101 to 200 vehicles
	Outside Disadvantaged Community	In Disadvantaged Community	
5,001 – 8,500	\$20,000	\$25,000	\$12,000
8,501 – 10,000	\$25,000	\$30,000	\$18,000
10,001 – 14,000 ²	\$50,000	\$55,000	\$30,000
14,001 – 19,500	\$80,000	\$90,000	\$35,000
19,501 – 26,000	\$90,000	\$100,000	\$40,000
> 26,000	\$95,000	\$110,000	\$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 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 Base Vehicle Incentive.

Other Voucher Amounts and Enhancements: HVIP offers voucher enhancements, shown in Tables 16 through 19 for plug-in or hydraulic hybrids, school buses, hybrid vehicles receiving ARB’s full vehicle certifications, fast charge capable ZEVs, OBD certified vehicles, aerial boom vehicles with electrified power takeoff (ePTO), and vehicles with extended warranties.

Table 16: Vehicle Voucher Enhancements

GVWR (lbs)	Plug-in or Hydraulic Hybrid ¹	Hybrid or Zero-Emission School Bus	ARB Certification (hybrid vehicles only)	Zero-Emission Fast-Charge/ Hydrogen Fuel Cell Vehicle
6,001 – 10,000 (plug-in hybrids only)	NA	\$ 5,000	NA	\$10,000/\$20,000
10,001 – 14,000	\$5,000			
14,001 – 19,500	\$10,000	\$10,000	\$10,000	\$15,000/\$30,000
19,501 – 33,000			\$15,000	
>33,000			\$20,000	

¹ Plug-in electric or hydraulic hybrid vehicles must demonstrate at least a 40 percent fuel economy benefit relative to their non-hybrid counterpart as part of their HVIP eligibility application.

Table 17: Voucher Enhancements for Hybrid Vehicles with ARB-Certified OBD

Vehicle GVWR	Total Number of Deficiencies ¹				
	2014 /2015 MY		2016 MY		
	10+	<10	9-14	5-8	≤4
14,001 - 26,000 lbs	\$12,000	\$16,000	\$8,000	\$12,000	\$16,000
26,001+ lbs	\$16,000	\$20,000	\$12,000	\$16,000	\$20,000

¹ Only OBD deficiencies related to the hybridization of the vehicle are counted for the purposes of determining the HVIP incentive amount. Deficiencies that exist on the engine independent of being in a hybrid application are not to be included for the purposes of determining HVIP incentives.

Table 18: Aerial Boom Vehicles with ePTO

GVWR (lbs)	Lithium Ion Battery Technology		With Lead Acid Battery Technology	
	1 to 100 vehicles	101 to 200 vehicles	1 to 100 vehicles	101 to 200 vehicles
> 26,000	\$20,000	\$12,000	\$14,000	\$8,000

Table 19: Extended Warranties^{1,2}

Time Period (years)	Miles	Voucher Enhancement
6	120,000	\$2,000
7	140,000	\$4,000
8	160,000	\$8,000

¹ Whichever comes first, years or mileage, for all three options.

² Engine, drivetrain (including battery), and hybrid or zero-emission components, emissions, frame rails, cross members, and cab.

The total voucher amount – including the HVIP base voucher, HVIP voucher enhancements, and all other public incentives – may not exceed 90 percent of the total vehicle cost. Public fleet school buses and public transit buses are exempt from this 90 percent limit.

STAFF PROPOSAL FOR FY 2015-16

Staff proposes a \$12 million allocation to continue the statewide first-come, first-served HVIP as shown in Table 20. Staff proposes to retain the existing per vehicle voucher amounts listed in Tables 14 through 19 with no changes. However, staff proposes adding eligibility for zero-emission and hybrid vehicle conversions as two new technology options as directed by SB 1204. Staff also proposes requiring all HVIP vehicles to be equipped with telematics devices.

Table 20: Proposed HVIP Funding for FY 2015-16

FY 2014-15 Allocation (million)	Proposed FY 2015-16 Allocation (million)
\$10	\$12

Hybrid Vehicle Conversions: Staff proposes adding eligibility for hybrid vehicle conversions of new vehicles (Class 2a and larger vehicles). For the purpose of HVIP, a

hybrid vehicle conversion means installing a hybrid driveline and other advanced technology to a newly manufactured vehicle or chassis. No hybrid conversions of existing in-use vehicles will be eligible due to uncertainty with durability, warranty, and continued emissions reduction performance. Initially, hybrid conversions will be required to have ARB aftermarket parts certification to be eligible for funding. If the Innovative Technology Regulation (currently under development by ARB) is adopted, hybrid conversion manufacturers will follow requirements within that regulation for pathway to ARB funding eligibility.²⁴ The proposed Innovative Technology Regulation will provide certification and aftermarket part approval flexibility for innovative heavy-duty engine and vehicle technologies. The intent of the proposed regulation is to encourage manufacturer development and early market launch of the advanced truck and bus technologies.

For hybrid vehicle conversions with zero-emission range capability (minimum of 40 mile zero-emission range), staff recommends voucher funding not to exceed 50 percent of the current funding levels provided for hybrid truck and bus vouchers as listed in Table 14. For hybrid vehicle conversions without zero-emission range capability, staff recommends funding not to exceed 25 percent of the current funding levels in Table 14. Specific vehicle funding amounts will be determined following a public work group during the summer or fall of 2015 to evaluate current market availability and technology costs, and could be lower than the maximum percentages above. While voucher enhancements (shown in Tables 16-19) are available for new hybrid vehicles, no voucher enhancements will be available for hybrid vehicle conversions,.

Zero-Emission Vehicle Conversions: Staff also proposes to include HVIP eligibility for zero-emission vehicle conversions. New or in-use vehicles with any fuel type will be eligible for funding to convert to zero-emission, including battery electric and fuel cell technologies.

Staff recommends establishing zero-emission conversion funding amounts to cover up to 50 percent of the conversion cost, not to exceed 75 percent of the current funding levels provided for new zero-emission trucks and buses as listed in Table 15. As described above, specific funding amounts will be determined following a public work group during the summer or fall of 2015. All voucher enhancements available for new zero-emission trucks and buses will apply to zero-emission vehicle conversions.

Staff recommends capping total funding for hybrid vehicle conversions at \$2 million, and zero-emission vehicle conversions at \$4 million for vouchers approved through the end of the FY 2015-16 funding allocation. Staff may recommend additional funding as part of the FY 2016-17 Funding Plan.

If approved by the Board, the zero-emission and hybrid vehicle conversion eligibility provisions will apply to the remaining FY 2014-15 HVIP funds. Staff will conduct a public work group during the summer or fall of 2015 to establish annual limits for the

²⁴ For more information on the Innovative Technology Regulation, see <http://www.arb.ca.gov/msprog/itr/itr.htm>

number of zero-emission and hybrid vehicle conversions, hybrid conversion emission testing requirements, maximum chassis age for zero-emission conversions, and specific funding amounts.

Telematics: Staff proposes that all vehicles receiving HVIP funding be equipped with telematics devices and, at ARB's request, report annually for up to three years 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. All HVIP-eligible vehicles currently are capable of generating this information, and some fleets already provide this type of information to local air districts that have provided HVIP co-funding. Staff recognizes, however, that a geographic tracking requirement may be a challenge for the smaller fleets that make up an increasing portion of the hybrid truck market. Staff will conduct a public HVIP work group meeting in summer of 2015 to define the details of the telematics reporting requirement. Staff proposes that the telematics requirement become effective for vouchers approved during the FY 2014-15 funding cycle following that public work group meeting.

Waiting List Provision: Staff anticipates that the proposed \$12 million HVIP allocation will meet voucher demand for the full funding cycle, but acknowledges the uncertainties in forecasting demand. Staff proposes that the Board provide the Executive Officer discretion to establish a waiting list to bridge a funding gap between budget years in the event that HVIP runs short of funding prior to the end of FY 2015-16.

Disadvantaged Community Benefits: HVIP will continue to be implemented on a first-come, first-served, statewide basis, so it is not possible to estimate in advance how much funding will benefit disadvantaged communities. However, a review of HVIP vouchers issued to date indicates that about 75 percent of HVIP funding has provided benefits to disadvantaged communities, and about 45 percent has been spent in disadvantaged communities. Staff expects a similar percentage of future HVIP vouchers will benefit these communities. As part of the reporting requirements associated with GGRF funding, ARB will track where vehicles are domiciled, so it can calculate the portion of total funding that benefits disadvantaged communities. In Table 2 (Chapter 2), staff included a conservative estimate that at least 50 percent of the FY 2015-16 HVIP funding will benefit disadvantaged communities and contribute to ARB's overall disadvantaged communities investment commitment.

Project Solicitation: ARB selected a grantee to administer FY 2014-15 HVIP funds via a 2-year competitive solicitation with the option of adding the FY 2015-16 funds to the grant with a grant amendment. If this option is employed, ARB would not issue a new solicitation for the FY 2015-16 funds. If ARB chooses not to pursue this option, a new solicitation would be issued.

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 \$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. The cost premium for fuel cell trucks is unknown, but expected to be substantial as the technology becomes commercially available. 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.

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 with benefits to disadvantaged communities.

Because the HVIP program is evolving, there continues to be a need to evaluate the effectiveness of program investments. Staff believes metrics of hybrid and zero-emission truck and bus market success can eventually help identify 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 powertrains sold per manufacturer.
- Manufacturer diversity.
- Declining vehicle incremental cost.
- Number of offerings in different vocational applications.
- 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 continue to be developed as more technologies enter the market, and will be discussed in depth with stakeholders in future work group meetings.

Zero-Emission Truck and Bus Pilot Commercial Deployment Projects

Proposed project allocation:

Low Carbon Transportation – \$65 million (\$45 million for buses; \$20 million for trucks)

PROJECT OVERVIEW AND GOALS

ARB's HVIP has encouraged California-based fleets to purchase almost 400 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 heavy-duty vehicle deployment must be significantly accelerated for California to meet its post-2020 air quality and climate goals. While HVIP has enabled the first deployments of zero-emission technology, staff's proposal to continue funding for the Zero-Emission Truck and Bus Pilot Commercial Deployment Projects takes the next step by leveraging resources, promoting efficiencies, and helping drive down per vehicle costs via larger, location-specific deployments.

These projects would place a significant number of zero-emission trucks and buses in a handful of strategic "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, vehicle maintenance and repair, and infrastructure issues.

Proposed investments in zero-emission buses complement GGRF investments from other State agencies. Caltrans is currently implementing the Low Carbon Transit Operations Program to support new or expanded bus or rail services, expand intermodal transit facilities, fueling, maintenance and other costs. Together, these complementary investments help to improve transit services especially in disadvantaged communities.

CURRENT PROJECT STATUS

The FY 2014-15 Funding Plan allocated up to \$25 million for zero-emission truck and bus pilot projects. Staff has received significant interest from stakeholders in this funding category, including comments received at two public workgroup meetings on the importance of synchronizing funding with the Federal Transit Administration (FTA). Staff is currently working with FTA to maximize leveraging opportunities with federal transit funding and anticipates issuing a joint solicitation for both FY 2014-15 and FY 2015-16 funding after the June 2015 Board meeting.

STAFF PROPOSAL FOR FY 2015-16

Due to the significant amount of early interest and the strong possibility that high quality project applications for the FY 2014-15 funding cycle will exceed the allotted \$25 million, staff proposes an additional \$65 million for FY 2015-16 for Zero-Emission Truck and Bus Pilot Commercial Deployments Projects, with \$45 million allocated to buses and \$20 million for trucks as shown in Table 21. Staff proposes separating bus and truck funding to better ensure that project applicants are competing against like projects, and to ensure that both technology markets are supported. Staff also proposes to set aside \$5 million from the bus allocation to provide incentives for school buses in rural school districts. Funding at this level is needed to increase vehicle production levels to the point where initial economies of scale can start to be realized. Staff anticipates strong fleet demand for this funding based on input received during the Funding Plan development process.

Table 21: Proposed Zero-Emission Truck and Bus Pilot Commercial Deployment Funding for FY 2015-16

Vehicle Category	FY 2014-15 Allocation (million)	Proposed FY 2015-16 Allocation (million)
Trucks	Funding not divided between categories	\$20
Buses		\$45
Total	\$25	\$65

Staff proposes to retain the same eligibility for vehicle categories and related infrastructure as in the FY 2014-15 Funding Plan, with expanded eligibility for school buses. In addition to zero-emission trucks and buses, eligible vehicle technologies will include plug-in hybrid and hybrid-electric trucks with the ability to operate with all zero-emission miles within disadvantaged communities, and conversions of any vehicle type to zero-emission technology. School buses eligible for the \$5 million allocation for rural school districts may include zero-emission, hybrid, and internal combustion engine school buses that operate on renewable fuels. Advanced telematics data and fleet management software will help to support targeting zero-emission operation in disadvantaged communities and extreme non-attainment areas. Vehicle charging and refueling infrastructure and workforce training that supports funded vehicles will also be eligible. Below are examples of four potential categories of vehicle projects that could receive funding under this pilot.

Zero-Emission Bus: Eligible zero-emission bus projects include urban transit buses, as well as urban rubber-tired trolleys and shuttle buses serving public or private facilities such as airports, educational institutions, and employment campuses. Technologies available today include fuel cell electric, battery electric, and plug-in hybrid transit buses. As early demonstrators of advanced technologies, transit agencies help accelerate clean technology availability and migration to the heavy-duty truck market. Increasing zero-emission bus populations will reduce overall transit-related emissions, with great potential to target benefits to disadvantaged communities. These

investments may also help support updates to the Advanced Clean Transit regulations currently under development and scheduled for Board consideration in spring 2016.

Transit agencies have started introducing fuel cell buses and hydrogen refueling within their fleets, and in February 2015, Sunline Transit, which serves the Coachella Valley, was awarded \$9.8 million in FTA grant funding for five new hydrogen fuel cell buses. Manufacturers, integrators, and technology providers of fuel cell electric transit buses include BAE Systems, Ballard Power Systems, El Dorado National, Hydrogenics, New Flier, US Fuel Cell, and US Hybrid. The recent addition of new fuel cell buses in transit applications signals that early demand is expected to grow.

Five manufacturers, including BYD Motors, New Flyer, Phoenix, Proterra, and Zenith Motors produce commercially available battery-electric transit and shuttle buses, and BYD and Proterra have either existing or planned manufacturing facilities in California. Several of these manufacturers are also investing in fast-charge technologies (such as fully automated overhead conductive charging or roadway-imbedded inductive charging) that improve the utility of these buses in transit applications. Incentive funding for multiple buses sharing the same charging infrastructure will help bring costs down and accelerate widespread zero-emission transit bus deployment. In February 2015, FTA awarded \$4.7 million in grant funding to San Joaquin Regional Transit District in Stockton to add five more electric buses and one charger to their existing electric bus fleet. Based on discussions with transit agencies, staff expects growing demand for this incentive funding for battery electric transit buses.

Zero-Emission School Bus: Zero-emission school bus projects may include fuel cell and battery electric school buses, as well as bus sharing projects that benefit disadvantaged communities. These projects provide an opportunity to accelerate the rate of technology deployment, reduce GHG emissions, and reduce children's exposure to diesel particulate matter. Today, Motiv Power Systems and TransPower produce battery electric school buses, and Adomani and others convert existing school buses to zero-emission.

Two school bus concepts discussed in the FY 2014-15 Funding Plan show significant promise in helping accelerate the rate of zero-emission school bus technology commercialization and deployment. The first project would demonstrate vehicle-grid integration (VGI), which enables bus-grid communication and electricity flow to and from the bus batteries. The second involves providing a pool of zero-emission school buses to share among school districts operating in disadvantaged communities, thus allowing district transportation officials to evaluate the technology building on past AQIP demonstration projects in San Diego and the San Joaquin Valley. These types of demonstrations are paving the way for technology providers to build manufacturing facilities in California. In May 2015, Motiv Power Systems opened a new facility in Hayward, California, where they will integrate their all-electric power train technology onto existing commercial OEM school bus, shuttle bus, and other truck chassis.

School Buses in Rural School Districts: School buses in rural school districts may include fuel cell and battery electric zero-emission school buses, plug-in hybrid school buses with the ability to operate in zero-emission only mode in disadvantaged communities, and internal combustion school buses or hybrid school buses operating on renewable fuels, such as biodiesel, renewable diesel, or renewable natural gas. While any diesel powered school bus can operate on biodiesel, there are several manufacturers and conversion companies (Thomas and Bluebird) producing school buses that operate on natural gas, including renewable natural gas.

Zero-Emission Freight/Delivery Trucks: Zero-emission vocational trucks may include fuel cell and battery electric trucks. While most planning efforts around a geographic hub concept have focused on zero-emission buses, the hub concept lends well to a fleet or fleets of vehicles servicing distribution centers and warehouses, and utilizing common fueling infrastructure, maintenance facilities and mechanics, and other shared resources. In addition, this delivery/freight hub concept would lead to reductions in costs associated with maintenance, repair, and refueling as well as provide valuable lessons regarding the costs and benefits of widespread conversion to zero-emission technologies in the trucking sector. Today, several manufacturers (AMP Electric Vehicles, EVI, Motiv Power, Smith Electric and Zenith Motors) offer HVIP-eligible plug-in hybrid and zero-emission battery electric delivery trucks.

Disadvantaged Community Requirements: For FY 2015-16, staff proposes that at least 50 percent the funding awarded to zero-emission truck and bus commercial deployment projects benefit disadvantaged communities. In addition, staff proposes that at least 50 percent of the bus funding go to projects located in disadvantaged communities where buses serve stops within disadvantaged community census tracts.

Project Solicitation: As discussed earlier, staff proposes to issue the competitive solicitation for the proposed FY 2015-16 funding in combination with the FY 2014-15 funding for this category soon after the June Board meeting, with the exception of the proposed \$5 million for school buses in rural school districts. The rural district school bus set aside funding would be administered according to an interagency agreement between ARB and either the California State Department of Education or a local air district. If ARB does not receive a sufficient number of applications that meet the minimum eligibility criteria to utilize these combined funds, ARB would release a second solicitation later in the FY 2015-16 funding cycle.

LONG-TERM PLAN

The Zero-Emission Truck and Bus Pilot Commercial Deployment Projects are intended to evaluate the effectiveness of a zero-emission hub to enable a fleet or fleets to minimize risks associated with new technology deployment and leverage resources as a model for accelerating large scale zero-emission deployments. Ideally, these initial ecosystems 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 potential technology adopters.

In evaluating future funding, ARB will consider the demand and strength of proposed project applications received during the first solicitation. ARB will also evaluate the ability to expand upon first year projects and new technology deployment opportunities. Depending on the success of these projects, staff may recommend shifting these pilot deployment projects to a first-come, first-served model in the FY 2016-17 funding cycle or a later funding cycle.

Metrics of success can help illustrate how well the projects accelerate technology deployment and achieve consumer acceptance. The truck and bus pilot solicitation will include metrics (such as zero-emission mile accumulation, fuel and energy usage, reliability, vehicle maintenance and operation costs, and infrastructure costs) that ensure project proposals are structured to enable collection of data needed to inform the metrics. ARB will require independent third party data collection and analysis to support these pilot commercial deployment projects. This will ensure a uniform approach to collecting data across all the heavy-duty projects, so results are directly comparable.

Low NOx Truck Incentives

Proposed project allocation:

Low Carbon Transportation – \$5 million

AQIP – \$2 million

PROJECT OVERVIEW AND GOALS

In 2013, the Board approved optional low NOx standards that allow manufacturers the ability to certify engines to NOx emission levels that are 50 percent, 75 percent, or 90 percent lower than today’s mandatory diesel emission standards. To date, no engines have yet been certified to the optional standards. In order to encourage manufacturers to produce these engines and fleets to purchase them, staff is proposing this new project to provide funding for heavy-duty trucks (greater than 14,000 pounds gross vehicle weight rating or GVWR) with engines certified to any of the lower NOx standards. This project, along with several other proposed heavy-duty projects, supports the goals of SB 1204 by ensuring that at least 20 percent of truck funding is provided for early commercial deployment of existing zero- and near-zero emission heavy-duty truck technology. Additionally, the project will provide benefits to disadvantaged communities and support the LCFS as described below.

STAFF PROPOSAL FOR FY 2015-16

Staff proposes to allocate up to \$7 million to provide incentives for low NOx trucks on a first-come, first-served, statewide basis once these vehicles are commercially available in California as shown in Table 22. This is the model that is used for CVRP and HVIP, as well as natural gas vehicle incentives provided by the Energy Commission.

Table 22: Proposed Low NOx Truck Incentives Funding for FY 2015-16

FY 2014-15 Allocation (million)	Proposed FY 2015-16 Allocation (million)
\$0	\$7

Renewable Fueling Requirement: In order to maximize the GHG emission benefits of low NOx vehicles, staff is proposing an additional incentive for use of renewable fuels. Vehicles funded by AQIP would be eligible for an optional renewable fuel incentive to offset incremental costs, and vehicles funded by Low Carbon Transportation would be required to use renewable fuels (and would qualify for the additional incentive). Fueling these vehicles with renewable fuels would not only provide additional GHG emission benefits, but would support the goals of the LCFS program by increasing demand for renewable fuels.

Project Implementation: Several implementation challenges will need to be addressed before low NOx engines are available in the market. The optional low NOx certification has three emission levels that are cleaner than the current diesel standard of

0.20 grams per brake horsepower-hour (g/bhp-hr): 0.10 g/bhp-hr, 0.05 g/bhp-hr, and 0.02 g/bhp-hr. Staff expects the per-vehicle funding amounts will vary based on the certification level, vehicle size (GVWR), and incremental costs. Those amounts have yet to be determined; however, staff recommends setting the vehicle funding amount such that the sum of all public funding does not exceed the incremental cost of the vehicle. Also, while vehicle usage reporting is a common requirement for Low Carbon Transportation and AQIP projects, determining the elements that should be required to ensure that renewable fuel requirements are being achieved while reducing the administrative burden is also an important consideration. Staff will work with stakeholders through the public work group process to determine specific funding amounts, renewable fuel usage and reporting requirements, and other implementation details.

Staff continues to work with the Energy Commission to ensure that our programs are well coordinated. Though its Alternative and Renewable Fuel and Vehicle Technology Program, the Energy Commission has provided more than \$60 million in incentives to date for the purchase of 2,700 conventional natural gas vehicles above 14,000 pounds GVWR, and funding remains available including \$10 million allocated for FY 2015-16.²⁵

Disadvantaged Community Benefits: Low NOx truck incentives would be implemented on a first-come, first-served, statewide basis, so it is difficult to estimate in advance how much of this funding would benefit disadvantaged communities. A review of HVIP vouchers issued to date indicates that over 75 percent of HVIP funding has provided benefits to disadvantaged communities, and staff believes a similar fraction of the low NOx truck incentives may benefit these communities. As part of the reporting requirements associated with Low Carbon Transportation Investments, ARB will track where these funds are spent, so benefits to disadvantaged communities can be determined. In Table 2 (Chapter 2), staff included an estimate that at least 50 percent of the low NOx funding will benefit disadvantaged communities in order to demonstrate how ARB will meet its overall disadvantaged communities investment commitment.

Project Solicitation: This project may be incorporated into an existing truck voucher or incentive program or solicited as a new, standalone project. Staff proposes that the Board delegate to the Executive Officer the authority to determine which of these two approaches to take.

Contingency Provisions: Staff anticipates that qualifying engines may be certified and available during FY 2015-16 and will monitor manufacturer progress in certifying these engines throughout the year. Staff intends to provide these incentives over a multiple year period to encourage and support the deployment of low NOx engines. In the event that no qualifying trucks are commercially available during FY 2015-16, staff

²⁵ See Table 23 on page 59 of Energy Commission's 2015-16 Investment Plan for the Alternative and Renewable Fuel and Vehicle Program, May 2015, <http://www.energy.ca.gov/2014publications/CEC-600-2014-009/CEC-600-2014-009-CMF.pdf>. ARB also provided about \$20 million in funding for natural gas trucks through the Proposition 1B Goods Movement Emission Reduction Program, matched with another \$20 million from local funding.

recommends ensuring uninterrupted funding availability by carrying over the Low Carbon Transportation allocation of \$5 million to FY 2016-17. To meet AQIP expenditure requirements, staff recommends that the Board delegate authority to the Executive Officer to reallocate unused AQIP funding for this project to other FY 2015-16 projects, consistent with the contingency provisions discussed in Chapter 6.

LONG-TERM PLAN

Incentive funding for low NOx heavy-duty vehicles is expected to continue for several years. As more engines are certified and introduced into the market, the amount of incentive funding is expected to increase and will be based on engine availability and demand. Staff will monitor market conditions and adjust funding eligibility, incentive amounts, and funding levels to support continued growth in the commercial deployment of vehicles with low NOx engines.

Advanced Technology Demonstration Projects

Proposed project allocation: Low Carbon Transportation – \$59 million
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PROJECT OVERVIEW AND GOALS

Demonstrations of advanced technologies for FY 2015-16 will be focused on accelerating advanced emission reducing technologies into the marketplace. A public investment in advanced technology demonstrations helps to achieve GHG reductions, as well as criteria pollutant and toxic air contaminant reductions sooner than would be possible otherwise. This commitment of funding encourages industry to expeditiously invent, develop, test, and introduce cutting edge emission reduction technologies faster than would occur naturally. These critical investments give confidence to companies and investors that a pathway exists for demonstrating promising advanced technologies that could lead to mass commercialization.

In addition to being guided by ARB's heavy-duty technology assessment and sustainable freight planning, staff also worked with interested stakeholders, technology demonstrators, and potential grantees over the last year in public workshops, public work group meetings, and one-on-one discussions to develop these proposed investments. Based on this input, staff's proposed funding recommendations are focused on strategically advancing technologies that build upon past efforts on a larger scale and transitioning these technologies into more demanding vocations and equipment types, coupled with identifying newly emerging technologies that show great promise to help California reach its GHG and criteria pollutant emission reduction goals.

CURRENT PROJECT STATUS

The FY 2014-15 Funding Plan provided funding for the demonstration of zero-emission drayage trucks and advanced technologies that operate at multi-source facilities such as distribution centers, warehouses, and intermodal facilities. Staff conducted four public work group meetings to develop both solicitations. Competitive solicitations for these projects are expected to be released prior to the June 2015 Board meeting. These investments also build on 13 smaller-scale advanced demonstration projects for a total of \$5.5 million in the marine, locomotive, school bus, and off-road equipment categories funded via AQIP in the FY 2009-10 through FY 2012-13 funding cycles. Each of these 13 projects is summarized in Appendix B of the FY 2014-15 Funding Plan.²⁶

Based on the feedback received in many stakeholder meetings, a sustained multiyear investment is critical to bring new advanced technologies to the commercial market and continue California's transition toward a low-carbon transportation future.

²⁶ http://www.arb.ca.gov/msprog/aqip/fundplan/final_fy1415_aqip_ggrf_fundingplan.pdf (See Appendix B)

STAFF PROPOSAL FOR FY 2015-16

For FY 2015-16, staff proposes to allocate up to \$59 million of Low Carbon Transportation funding to the projects shown in Table 23. Many of the projects proposed for funding this year build on the freight demonstration investments already underway. Consistent with the vision and funding priorities identified in the FY 2014-15 Funding Plan, this year’s projects include freight locomotives, cargo handling equipment, and on-road line-haul and regional haul truck demonstrations. New investments are recommended to achieve advancements in the heaviest on-road trucks, such as advanced engines and powertrains in Class 7 and 8 trucks (those over 26,000 pounds GVWR), and efficiency improvements with intelligent truck systems and connected vehicles. Each of the proposed projects is described further below.

Table 23: Proposed Funding Levels for Advanced Technology Demonstrations

Project Category	Proposed Projects	Proposed FY 2015-16 Funding¹ (million)
On-Road Trucks	Intelligent Truck Systems and Connected Vehicles	\$30
	Advanced Engines and Powertrains	
	Zero-Emission or Near-Zero Emission Short and Regional Haul Trucks	
Freight Locomotives	Zero-Emission or Near Zero-Emission Switchers	\$10
	Zero-Emission Tender Technologies	
Off-Road Freight Equipment	Zero-Emission Cargo Handling Equipment	\$10
	Zero-Emission Ground Support Equipment	
	Advanced Port Equipment	
Non-Freight Off-Road Equipment	Off-Road Near-Zero Agricultural and Construction Equipment	\$9
	Off-Road Passenger Transportation	
Total Proposed Allocation for Demonstration Projects		\$59

¹Funding amounts shown are maximums; up to \$3 million of this total will be allocated for data collection and analysis.

The amount of funding that will be allocated to each of the individual projects in each project category will be determined in the public work group meeting process beginning after Board approval of the Funding Plan.

All demonstration projects must have the potential for widespread commercialization that will significantly transform the industry while supporting the objective of providing GHG, criteria pollutant, and toxic emission reductions as required by SB 1204. Advanced technology demonstration projects will directly reduce GHG and criteria pollutant emissions over the course of their field demonstration. In addition, a primary goal is to demonstrate these advanced technologies and deploy them into the

marketplace in greater volumes, where longer-term future emission reductions in considerably larger magnitudes can be achieved.

On-Road Trucks: Up To \$30 Million

Results from ARB's technology assessments indicate that several on-road emission reduction technologies are ready for demonstration. More importantly, ARB's assessments conclude that investments in the three on-road projects listed below are critical in order to achieve the necessary trucking industry transformation needed for California to meet its climate change and air quality goals. Investments in these areas will also help meet the need illustrated in the *Sustainable Freight* document for more efficient truck movement in the freight system. Consistent with the framework of SB 1204 for promoting investment in a variety of vocations with the current state of the technology and the need for cleaner and more efficient truck operations, the following three project categories are proposed for on-road trucks:

Intelligent Truck Systems and Connected Vehicles: Technologies in this category are focused on increasing efficiencies by allowing communications between truck(s) and their environment, or between two or more trucks. These technologies have the potential to increase truck efficiency, thereby reducing emissions of GHG and criteria pollutants. There are other potential ancillary benefits to these technologies such as accident avoidance, which can reduce traffic congestion and lower transportation costs.

Intelligent truck systems and technologies can employ the use of advanced cruise control to apply braking pressure when the truck is approaching a vehicle too quickly. Advanced cruise control systems can minimize sudden deceleration and acceleration events, inform the driver regarding current road conditions ahead, map more efficient routes to avoid traffic and accidents, autonomously anticipate geographical features such as hills and grades, and make adjustments to engine parameters to operate more efficiently based on local conditions.

Connected vehicles allow for two or more trucks to operate in concert. For example, truck platooning allows reduced spacing between each truck to take advantage of aerodynamic drafting behind a lead truck. Connected vehicles can share video feeds from the lead truck that can also apply braking force or acceleration to all trucks in a platoon. Demonstration of real-time communications between individual trucks while on the road can also enable more efficient logistics scheduling and traffic avoidance.

Advanced Engines and Powertrains: Advanced technologies employed in the generation of motive power have the potential to increase on-road truck efficiency and reduce emissions. Increases in engine and powertrain efficiency can help achieve California's goal of a 50 percent reduction in petroleum use by 2030.

Advanced engines and powertrains can include technologies such as microturbines, opposition piston engines, free piston engines, engine downsizing, advanced transmissions, engine waste heat recovery, auxiliary electrification, electric drive, and other advanced engine and powertrain technologies for use in longer range Class 7 and 8 vehicles. Technologies in this category will increase truck efficiency and reduce emissions of GHG and criteria pollutant emissions. Increases in truck efficiency reduce fuel consumption on a per mile basis and reduce operational expenses for truck owners.

Zero-Emission or Near-Zero Emission Short and Regional Haul Trucks: This project category would build upon the advances made in the demonstration of zero-emission drayage trucks and transfer that technology into the more demanding short and regional haul trucking service category. Short and regional haul trucking services are characterized by shorter daily driving distances than line-haul trucking, but more than drayage trucks. These trucks tend to be domiciled in a central location nightly. Trucks in this service include food distribution, warehouse to retail store transport, and recyclables transfer trucks, among others.

Projects that demonstrate the use of zero-emission on-road truck technologies in short and regional haul Class 7 and 8 heavy-duty truck applications would be eligible. Technologies could include battery electric vehicles, fuel-cell power plants, electric drive with range extenders, or other advanced technologies that result in significant zero-emission miles.

Freight Locomotives: Up To \$10 Million

Advanced technology demonstrations in the locomotive category are focused on the goal of zero-emission miles in switcher and freight locomotives. Both of the proposed freight locomotive projects below were identified in the *Heavy-Duty Technology and Fuels Assessment* and discussed at a public workshop on the technology assessment held in September 2014. Projects with the objective of demonstrating zero-emission miles for freight and switcher locomotives are consistent with the goals illustrated in the *Sustainable Freight* document and SB 1204. The following two categories are proposed for freight locomotive demonstrations:

Zero-Emission or Near Zero-Emission Switchers: Projects in this category would use energy storage systems contained on-board a switcher locomotive to provide zero-emission motive power to the switch locomotive for most or all of its duty-cycle, thereby reducing emissions. The use of on-board internal combustion engine range extenders to supplement stored energy could allow for a battery-electric switcher locomotive to operate continuously, thereby reducing the cost of a large battery pack and enabling full functionality. An example of this concept is a demonstration underway of a Norfolk Southern switch locomotive using on-board battery technology. This promising technology has the capability to

significantly reduce emissions of GHG, criteria pollutant and toxic air contaminant emissions in communities located near railyards.

Zero-Emission Tender Technologies: The use of locomotive tenders for energy storage technologies to facilitate zero-emission operation for part of a locomotive duty-cycle has potential to reduce emissions from freight locomotive operations. The technology utilizes battery or other technologies for storing electrical power from charging events or dynamic braking to propel the locomotive in zero-emission mode during some part of the locomotive duty-cycle. This project would further the goal of developing and demonstrating technologies that would allow for zero-emission miles during some part of a freight locomotive duty-cycle.

Off-Road Freight Equipment: Up To \$10 Million

Advanced technology demonstrations in the off-road freight equipment category build upon the advances made with FY 2014-15 demonstration projects by expanding the type and numbers of zero and near zero-emission off-road equipment. The following three categories are proposed for demonstrations:

Zero-Emission Cargo Handling Equipment: These projects would demonstrate the zero- and near zero-emission technology that significantly advances the state of the technology compared to conventional cargo handling equipment. This category includes forklifts, reach stackers, yard trucks, and other equipment. Advanced zero-emission technologies have tremendous potential to reduce emissions of GHGs and criteria pollutants because cargo handling equipment is widely used in California, so cleaner technologies in this category has the potential for broad applicability to many industries.

Zero-Emission Ground Support Equipment: These projects would be designed to expand the use zero-emission ground support equipment technologies and strategies utilized at airports beyond the current state of the technology. Eligible equipment categories could include high capacity aircraft tow tractors, tow tractor automation, and aircraft support equipment. Technologies such as battery, fuel cell, and flow batteries may be employed, along with strategies that can reduce emissions from aircraft while being loaded/unloaded, taxiing to and from the runway, and while waiting in queue to take off.

Advanced Port Equipment: The focus of this project category would be demonstrations or pilots of advanced technologies and strategies for use in California's ports. This could include demonstration of zero-emission equipment, automated container movement technologies, advanced logistic strategies to gain efficiencies, and other equipment that are unique to port operations or enable more efficient port operations.

Non-Freight Off-Road Equipment: Up to \$9 Million

Proposed projects in the non-freight off-road equipment category are focused on expanding the technology advancements from other categories. Transfer of technologies such as hybrid systems from the on-road truck and bus market into other segments such as construction equipment would be eligible. This funding category also supports expanding the use of energy storage systems into other categories such as off-road passenger movement, like passenger locomotives and ferry vessels.

Off-Road Near-Zero Agricultural and Construction Equipment: Projects in this category would focus on the demonstration and deployment of hybrid and near zero-emission agricultural and construction equipment and strategies that reduce emissions of GHG and criteria pollutants from agricultural and construction equipment. There is significant overlap in the use of equipment that is applicable to both the agricultural and construction industries and advances made in one field can be transferred to the other.

The demonstration and deployment of hybrid and near zero-emission agricultural and construction equipment such as hybrid bull dozers or front loaders that reduce GHG emissions can provide an increase in operational efficiency and reduce maintenance and operational costs for farmers and construction firms. Automation and other strategies that provide efficiency gains would also be eligible.

Project funding in this category would advance the current state of the technology through the demonstration and deployment of advanced engines, including low NOx engines, electric drive powertrains, automation strategies, and other technologies in the agricultural and construction vehicle and equipment categories.

Off-Road Passenger Transportation: Projects would focus on advanced technologies to reduce emissions from in-state passenger rail and ferry service. Ferry projects could include use of fixed wing sail technology that builds on successful past demonstrations, or use of fuel cells or other technologies to reduce emissions. For passenger locomotives, demonstration projects could include use of fuel cells, hybridization, advanced energy storage strategies, and other emission reduction technologies.

Data Collection and Analysis: Data collection is an essential component of demonstration and pilot deployment projects. Staff estimates that up to \$3 million is needed for independent third-party data collection and analysis to verify the emission reductions and performance of vehicles and equipment funded in such projects. This would ensure a uniform approach to collecting data across all the projects, so results are more directly comparable and more useful for informing future planning and funding decisions, and in evaluating project performance and emission reductions. This would also help inform future investment opportunities for continued market development.

Consistent with the contingency provisions provided in Chapter 6, staff proposes that the Executive Officer have flexibility to determine the proper mechanism for funding data collection, analysis, and emission reduction verification.

Cost Sharing Requirements: In past funding cycles, ARB has emphasized the importance of developing a strong public/private investment to ensure a successful demonstration of advanced technology. As such, ARB requires cost sharing from the technology demonstrator, grantee and/or the fleet or equipment end-user. Staff proposes to continue a minimum 25 percent cost share from project applicants. As with past funding cycles, applicants that provide higher overall match funding will receive a scoring preference.

Disadvantaged Communities Benefits: ARB is targeting at least 50 percent of Low Carbon Transportation funds to benefit disadvantaged communities and at 10 percent of these funds to be invested in disadvantaged communities. To meet these targets, staff proposes that all funds allocated for Advanced Technology Demonstration Projects benefit disadvantaged communities, with at least \$10 million directly spent on projects located in disadvantaged communities.

Project Solicitation: ARB will issue grant solicitations that clearly identify eligible project categories and maximum funding available. As in previous years, eligible grantees are public agencies (including air districts, ports, cities and counties) as well as non-profit organizations with relevant experience.

LONG TERM PLAN

Advanced Technology Demonstration projects are a critical component for achieving long-term emission reduction and climate change goals. A long-term demonstration program, with sustained, multiyear funding directed at the acceleration of advanced technology into the marketplace will help ARB to reach the long-term GHG and criteria pollutant emission reduction goals. The first installment in that multiyear effort was include in last year's Funding Plan with a strategic investment in zero-emission drayage trucks and the multisource facilities demonstration project. The movement toward zero-emission or near-zero emission technologies in on-road, off-road, locomotive and other categories has begun and can only be transformative with the continued strong financial commitment made by the State. This significant investment signals to vehicle and equipment manufacturers as well as end-users of such equipment that their investments will help develop a strong market, reducing manufacturing and operational costs while benefitting disadvantaged communities.

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 Demonstration Projects 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.

Zero-Emission Freight Equipment Pilot Commercial Deployment Projects

Proposed project allocation:
Low Carbon Transportation – \$9 million

PROJECT OVERVIEW AND GOALS

Zero-emission technologies are commercially available and in use in various freight equipment including battery and fuel cell forklifts, certain types of cargo handling equipment, and airport ground support equipment. Staff is proposing that this project provide incentives for zero-emission off-road freight equipment to accelerate deployment and drive consumer acceptance in the early stages of commercialization. At the same time, project applications will give staff the opportunity to assess multiple equipment types at various stages of commercialization and better plan for future freight project funding opportunities.

STAFF PROPOSAL FOR FY 2015-16

Staff is proposing to provide \$9 million in funding from Low Carbon Transportation investments for Zero-Emission Freight Equipment Pilot Commercial Deployment Projects with at least 50 percent of funding to benefit disadvantaged communities as shown in Table 24. Eligible off-road zero-emission projects would include forklifts, transport refrigeration units (TRUs), yard trucks, airport ground support, and cargo handling equipment. Staff anticipates releasing a solicitation and ranking projects based on competitive criteria. Projects will be required to be located where freight related off-road equipment is prevalent such as port, rail yard, distribution center, warehouse, or freight hub facilities.

Table 24: Proposed Zero-Emission Freight Equipment Pilot Commercial Deployment Projects Funding for FY 2015-16

FY 2014-15 Allocation (million)	Proposed FY 2015-16 Allocation (million)
\$0	\$9

Project Solicitation: Staff proposes releasing a project solicitation for the full \$9 million funding allocation. The number of projects selected for funding will depend on the number of applications and strength of each application, but could include one or more projects. The project solicitation will be open to public agencies (including air districts, ports, cities, and counties) as well as non-profit organizations with relevant experience. The solicitation will define the scoring criteria to be used by ARB to evaluate applications, including elements such as GHG emission reductions, benefits to disadvantaged communities, and potential for technology transfer to other freight sources.

Cost Sharing Requirements: Staff proposes that the maximum cost share provided by ARB for this project be 75 percent, consistent with other Low Carbon Transportation project categories such as the Advanced Technology Demonstration Projects. Ability to leverage significant additional match funding (beyond the minimum 25 percent applicant contribution) will be an important criterion within the competitive process.

LONG-TERM PLAN

The Zero-Emission Freight Equipment Pilot Commercial Deployment Project is intended to support broad scale deployment of zero-emission equipment by minimizing consumer risk and leveraging resources as a model to accelerate large-scale zero-emission freight equipment deployment. However, since specific zero-emission equipment in each vocation is at varying levels of commercialization, staff is proposing to assess applications and be poised to provide incentives as zero-emission freight technologies emerge.

Staff will pay particular attention to the scalability of the projects funded in the first year of this pilot and will analyze the most promising scalable projects to promote their continuation and expansion in future years. This expansion has the potential to transition a targeted subset of projects to a first-come, first-served basis, similar to HVIP and CVRP. For example, if an initial pilot project for zero-emission yard trucks is successful and demand warrants, staff could propose a voucher-based project for zero-emission yard trucks.

Although zero-emission freight equipment is still at the early stages of commercialization, staff expects the pilot project to also work as a catalyst to spur technology development. Staff intends to design the pilot project in a way that is adaptable and can be quickly adjusted each year to broaden the types of pilots funded as additional promising zero-emission freight equipment is introduced.

There is a clear need to evaluate the effectiveness of these projects. Metrics for success can help illustrate the success of this pilot project in accelerating technology deployment and achieving consumer acceptance. Staff proposes to develop proposed metrics of success, include them with the project solicitation, and, where feasible, ensure the project proposals be structured to enable collection of data to inform these metrics. Metrics will focus on achievement of technology price reductions, manufacturer diversity, applicability to broader types of equipment, consumer acceptance, and any additional metrics stemming from discussions with stakeholders in future work group meetings.

CHAPTER 5: TRUCK LOAN ASSISTANCE PROGRAM

PROJECT OVERVIEW AND GOALS

Launched in 2009, the Truck Loan Assistance Program utilizes AQIP funds to help small-business fleet owners affected by ARB's In-Use Truck and Bus Regulation to secure financing for upgrading their fleets with newer trucks or with diesel exhaust retrofits. Because the program primarily reduces criteria emissions with little or no GHG reductions, AQIP is the only source of ARB funding available.

This program is an ongoing and successful incentive option that leverages public funding with private funding from participating lending institutions. Implemented in partnership with the State Treasurer's Office's California Pollution Control Financing Authority (CPCFA) through its California Capital Access Program (CalCAP), 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. The State's funds are deposited as "contributions" (based on a percentage of each enrolled loan amount) into a loan loss reserve account for each participating lender to cover potential losses resulting from loan defaults. Currently, the percentages are 20 percent for lenders new to this program and 10 percent after a lender has enrolled \$5 million in loans. 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. The program is available for small fleets with 10 or fewer trucks at the time of application. Lenders use their traditional underwriting standards to establish loan terms; however, the program currently includes an interest rate cap of 20 percent.

CURRENT PROJECT STATUS

As of April 30, 2015, about \$57 million in Truck Loan Assistance Program funding has been expended to provide about \$446 million in financing to small-business truckers for the purchase of nearly 7,500 cleaner trucks, exhaust retrofits, and trailers. The program has had a low default rate of about 2 percent. The program has reimbursed lenders just under \$4.4 million for a total of 141 claims (out of 6,716 loans) for losses resulting from loan defaults. Participation in the Truck Loan Assistance Program has increased steadily since it launched in 2009 in response to regulatory compliance deadlines, as shown in Figure 9.

Figure 9: Loan Activity by Quarter

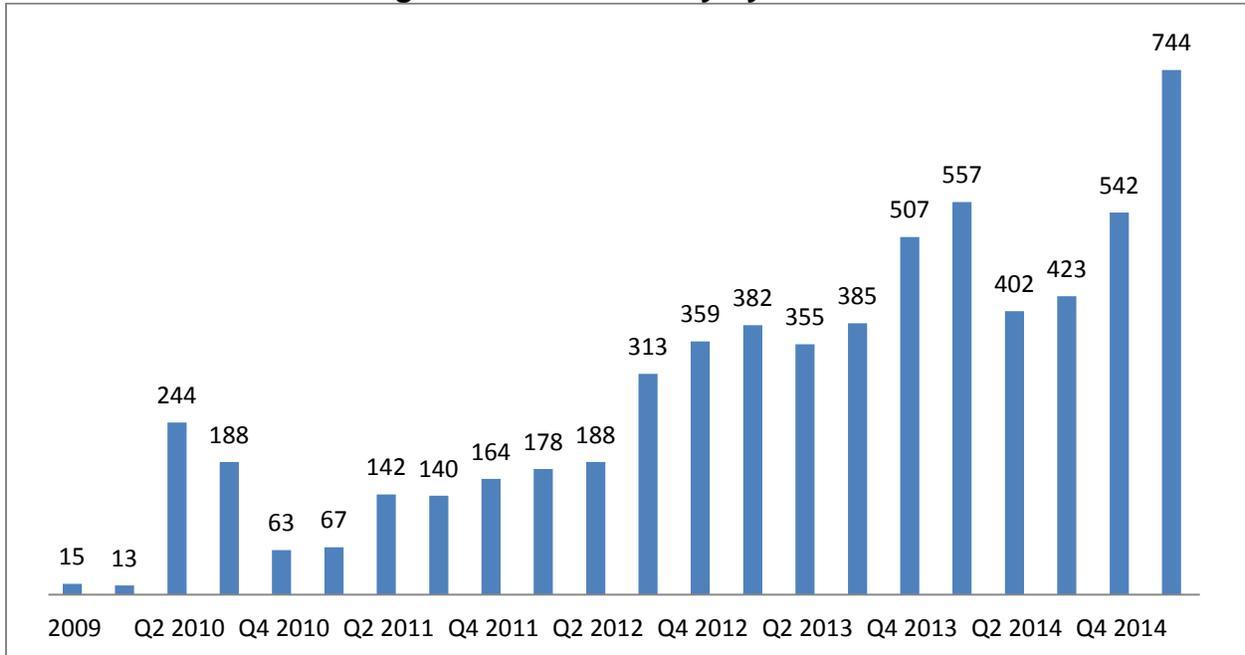


Table 25 provides a summary of financing offered. Historically, nearly 80 percent of enrolled loans have been issued to owner operators with one truck, and nearly 90 percent of enrolled loans have been issued to fleet owners with 10 or fewer employees. Figure 10 shows the distribution of funding by air district. Because the Truck Loan Assistance Program is funded solely with AQIP funds, it is not subject to the disadvantaged community investment requirements that accompany the Low Carbon Transportation appropriation. However, it is worth noting much of this funding benefits disadvantaged communities. Over 80 percent of the loans to date have been issued for trucks registered in ZIP codes that are defined as benefiting disadvantaged communities in ARB’s *Investments to Benefit Disadvantaged Communities: Interim Guidance to Agencies Administering Greenhouse Gas Reduction Fund Monies*.

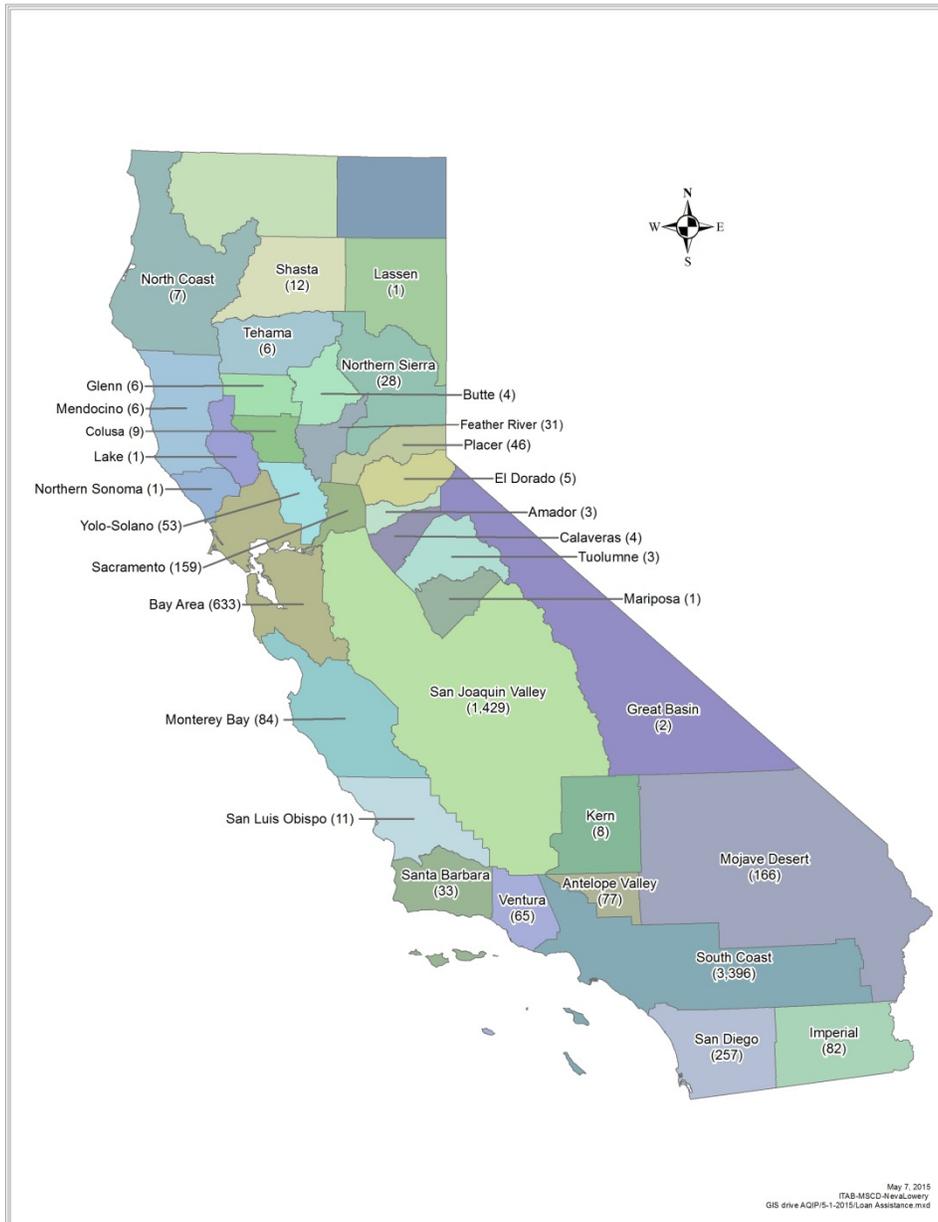
Table 25: Truck Loan Assistance Program Status –Vehicles/Equipment Financed

Program	Number of Loans Issued ¹	Number of Projects Financed	Project Type	\$ Spent	Total Amount Financed
ARB/CalCAP Truck Loan Assistance Program	6,716	6,903	Truck Purchases	\$57M	\$446M
		500	Exhaust Retrofits		
		61	Trailers		

Based on data through April 30, 2015.

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

Figure 10: Loans by Air District



Based on data through April 30, 2015.

STAFF PROPOSAL FOR FY 2015-16

For the FY 2015-16 Funding Plan, staff proposes an allocation of \$15 million to continue program operation as shown in Table 26. Growth in the program has increased steadily, as shown in Figure 9. For example, program expenditures in 2014 were \$15.4 million, which was nearly 150 percent of that in 2012. Program growth is related to increased lender and borrower awareness and utilization of the program, increased cost of new diesel trucks, and increased enforcement of the Statewide In-Use Truck and Bus Regulation. Other contributing factors include continued economic recovery,

strength in the trucking sector, and growing availability of 2010 and later model year trucks in the used truck market.

Table 26: Proposed Truck Loan Assistance Program Funding for FY 2015-16

FY 2014-15 Allocation (million)	Proposed FY 2015-16 Allocation (million)
\$10	\$15

Due to this increase in demand, ARB staff is increasing its proposed Truck Loan Assistance Program allocation from \$10 million which it had shared at the January 2015 and March 2015 public workshops to the proposed level of \$15 million. Based on an analysis of historic expenditures, CPCFA estimates that the Program would exhaust \$10 million by March 2016, leaving the program unfunded for the remainder of the 2015-16 fiscal year. Avoiding the interruption of funding is very important for the Truck Loan Assistance Program. Having loan assistance unavailable for even a short period erodes the confidence the affected fleets have in obtaining the necessary financing to purchase trucks to meet the compliance requirements of the In-Use Truck and Bus Regulation. Furthermore, the lenders as our private-sector partners would be negatively affected by an interruption of funding. Providing adequate funding will significantly alleviate the possibility of this issue.

To ensure the sustainability of the Truck Loan Assistance Program and continuous availability of funding to participating lenders, staff is working with CPCFA to examine potential program modifications to address both short-and long-term cash flow and to meet ever-increasing demand. Options under consideration include:

- *Alignment of contribution rates consistent with the State CalCAP Program:* The State CalCAP program for small business lending administered by CPCFA requires the lender and the borrower to each contribute a fee into the loan loss reserve account, in addition to the publicly-funded contribution, as an added measure of the perceived need for the program on a loan-by-loan basis. When the Truck Loan Assistance Program was implemented, the lender and borrower fees were omitted as a means to jumpstart participation in the new program. Now that this program has matured, staff will work with CPCFA to engage the participating lenders to realign the contribution rates to those currently offered under the regular small business program, including a lower CalCAP/ARB contribution rate and a required lender and borrower fee. Realigning the contribution rates would slow the rate of the expenditure of AQIP funding, plus add a mechanism to encourage lenders and borrowers to more closely evaluate the need for enrolling each loan in this program.
- *Incremental recapture of funds in the lenders' loan loss reserve accounts:* Currently, the contributions in each lender's account accumulate unless claims are made. To date, no lender's claims have exceeded the balance in its account. Staff and CPCFA will examine the potential for a recapture of funds, balancing

the lender's need for reasonable protection against losses with the prudent use of public funds.

- *Short-term cash flow:* Because the AQIP revenues accrue throughout the fiscal year, the demand for funding for the Truck Loan Assistance Program may from time-to-time precede the availability of funds to advance to CPCFA. Staff will assess whether there are any sources of funding that may be able to cover the temporary lack of funding.

Staff will continue to closely monitor Program demand and work with CPCFA staff, participating lenders, and other stakeholders to evaluate whether to implement Program changes to balance available funding with meeting the needs of the fleets. If changes are warranted, they will be implemented through a public process resulting in an amended interagency agreement between ARB and CPCFA.

LONG-TERM PLAN

The Truck Loan Assistance Program helps small business truckers affected by the In-Use Truck and Bus Regulation. The majority of participants are small-business fleet owners with one truck who need to comply with the regulation. Staff anticipates that future funding plans will maintain funding for the program to continue to meet the strong demand and support for small-business fleets through the compliance deadlines approved by the Board. 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, ARB staff commits to perform periodic assessments to develop funding projections for annual program needs. 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 (for example, less than five percent noncompliance with final regulatory requirements), staff anticipates recommending discontinuing the program.

CHAPTER 6: CONTINGENCY PROVISIONS

The proposed FY 2015-16 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 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 funds are spent expeditiously, efficiently, and where the need is the greatest. Under these provisions, the Board would grant the Executive Officer authority to make mid-course adjustments as necessary.

Low Carbon Transportation and AQIP Funding Levels: Over past funding cycles, AQIP revenues were sometimes lower than the levels included in the State Budget, and project solicitations had to be scaled back. AQIP appropriation levels have been adjusted in the State Budget in recent years to more closely track anticipated revenues, so staff does not expect needing to scale back AQIP funding in the FY 2015-16 funding cycle. However, staff is proposing to leave \$1 million of the AQIP appropriation unallocated to function as a prudent reserve and further minimize the need to scale back solicitation totals or be available to bridge the gap between fiscal years in the case that a project is oversubscribed.

The proposed Funding Plan includes allocations for Low Carbon Transportation investments, based on the Governor's State Budget proposal, as revised in May 2015. The final State Budget has not been approved and signed at the time this proposed Funding Plan was released. If the final State Budget authorizes an amount different than the \$350 million proposal, staff will present proposed modifications to address those changes at the June 25, 2015 Board meeting provided that the State Budget is signed by the Governor before the Board meeting date. If there are further changes to the Low Carbon Transportation appropriation after the Board meeting, staff proposes to scale funding allocations up or down proportionately for each project unless otherwise specifically directed by the Board or legislation.

In the FY 2014-15 State Budget, the Legislature included a requirement that no State agency receiving funding from GGRF commit more than 75 percent of its appropriation prior to the fourth Cap-and-Trade auction in the fiscal year as a way to ensure against spending more proceeds than are generated by auction. If the final FY 2015-16 State Budget includes similar provisions, ARB will design its funding solicitation schedule to meet this requirement.

Additional Funding Sources: If funding from other sources is provided for any of the project categories authorized in the Funding Plan, these outside funds will be allocated as needed for projects or as specifically required by the authorizing entity. Additionally, projects receiving additional funding may be altered to accommodate any conditions placed upon the use of alternative sources of funding as long as these conditions are consistent with the statutory provisions for Low Carbon Transportation and AQIP. ARB staff will consult with project work groups prior to making any changes to projects.

Project Demand: ARB staff plans to issue initial solicitations and funding agreements based on the allocations listed in Table 2 (Chapter 2). However, these solicitations and grant agreements will be written with provisions to allow an increase in awarded funding if there are sufficient revenues and project demand. Conversely, staff proposes that the Executive Officer have the ability to reallocate funding from any project in the event that demand does not materialize. In this case, funds would be preferentially reallocated within the same project category or sector prior to reallocating to different sector. That is, if demand fails to materialize for one of the truck projects, ARB would first prioritize reallocating that funding to other truck projects. Likewise, if demand falls short for one of the light-duty pilot projects, ARB would shift that funding to another light-duty pilot. Any changes in funding for a particular project category would be publicly vetted through public project work groups.

When ARB is evaluating solicitations, there may be cases where funding has been awarded to the highest scoring applications and the remaining available funds are less the amount requested in the next highest scoring application. In these cases, staff proposes that the Executive Officer have the authority to offer funding to the next highest scoring project(s) at a scaled down scope, carry the remaining funds forward to the next fiscal year, or shift the funds to another project category at his discretion.

Finally, staff proposes the Executive Officer have the authority to establish consumer waiting lists for CVRP and HVIP in the event funding is exhausted prior to the end of the funding cycle.

Minor Technical or 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 public project work groups that have been established to discuss the implementation details of each project. For several project categories, staff is already planning to use the public work group process to finalize technical details prior to issuing solicitations. These cases are noted in the project descriptions in Chapters 3 and 4. These changes would be within the Funding Plan parameters approved by the Board.

CHAPTER 7: PROJECT SOLICITATION AND AWARD PROCESS

Following Board approval of the proposed FY 2015-16 Funding Plan and after the final State Budget is signed, staff will either release competitive solicitations in order to select a grantee(s) or complete grant/interagency agreements for each of the project categories. Solicitations will include all of the programmatic details applicants will need to apply for funds. In addition, solicitations will include the criteria upon which the applications will be evaluated, scored, and selected.

Public work groups have been or will be established for each project category and will continue to be the primary avenue for seeking stakeholder input and feedback on solicitation details and, if applicable, implementation guidelines. Staff will monitor and evaluate current projects over the course of the fiscal year and share project data in the work groups.

In several cases, the funding award process will deviate from the competitive solicitation process described above. These are explained in the project description in Chapters 3, 4, and 5, and summarized below:

- For CVRP and HVIP, there is an option at ARB's discretion in the FY 2014-15 grants to be renewed for FY 2015-16. If this option is exercised, there will be no solicitations for these projects for FY 2015-16 funds. The Public Fleets to Benefit Disadvantaged Communities Pilot Project will continue to be administered as a set aside within CVRP, so there will be no solicitation for this project if the CVRP grant is renewed.
- The EFMP Plus-Up Pilot Project funding will be awarded non-competitively through grant agreements with the San Joaquin Valley and South Coast air districts and potentially other air districts that choose to start a qualifying program.
- The Truck Loan Assistance Program, and a portion of the Financing Assistance Pilot Project funding, will be awarded non-competitively as an interagency agreement with the State Treasurer or any of the boards, authorities or commissions chaired by the State Treasurer.
- The rural district school bus funding set aside, an element of the Zero-Emission Truck and Bus Commercial Deployment Pilot Projects, will be administered via an interagency agreement between ARB and the California State Department of Education or via a grant agreement between ARB and a local air district. ARB will not hold a competitive solicitation for these funds.

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APPENDIX A

AB 8 PROJECT SCORING REQUIREMENTS FOR AQIP PROJECTS

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AQIP PROJECT SCORING CRITERIA: METHODOLOGY

Overview

AB 8 (Perea, Chapter 401, Statutes of 2013) refined the evaluation criteria for projects funded by fees that support AQIP, which focuses on reducing criteria pollutant and diesel particulate matter emissions with concurrent reductions in GHG emissions and other benefits. This year's budget appropriates \$23 million to ARB for AQIP projects. This appendix describes the AB 8 scoring criteria analysis of project categories found in the Funding Plan and provides additional details on the methodology developed and assumptions used. Since the passage of AB 8, this is the second annual Funding Plan to include the scoring criteria analysis, and ARB anticipates updating and revising the analysis in each subsequent Funding Plan as new data become available and methodologies are refined. For this Funding Plan, the methodology remains the same as FY 2014-15, but emissions factors, assumptions, and projects have been updated. While the AB 8 scoring evaluation applies only to projects that have been proposed for funding by AQIP, staff extended the analysis to all project categories that have been proposed in the FY 2015-16 Funding Plan, including projects supported only by GGRF.

Assembly Bill 8

The analysis and methodology in this appendix describes ARB's implementation of the provisions that require ARB to assign preference to projects with a higher benefit-cost score. AB 8 extended the funding for AQIP through 2023, 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.¹
- "Benefit-cost score" means the reasonably expected or potential criteria pollutant emission reductions achieved per dollar awarded by the board for the project.²
- The state board also may give additional preference based on the following criteria, as applicable, in funding awards to projects.³
 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 Energy Commission.

¹ Health & Safety Code Section 44274(b)

² Health & Safety Code Section 44270.3(e)(1)

³ Health & Safety Code Section 44274(b)

4. Ability to achieve climate change benefits in addition to criteria pollutant or air toxic emissions reductions.
5. Ability to support market transformation of California's vehicle or equipment fleet to utilize low carbon or zero-emission technologies.
6. Ability to leverage private capital investments.

Statue directs ARB to annually evaluate potential project categories to assign preference for AQIP funding, based upon the specific criteria identified above. Staff's analysis and evaluation methodology was applied to all of the proposed project types identified in the FY 2015-16 Funding Plan to determine project-specific benefit cost scores.

Methodology

To determine the benefit-cost scores for the proposed projects, staff utilized the developed methodology adopted in the FY 2014-15 Funding Plan and applied it to the proposed project categories. Staff 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 costs evaluations, analysis to support the additional preference criteria, and scoring methodology. This appendix provides information on the following:

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

Emissions Benefit Analysis

Well-to-Wheel Emission Factors

Staff determined that a well-to-wheel (WTW) analysis for emission reductions is the most appropriate method to determine emission benefits for a majority of the proposed projects. A well-to-wheel emission analysis allows staff to quantify the emissions produced from the production, distribution, and usage of different fuel types, including hydrogen and electricity, and any associated emissions from the usage of the vehicles. 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, when applicable, were quantified for each proposed project. Staff calculated the near-term and expected future oxides of nitrogen (NOx), particulate matter (PM) 2.5, and hydrocarbons (HC) emissions, along with GHG emissions for each project type.

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

- Light-duty vehicles (LDV)
- Medium Heavy-duty vehicles (MHD)
- Heavy Heavy-duty vehicles (HHD)
- Urban buses

To support the analysis of criteria pollutant 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,⁴ ARB's Emission Factor (EMFAC) Model,⁵ information from ARB regulation staff reports, publically available technical reports, and staff assumptions. Additionally, staff analyzed GHG emissions utilizing updated carbon intensity data from ARB's Low Carbon Fuel Standard (LCFS)⁶ Program to address Additional Preference Criterion 4, the ability to achieve climate change benefits, which is discussed later in this document. To quantify WTW emission factors, the analysis combined two pieces of data: upstream emission factors (well-to-tank) and vehicle usage emission factors (tank-to-wheel).

To develop upstream emission factors, staff evaluated emissions created by the production, processing, and distribution of applicable fuels on a per-gallon basis with data derived from the GREET model (for criteria pollutants) and LCFS (for GHG emissions). While there are many components involved in the development of the upstream emission factors, one key component is the generation of fuel economy values for the baseline vehicles for the different vehicle categories. Fuel economy is an important component of the upstream emissions analysis, as the value determines the emissions generated based on the production of each unit of fuel for the miles traveled. Moreover, to analyze the near-term and the long-term potential emissions benefits from the various technologies, staff accounted for fuel economy improvements of conventional baseline vehicles in later years due to anticipated improvements in engine and vehicle efficiencies. LDV fuel economy values were derived from the potential improvements based on the Corporate Average Fuel Economy (CAFE) regulation.

For the heavy-duty vehicle classes (MHD, HHD, and Urban Buses), the near-term fuel economy values were based on published reports for conventional vehicles in similar weight classes. Long-term fuel economy values were generated based on the assumed vehicle efficiency improvements after the implementation of U.S. Environmental Protection Agency's (EPA's) Phase I Standard for GHG and fuel efficiency. For the purpose of this analysis, staff's fuel economy assumptions do not reflect EPA's Phase II Standard, which may alter the long-term fuel economy values for the heavy-duty vehicle categories as the rule is still being developed. Staff will update these values as more

⁴ <https://greet.es.anl.gov/> (Version 2014)

⁵ <http://www.arb.ca.gov/emfac/>

⁶ http://www.arb.ca.gov/fuels/lcfs/lcfs_meetings/040115_pathway_ci_comparison.pdf

data become available. Table A-1 summarizes the baseline fuel economy estimates used in the near-term and potential long-term analysis of conventional vehicles in the analysis.

A-1: Fuel Economy Values of Baseline Conventional Vehicles

Vehicle Class	Fuel Economy	2015	2020	2025
LDV	Gasoline (mpg)	26.0	29.4	-
MHD	Diesel (mpg)	14.5	-	15.9
HHD	Diesel (mpg)	6.2	-	6.9
Urban Buses	Diesel (mpg)	3.4	-	3.8

Staff developed upstream emission factors that were based on the mix of feedstock used in the production of the various fuels. Staff assumed the following upstream pathways for the fuels analyzed:

- Gasoline baseline: California reformulated gasoline pathway
- Diesel Baseline: Ultra-low-sulfur diesel pathway
- Electricity: Current U.S. average mix pathway
- Hydrogen: Current North America average natural gas with centralized production of hydrogen and 33% biomass, such as landfill gas

It should be noted that as more renewables are introduced into fuel production, such as hydrogen, additional benefits may be achieved, which may lower the emission factors. The upstream emission factors generated were then combined with downstream emission factors to generate the complete WTW emission factors for criteria pollutants. For the determination of tank-to-wheel emission factors, staff utilized ARB’s EMFAC model to generate the tailpipe emissions and emissions associated with the usage of the supported vehicles or equipment, when applicable. WTW emission factors were developed for advanced technology vehicles supported by the proposed programs, when appropriate, along with near-term and projected long-term emission factors for new conventional vehicles. As previously mentioned, staff also used carbon intensity data from LCFS to generate WTW GHG emission factors on a miles per gallon basis. 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 LDV

	Gasoline Baseline (2015)	Gasoline Baseline (2020)	Plug-in Hybrid	Battery-Electric	Fuel Cell
NOx (g/mi)	0.32	0.29	0.15	0.026	0.10
PM (g/mi)	0.038	0.037	0.029	0.021	0.042
HC Total (g/mi)	0.17	0.15	0.10	0.006	0.02
GHG (g/mi)	442	399	214	138	218

*Note: Staff assumed plug-in hybrid LDVs operate in all-electric mode 40% of the time with additional fuel economy improvements provided by the use of the hybrid drivetrain.⁷

Table A-3: WTW Emission Factors for MHD

	Diesel Baseline (2015)	Diesel Baseline (2025)	Battery-Electric	Fuel Cell	Hybrid
NOx (g/mi)	1.31	1.29	0.08	0.28	1.12
PM (g/mi)	0.170	0.165	0.078	0.115	0.105
HC Total (g/mi)	0.15	0.15	0.02	0.05	0.13
GHG (g/mi)	953	869	247	515	762

Table A-4: WTW Emission Factors for HHD

	Diesel Baseline (2015)	Diesel Baseline (2025)	Battery-Electric	Fuel Cell
NOx (g/mi)	2.48	2.41	0.19	0.65
PM (g/mi)	0.34	0.33	0.14	0.25
HC Total (g/mi)	0.34	0.33	0.02	0.11
GHG (g/mi)	2,229	2,003	578	1,203

Table A-5: WTW Emission Factors for Urban Buses

	Diesel Baseline (2015)	CNG Baseline (2015)	Diesel Baseline (2025)	CNG Baseline (2025)	Battery-Electric	Fuel Cell
NOx (g/mi)	3.36	3.50	3.36	3.29	0.38	1.31
PM (g/mi)	0.56	0.48	0.56	0.47	0.22	0.45
HC Total (g/mi)	0.50	0.68	0.50	0.63	0.020	0.22
GHG (g/mi)	4,065	3,585	3,637	3,208	1,055	2,194

*Note: For baseline urban bus emission factors, staff assumed an average between Diesel and CNG baseline urban buses, as the current California fleet utilizes a mix of the two fuel types.

⁷ Consistent with assumptions used in 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>

Additional Emission Factors

For projects where new fuels and advanced technologies are not involved or are not suitable for the WTW analysis described above, additional emission factors specific to the projects were developed. Projects necessitating additional emission factors are:

- Truck Loan Assistance Program
- Low NOx Truck Incentives
- EFMP Plus-up

Truck Loan Assistance Program:

Emission factors were 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 updated data from the project, a majority of funds were directed towards the replacement of non-compliant diesel trucks with a mix of trucks equipped with engine model years (MY) 2007 and 2010. Project data also indicate that 60 percent of the replacements were trucks with MY 2010 or newer engines, and MY 2007-2009 engines trucks made up the remaining 40 percent. Staff used the engine model year information and a weighted average of the emission factors for the analysis.

Since the replacement trucks uses the same fuel type as the older truck, 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 pollutant 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 for the truck loan assistance program to be used in the benefit-cost score analysis.

Table A-6: Exhaust Emission Factors for Truck Loan Assistance Program*

	Diesel Baseline (1997)	Diesel Baseline (2007)	Diesel (2010)
NOx (g/mi)	16.90	6.30	2.06
HC Total (g/mi)	0.26	0.33	0.18

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

Low NOx Truck Incentives:

For FY 2015-16, one new project, incentives for the deployment of certified low NOx trucks, is proposed in the Funding Plan. The project will support trucks with engines that meet optional low NOx standards that allow manufacturers the ability to certify engines to NOx emission levels that are 50 percent, 75 percent, or 90 percent lower than today's mandatory diesel emission standards. The proposed project in the

Funding Plan will encourage manufacturers to produce these engines and incentivize fleets to purchase them. Staff is proposing this new project to provide funding for heavy-duty trucks (greater than 14,000 pounds gross vehicle weight rating or GVWR) equipped with engines certified to any of the lower NOx standards. For this analysis, staff utilized fuel economy values from the HDD vehicle class to determine the WTW emission factors to be used in the evaluation.

In order to maximize the GHG emission benefits of low NOx vehicles, staff also proposed in the Funding Plan additional incentives for the use of renewable fuels. While vehicles funded by AQIP would be eligible for an optional renewable fuel incentive, vehicles funded by Low Carbon Transportation Investments would be required to use renewable fuels to additionally provide GHG emission benefits. In response, staff developed WTW emission factors for two renewable fuels: renewable natural gas (RNG) and renewable diesel. For upstream emission factors, staff derived data from GREET to determine the criteria pollutant emissions generated during the production, extraction, processing, and delivery of the renewable fuels. Staff utilized landfill gas and animal waste pathways for RNG emission factor development and soybean pathway for renewable diesel. Additionally, exhaust NOx emission factors were developed based on the optional low NOx engine emission standards based on EMFAC. Staff assumed different optional low NOx standards for the two renewable fuels used in this analysis with a 50 percent reduction in NOx for trucks utilizing renewable diesel and a 90 percent reduction for RNG. Additionally, WTW GHG emission factors were also generated to evaluate the benefits for the proposed project using renewable fuels to address Additional Preference Criterion 4. Table A-7 summarizes the WTW emission factors for the baseline diesel and renewable fuels to be used in the analysis.

Table A-7: Exhaust Emission Factors for Low NOx Truck Incentives Project

	Diesel Baseline (2015)	Diesel Baseline (2025)	Renewable Natural Gas	Renewable Diesel (RD)
NOx (g/mi)	2.48	2.41	0.71	1.59
PM (g/mi)	0.34	0.33	0.38	0.31
HC Total (g/mi)	0.34	0.33	0.75	0.44
GHG (g/mi)	2,229	2,003	581	1,070

EFMP Plus-up:

EFMP Plus-up, formerly known as the Vehicle Retirement and Replacement Plus-up, is a pilot project that provides additional incentive for consumers in disadvantaged communities to retire old vehicles and replace them with used or new hybrid, plug-in hybrid, or zero emission vehicles. According to the EFMP staff report,⁸ the average model year of a vehicle replaced through EFMP is 1995. Staff estimated the average

⁸ <http://www.arb.ca.gov/regact/2014/carscrap14/efmp14isor.pdf>

fuel economy of a 1995 model year LDV to be 21 mpg based on average fuel economy of U.S. light-duty vehicles,⁹ which is representative the CA light-duty fleet, and used this vehicle as the baseline for the analysis. Also, based on project data found in the staff report,¹⁰ staff assumed 80 percent of the high-polluting retired vehicles will be replaced with a gasoline hybrid passenger car with an average fuel economy of 35 mpg and 20 percent of the replacements with plug-in hybrid vehicles. The emission factors for the clean vehicles were weighted in the analysis. EFMP Plus-up emission factors based on the information provided above were derived from EMFAC and summarized in Table A-8.

Table A-8: Exhaust Emission Factors for EFMP Plus-Up

	Gasoline (1995)	Hybrid	Plug-in Hybrid
NOx (g/mi)	0.81	0.22	0.15
PM (g/mi)	0.053	0.032	0.029
HC Total (g/mi)	0.54	0.14	0.10
GHG (g/mi)	518	328	214

Supported Vehicles

With the criteria emission factors generated for each of the vehicle types, staff then analyzed the criteria emissions benefits for each of the proposed projects. Evaluations were performed by comparing advanced clean vehicles supported by projects proposed in the Funding Plan to a new conventional baseline vehicle. Staff performed analyses on the following projects with the corresponding vehicle class emission factors:

- CVRP (Emission Factors: LDV)
- HVIP (Emission Factors: MHD)
- Advanced Technology Demonstration Projects (Emission Factors: HHD)
- Zero-Emission Truck and Bus Pilots (Emission Factors: Urban Bus)
- Light-Duty Pilot Projects to Benefit Disadvantaged Communities
 - Car Sharing Pilot Project (Emission Factors: LDV)
 - Enhanced Fleet Modernization Program Plus-up Pilot Project (Emission Factors: EFMP Plus-Up)
 - Public Fleets in Disadvantaged Communities (Emission Factors: LDV)
- Truck Loan Assistance Program (Emission Factors: Truck Loan Assistance Program)
- Low NOx Engine Incentives (Emission Factors: Low NOx Truck Incentives)

Advanced Technology Demonstration Projects proposed for FY 2015-16 consist of various categories including on-road trucks, freight locomotives, off-road freight

⁹http://www.rita.dot.gov/bts/sites/rita.dot.gov.bts/files/publications/national_transportation_statistics/html/table_04_23.html

¹⁰ http://www.arb.ca.gov/msprog/aqip/EFMP_Update_Staff_Report_November_2013.pdf

equipment, and non-freight off-road equipment. Details regarding the vehicles and equipment supported by the demonstration projects will not be known until the projects are launched, therefore staff assumed emission factors for zero-emission short and regional haul trucks, a project proposed in the Funding Plan, as the basis for the Advanced Technology Demonstration Projects benefit-cost score.

Similarly, light-duty pilot projects to benefit disadvantaged communities were established in FY 2014-15 and information on the project is limited. As a result, staff refined last year’s analysis, which included increased incentives for public fleets, car sharing and mobility options, and EFMP Plus-Up, to evaluate light-duty pilot projects to benefit disadvantaged communities.

Using the emission factors identified above with project data and assumptions, staff determined the vehicles or equipment that may be supported by the projects to provide near-term emissions reductions for each of the projects in FY 2015-16. Table A-9 summarizes the supported technologies and vehicles that were used in the analysis to calculate the near-term emissions benefits.

Table A-9: Near-term Supported Technology Types by Proposed Projects

Proposed Programs	Supported Technology Types	Comments
Truck Loans	Replacement of a MY1997 with a MY2007 or MY2010 truck	Assumes replacement trucks are 40% MY2007 and 60% MY2010
CVRP	Plug-in hybrid and battery-electric passenger cars	45% PHEVs and 55% BEVs split, based on historical CVRP rebate data
HVIP	Hybrid and battery-electric medium-duty trucks	90% hybrid and 10% battery electric split, based on HVIP data
Advanced Technology Demonstrations	Fuel cell and battery-electric short and regional haul trucks	Eligible technologies
Zero-Emission Transit Bus Pilot	Fuel cell and battery-electric urban buses	Eligible technologies
Car Sharing Pilot Project	Plug-in hybrid and battery-electric passenger cars	50/50 split of the two technologies assumed
EFMP Plus-up	Gasoline hybrids and PHEVs	80% new gasoline hybrid and 20% PHEVs split, based on project data
Public Fleets in Disadvantaged Communities	Plug-in hybrid and battery-electric passenger cars	50/50 split of the two technologies assumed
Low NOx Engines	Low NOx trucks utilizing renewable fuels	Staff assumed only RNG for near-term evaluation

Consistent with AB 8, staff also calculated the potential long-term criteria pollutant emission 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-10 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. Long-term benefits of light-duty pilot projects cannot yet be quantified due to the nature of pilot projects and the lack of data available prior to project implementation.

Table A-10: 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
CVRP	Plug-in hybrid, battery-electric, and fuel cell passenger cars	Staff assumed an even split between the three technology types
HVIP	Hybrid, battery-electric, and fuel cell medium-duty trucks	Staff assumed an even split between the three technology types
Advanced Technology Demonstrations	Fuel cell and battery-electric short and regional haul trucks	Eligible technologies
Zero-Emission Transit Bus Pilot	Fuel cell and battery-electric urban buses	Eligible technologies
Car Sharing Pilot Project	NA	Long-term benefits not quantified for pilot projects in disadvantaged communities
EFMP 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
Low NOx Engines	Low NOx trucks utilizing renewable fuels	50/50 split of the two renewable fuels assumed, RNG and renewable diesel

Staff generated vehicle usage assumptions (annual miles traveled) through literature review for each of the vehicle types evaluated, or actual usage data when available. Table A-11 summarizes the annual mileage assumptions used for emissions benefit analysis.

Table A-11: Annual Usage Assumptions

Proposed Programs	Annual Mileage Assumptions (miles per year)	Details
Truck Loans	20,000	Staff Assumption ¹¹
CVRP	EV: 11,059	Based on 30.3 miles per day ¹²
	PHEV: 14,855	Based on 40.7 miles per day ¹³
	FCEV: 14,855	Same as PHEV
HVIP	12,000	Climate Change Scoping Plan, Measure Documentation Supplement, Measure T-7 ¹⁴
	20,000	
Advanced Technology Demonstrations	40,000	Staff Assumption ¹⁵
Zero-Emission Transit Bus Pilot	35,000	NREL Technical Report NREL/TP-7A2-47919 ¹⁶
Car Sharing Pilot Project	10,000	Derived from similar car share program (Buffalo Car Share ¹⁷)
EFMP Plus-up	Same as CVRP	Staff Assumption
Public Fleets in Disadvantaged Communities	10,647	California Department of General Services Fleet Report ¹⁸
Low NOx Engines	30,000	Truck and Bus Regulation Technical Report ¹⁹

Annual Emissions Reductions

Based on the emission factors and additional information provided above, the criteria pollutant emissions reductions (NOx, HC, and PM 2.5) for supported vehicle types were calculated by multiplying the assumed annual mileage by the difference between the conventional and supported vehicle emissions for each technology type. A weighted emissions benefit average, according to technology type (as shown in Table A-9 and A-10), for each project was calculated for both the near- and long-term assumptions.

¹¹ 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.

¹² 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/>)

¹³ 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>)

¹⁴ http://www.arb.ca.gov/cc/scopingplan/document/measure_documentation.pdf

¹⁵ http://www.calstart.org/Libraries/CalHEAT_2013_Documents_Presentations/CalHEAT_Roadmap_Final_Draft_Publication_Rev_6.sflb.ashx Short haul/regional trucks travels an average of 55,000 miles annually. Due to the use of advanced technologies, staff lowered the annual VMT for this analysis.

¹⁶ <http://www.afdc.energy.gov/pdfs/47919.pdf>

¹⁷ <http://www.buffalocarshare.org/Bufalo%20CarShare%202yr%20report%20-%20print.pdf>

¹⁸ <http://www.documents.dgs.ca.gov/ofa/FleetReduction/FleetReduction-FinalReport-July2010.pdf>

¹⁹ Truck and Bus Regulation Technical Support Document: Table XVI-1
<http://www.arb.ca.gov/regact/2008/truckbus08/tsd.pdf>

Annual criteria emissions benefit analysis was performed based on a per average vehicle basis using the following formula.

$$\text{Total Criteria Pollutant Emissions Reductions (tons)} = \text{annual vehicle miles traveled} \times (\text{emission factors for new conventional vehicle} - \text{emission factor for supported advanced technology vehicles})$$

As discussed in the FY 2014-15 Funding Plan,²⁰ 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 pollutant 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 consistent with the Carl Moyer Memorial Air Quality Standards Attainment Program.²¹

Table A-12 summarizes both the near-term and potential long-term annual emissions benefits from the vehicles and equipment supported by the projects.

Table A-12: Potential Per Vehicle Near- and Long-Term Annual Emission Benefits (tons/year)

Proposed Projects	Supported Technologies	Average Per Vehicle Annual Criteria Pollutant Emissions Reductions (tons/year)			
		Near-term	Near-term Average	Long-term	Long-term Average
Truck Loan Assistance Program	NA	0.29	0.29	NA	NA
CVRP	Battery-electric	0.0096	0.0084	0.0086	0.0058
	Plug-in Hybrid	0.0068		0.0055	
	Fuel Cell	NA		0.0034	
HVIP	Battery-electric	0.042	0.034	0.041	0.039
	Hybrid	0.033		0.031	
	Fuel Cell	NA		0.047	
Advanced Technology Demonstrations	Battery-electric	0.29	0.23	0.28	0.22
	Fuel Cell	0.17		0.16	
Zero-Emission Truck and Bus Pilots	Battery-electric	0.37	0.26	0.36	0.25
	Fuel Cell	0.15		0.14	
Low NOx Engines	RNG	0.14	0.14	0.13	0.08
	Renewable Diesel	0.046		0.037	

Pilot projects are intended to facilitate the early initial deployment of advanced technologies in lower-income households and to benefit disadvantaged communities.

²⁰ http://www.arb.ca.gov/msprog/aqip/fundplan/final_fy1415_aqip_ggrf_fundingplan.pdf

²¹ <http://www.arb.ca.gov/msprog/moyer/moyer%20staff%20report.pdf>

For this reason, staff only analyzed the near-term emission benefits of the proposed projects. Table A-13 summarizes both the near-term annual criteria pollutant emission benefits from the vehicles supported by the proposed pilot projects in disadvantaged communities.

Table A-13: Potential Per Vehicle Near-Term Annual Emission Benefits from Light Duty Pilot Projects in Disadvantaged Communities

			Average Per Vehicle Annual Criteria Pollutant Emissions Reductions (tons/year)	
	Proposed Projects	Supported Technologies	Near-term	Near-term Average
Pilot Projects to Benefit Disadvantaged Communities	Car Sharing Pilot Project	Battery-electric	0.0087	0.0067
		Plug-in Hybrid	0.0046	
	EFMP Plus-up	Battery-electric	0.023	0.023
		Plug-in Hybrid	0.026	
	Public Fleets in Disadvantaged Communities	Battery-electric	0.0093	0.0071
		Plug-in Hybrid	0.0049	

Cost Analysis

Since AQIP is intended to support long-term market transformation toward clean technologies, staff analyzed both the near-term and the potential long-term cost of the projects, when applicable. Because AQIP project incentive 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-duty²² and medium to heavy-duty vehicles.²³ The analysis then considered lower future incentive amounts per project to reflect potential long-term cost reductions.

Project costs are grouped in the following categories:

- Demonstration Phase Projects
- Commercialization Phase Projects
- Transition Phase Projects
- Pilot Projects to Benefit Disadvantaged Communities

Demonstration 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 demonstration phase. Incentives are provided to help advance the development of technologies through demonstration projects focused on single vehicle prototypes to

²² Air Resources Board. (2011). Staff Report: Initial Statement of Reasons for Advanced Clean Cars; 2012 Proposed Amendments to the California Zero Emission Vehicle Program Regulations.

²³ 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.

low-volume demonstration projects to advance the technology to the commercialization phase. In the demonstration phase, incentive funding levels are high because manufacturing is not standardized and is focused on smaller batches of vehicles.

For projects in the demonstration phase, the high near-term project costs were based on the potential funding amounts, assumed by staff, to be allocated to the proposed advanced technology demonstration project. Long-term project incentive funding amounts reflect the associated funding support after the advanced technology vehicles and equipment have been demonstrated in the demonstration phase and transitioned into commercialization phase projects, such as CVRP or HVIP.

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 current incentive funding amounts for each project. For the potential long-term incentive levels, staff assumed that as sales grow and economies of scale are achieved, the incremental costs associated with advanced vehicle technologies are expected to be 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 PHEVs based on manufacturing cost information provided in ARB’s California Zero Emission Vehicle Program Regulation: Staff Report.²⁴

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	\$2,500	\$6,462	\$1,500
2020	\$8,752	\$1,000	\$3,309	\$620

For medium to heavy-duty commercialization phase projects, the near-term incentives are based on current voucher amounts²⁵ 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

²⁴ 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>)

²⁵ http://www.californiahvip.org/docs/HVIP_Y4_Implementation%20Manual_2014-04-08.pdf

Engines and Vehicles²⁶ to current incentive 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 incentive amounts accordingly.

For low NOx trucks, as discussed earlier, no engines have yet been certified to the optional standards and cost data are not currently available. However, the use of renewable fuels, such as renewable RNG, is a component of the proposed project. For the costs associated with low NOx trucks, staff based on the cost on the use of RNG, and the use of a natural gas engine. Staff anticipates that natural gas engines certified to the optional standards will increase the incremental cost but data are not available at this time. Therefore, staff assumed the incremental cost of a natural gas truck to be representative of an eligible truck supported by the proposed project for the analysis. Current increment cost of a natural gas truck is between \$50,000 and \$90,000.²⁷ Assuming a low NOx truck powered by renewable fuels at ~\$75,000 and after combining incentives from the Energy Commission (\$25,000), staff assumed an incentive amount of \$25,000 (half of the remaining incremental cost) to be provided by ARB. For long-term costs, staff assumed a 50 percent reduction in the incremental cost and adjusted the incentive amounts accordingly.

Pilot Projects to Benefit Disadvantaged Communities and Transition Phase Projects: The proposed projects under these categories are primarily intended to support the penetration of advanced technology vehicles to benefit disadvantaged communities or support the purchase of commercialized clean technologies by economically challenged consumers. Long-term costs are not included in the analysis for these project types as long-term benefits of light-duty pilot projects cannot yet be quantified due the lack of data. Moreover, transition phase project types have been established to increase market acceptance in disadvantaged communities, unlike commercialization projects with the purpose to advance the widespread use of advanced technologies to reduce costs due to increased production volumes.

Project Costs

Based on the information provided above, staff determined the incentive levels for the proposed projects and supported technologies on a per vehicle basis. Table A-15 and Table A-16 below summarize the near-term and potential long-term incentive levels provided for each of the projects.

²⁶ <http://www.epa.gov/otaq/climate/documents/420r11901.pdf>

²⁷ http://www.jbhunt.com/files/0001723_NATURAL_GAS_WHITE_PAPER_022014.pdf

Table A-15: Near-Term Incentive Amounts for Projects and Supported Technologies

Phase	Proposed Projects	Supported Technologies	Near-term Incentive Amount	Near-term Average	Additional Details
Demonstration Phase	Advanced Technology Demonstrations	Battery-electric	\$250,000	\$250,000	Staff Assumptions
		Fuel Cell	\$250,000		
Commercialization Phase	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 ²⁸
		Fuel Cell	\$500,000		
	Low NOx Engines	RNG	\$25,000	\$25,000	Estimated from the incremental cost of Low NOx trucks (based on natural gas trucks ²⁹) combined with incentives from Energy Commission ³⁰
		Renewable Diesel	\$25,000		
	CVRP	Battery-electric	\$2,800	\$2,350	Fuel cells not included in near-term costs as volumes are low. Increased incentive amounts for lower-income consumers were incorporated
		Plug-in Hybrid	\$1,800		
	HVIP	Battery-electric	\$40,000	\$22,000	HVIP voucher based on funding amounts identified in the HVIP Implementation Manual ³¹
		Hybrid	\$20,000		
Transition Phase	Truck Loan Assistance Program	NA	\$10,000	\$10,000	Based on historical data
Pilot Projects to Benefit Disadvantaged Communities	Car Sharing Pilot Project	Battery-electric	\$15,000	\$15,000	Assumes 50% match on ~\$30K operating expenses per vehicle ³¹
		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		
	EFMP Plus-up	Hybrid	\$2,500	\$3,000	Based on proposed incentive amounts
		Plug-in Hybrid	\$5,000		

²⁸ http://www.fta.dot.gov/grants/13093_3561.html

²⁹ http://www.jbhunt.com/files/0001723_NATURAL_GAS_WHITE_PAPER_022014.pdf

³⁰ http://www.energy.ca.gov/contracts/PON-13-610/00-PON-13610_2014_NGVIP_Application_Manual_2-25-14.doc

³¹ http://www.californiahvip.org/docs/HVIP_Y4_Implementation%20Manual_2014-04-08.pdf

Table A-16: Potential Long-Term Incentive Amounts for Projects and Supported Technologies

Phase	Proposed Projects	Supported Technologies	Long-term Incentive Amount	Long-term Average	Additional Details
Demonstration Phase	Advanced Technology Demonstrations	Battery-electric	\$75,000	\$75,000	Long-term incentive amounts based on potential HVIP amounts for technology type and vehicle weight class
		Fuel Cell	\$75,000		
Commercialization Phase	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		
	Low NOx Engines	Low NOx Engines	\$12,500	\$12,500	Staff assumed half the cost of near-term incentive amount
	CVRP	Battery-electric	\$1,000	\$990	Staff assumed an even split between the three technology types
		Plug-in Hybrid	\$620		
		Fuel Cell	\$1,350		
	HVIP	Battery-electric	\$15,000	\$14,500	Staff assumed an even split between the three technology types
		Hybrid	\$6,500		
		Fuel Cell	\$22,000		

Benefit-Cost Score Analysis

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 emission reductions and costs were applied to a well-established cost-effectiveness calculation methodology for incentives (consistent with that used in the Carl Moyer Memorial Air Quality Standards Attainment 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 Guidelines³³ to determine the annualized costs. Annualized cost is determined by the formula below:

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

³² 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/Bufalo%20CarShare%202yr%20report%20-%20print.pdf>

³³ http://www.arb.ca.gov/msprog/moyer/guidelines/2011gl/2011cmpgl_03_30_15.pdf

A two percent discount rate³⁴ 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-17 below shows the assumed vehicle or equipment usage life and the corresponding CRF values used to determine the annualized cost of the programs.

Table A-17: Vehicle Usage and Corresponding Cost Recovery Factors

Proposed Projects	Usage Life (Years)	CRF	Comments
Truck Loan Assistance Program	5	0.212	Average truck replaced equipped with 1997 MY engine. All 1996-1999 MY engines are required to be replaced by January 1, 2020 ³⁵
CVRP	15	0.078	Staff Assumption for light-duty vehicles ³⁶
HVIP	15	0.078	Staff Assumptions for Medium Heavy-Duty Vehicles ³⁷
Advanced Technology Demonstration Projects	3	0.347	Similar to HVIP, usage life based on HDD
Zero-Emission Transit and Bus Pilot	15	0.078	Based on assumed bus usage life ³⁸
Car Share Pilot	3	0.347	Car share vehicle operating life ³⁹
Public Fleets in Disadvantaged Communities	15	0.078	See CVRP
EFMP Plus-up	7	0.155	Staff Report: Enhanced Fleet Modernization Program ⁴⁰ and Program Assessment ⁴¹
Low NOx Engines	15	0.078	See HVIP

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

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

³⁴ http://www.arb.ca.gov/msprog/moyer/guidelines/2011gl/2011cmp_appg_03_30_15.pdf

³⁵ <http://www.arb.ca.gov/msprog/onrdiesel/documents/FSRegSum.pdf>

³⁶ 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.

³⁷ 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

³⁸ 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

³⁹ 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.

⁴⁰ <http://www.arb.ca.gov/regact/2009/carscrap09/carscrapisor.pdf>

⁴¹ http://www.arb.ca.gov/msprog/aqip/EFMP_Update_Staff_Report_November_2013.pdf

Based on the above formula, Table A-18 provides the inputs and the resulting near-term cost-effectiveness of the proposed projects.

Table A-18: Near-term cost-effectiveness inputs and cost-effectiveness score

Proposed Projects	CRF	Near-term		
		Per Vehicle Emissions Reduction (tons)	Per Vehicle Incentive levels (\$)	Cost-Effectiveness (\$/ton)
Truck Loan Assistance Program	0.212	0.29	\$10,000	7,303
CVRP	0.078	0.0084	\$2,350	21,870
HVIP	0.078	0.034	\$22,000	50,186
Advanced Technology Demonstrations	0.347	0.23	\$250,000	375,726
Zero-Emission Truck and Bus Pilots	0.078	0.26	\$500,000	150,473
Car Sharing Pilot Project	0.347	0.0067	\$15,000	781,281
Public Fleets in Disadvantaged Communities	0.078	0.0071	\$7,625	83,848
EFMP Plus-up	0.155	0.023	\$3,000	19,826
Low NOx Engines	0.078	0.138	\$25,000	14,094

Table A-19 provides the inputs and the resulting potential long-term cost-effectiveness of the proposed projects.

Table A-19: Potential long-term cost-effectiveness inputs and cost-effectiveness score

Proposed Projects	CRF	Potential Long-term		
		Per Vehicle Emissions Reduction (tons)	Per Vehicle Incentive levels (\$)	Cost-Effectiveness (\$/ton)
Truck Loan Assistance Program	0.212	NA	NA	NA
CVRP	0.078	0.0058	\$990	13,253
HVIP	0.078	0.039	\$14,500	28,778
Advanced Technology Demonstrations	0.347	0.22	\$75,000	119,085
Zero-Emission Truck and Bus Pilots	0.078	0.25	\$90,000	27,880
Car Sharing Pilot Project	0.347	NA	NA	NA
Public Fleets in Disadvantaged Communities	0.078	NA	NA	NA
EFMP Plus-up	0.155	NA	NA	NA
Low NOx Engines	0.078	0.083	\$12,500	11,731

To account for the reasonably or expected potential criteria pollutant 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 are in units of dollars per ton of criteria pollutant emissions reduced (\$/ton). Per AB 8, the cost-effectiveness values were converted to a benefit-cost score based on pound of

criteria pollutant emission benefit per dollar spent (lbs/\$). Table A-20 summarizes the final cost-effectiveness and benefit-cost scores for each of the proposed projects.

Table A-20: Final Cost-Effectiveness and Benefit-Cost Score

Proposed Projects	Final Cost-Effectiveness (\$/ton)	Benefit-Cost Score (lbs/\$)
Truck Loan Assistance Program	7,303	0.27
CVRP	17,561	0.114
HVIP	39,482	0.051
Advanced Technology Demonstrations	247,406	0.0081
Zero-Emission Truck and Bus Pilots	89,177	0.022
Car Sharing Pilot Project	781,281	0.0026
Public Fleets in Disadvantaged Communities	83,848	0.024
EFMP Plus-up	19,826	0.101
Low NOx Engines	12,913	0.155

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 \$15,000 per ton of emissions reduced, received a high of 5 points, because this cost-effectiveness level is within the range of allowable cost-effectiveness in other ARB incentive programs. The remaining bins were increased by \$15,000 increments with the least cost-effective projects, those projects over \$75,000 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, as described later in the document. The cost-effectiveness of each proposed projects were scored based on the following scale and summarized in Table A-21.

- 5: Less than \$15,000/ton
- 4: Greater than or equal to \$15,000/ton and less than \$30,000/ton
- 3: Greater than or equal to \$30,000/ton and less than \$45,000/ton
- 2: Greater than or equal to \$45,000/ton and less than \$60,000/ton
- 1: Greater than \$60,000/ton

Table A-21: 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	7,303	0.27	5
CVRP	17,561	0.114	4
HVIP	39,482	0.051	3
Advanced Technology Demonstrations	247,406	0.0081	1
Zero-Emission Truck and Bus Pilots	89,177	0.022	1
Car Sharing Pilot Project	781,281	0.0026	1
Public Fleets in Disadvantaged Communities	83,848	0.024	1
EFMP Plus-up	19,826	0.101	4
Low NOx Engines	12,913	0.155	5

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 and 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 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 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 pollutant 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 4.3 tons of lifetime criteria pollutant emission reductions per vehicle. The scoring scale associated within each rank (1-5) for

this criterion was established by evaluating the range of lifetime tons of emission reduction between the highest and lowest value to try to have an equal distribution of scores. As a result the bins were scaled in 0.3 ton increments. Projects with less than or equal to 0.3 tons of criteria pollutant emission reduced receive 1 point, while those projects with greater than 1.5 tons of criteria pollutant emission reductions reduced receive 5 points. Below is the resulting scale for criteria pollutant emission reductions per vehicle:

- 5: Greater than 1.5 tons
- 4: Greater than 0.9 tons and less than 1.5 tons
- 3: Greater than 0.6 tons and less than 0.9 tons
- 2: Greater than 0.3 tons and less than 0.6 tons
- 1: Less than 0.3 tons
- 0: No Benefits

Based on the information described above, Table A-22 summarizes the results and the corresponding score for this additional preference criterion.

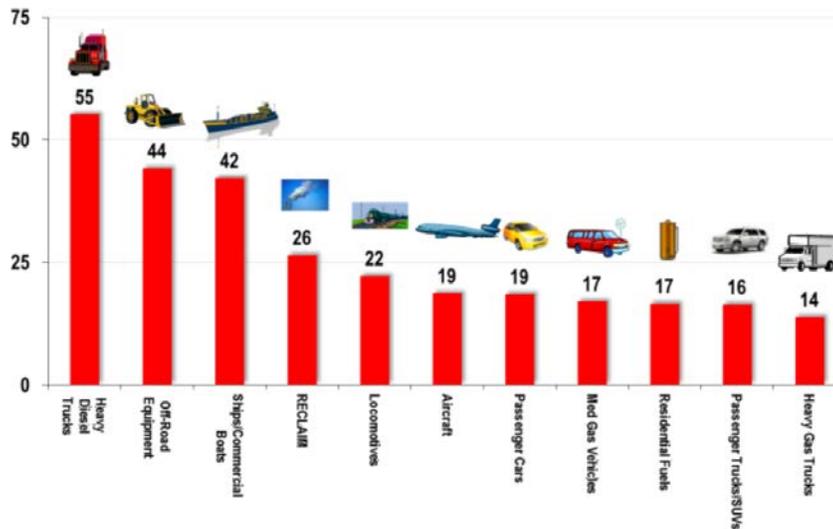
Table A-22: Results for Additional Preference Criterion 1.

Proposed Projects	Per Vehicle Near-term Average Reduction	Project Life (years)	Total Per Vehicle Lifetime Emissions Reduction (tons)	Score
Truck Loan Assistance Program	0.29	5	1.45	4
CVRP	0.0084	15	0.13	1
HVIP	0.034	15	0.51	2
Advanced Technology Demonstrations	0.23	3	0.69	3
Zero-Emission Truck and Bus Pilots	0.26	15	3.89	5
Car Share Pilot Project	0.0067	3	0.020	1
Public Fleets in Disadvantaged Communities	0.0071	15	0.106	1
EFMP Plus-up	0.023	7	0.16	1
Low NO _x Engines	0.138	15	2.08	5

2. *Contribution to regional air quality improvement* – Staff developed a scoring scale based on the ARB emission inventory for the largest region federally designated as an extreme non-attainment area in CA, and ranked projects based on their corresponding emission inventory contributions from highest to lowest. Specifically, staff used the NO_x 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 Planning⁴². The ranking scale is based on the emissions inventory shown in Figure A-1.

⁴² 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.

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 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 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 achieved for each vehicle or equipment funded by the proposed projects. The bins were determined by taking the high and low resulting benefits, and scaled to try to develop an equal distribution of scores. Below is the resulting scale for GHG reductions per vehicle:

5: Greater than 1,000 MTCO₂e

4: Greater than 500 MTCO₂e and less than 1,000 MTCO₂e

3: Greater than 150 MTCO₂e and less than 500 MTCO₂e

2: Greater than 50 MTCO₂e and less than 150 MTCO₂e

1: Less than or equal to 50 MTCO₂e

0: No GHG emission reduction

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 Per Vehicle Additional Preference Criterion 4.

Proposed Projects	Supported Technologies	Near-term (MTCO _{2e})	Near-term Average (MTCO _{2e})	Vehicle Life (years)	Total Per Vehicle GHG Emissions Reduction (MTCO _{2e})	Score
Truck Loan Assistance Program	No advanced technology or alternative fuels used	NA	NA	5	NA	0
CVRP	Battery-electric	3.4	3.4	15	51	2
	Plug-in Hybrid	3.4				
HVIP	Battery-electric	8.5	4.3	15	64	2
	Hybrid	3.8				
Advanced Technology Demonstrations	Battery-electric	66.0	53.5	3	161	3
	Fuel Cell	41.0				
Zero-Emission Truck and Bus Pilots	Battery-electric	97.0	77.0	15	1,155	5
	Fuel Cell	57.1				
Car Sharing Pilot Project	Battery-electric	3.0	2.7	3	8	1
	Plug-in Hybrid	2.3				
Public Fleets in Disadvantaged Communities	Battery-electric	17.6	14.2	15	214	3
	Plug-in Hybrid	10.9				
EFMP Plus-up	Hybrid	2.8	3.2	7	22	1
	Plug-in Hybrid	4.5				
Low NO _x Engines	RNG	47.5	47.5	15	713	4
	Renewable Diesel	32.6				

5. *Ability to support market transformation of California’s vehicle or equipment fleet to utilize low carbon or zero-emission technologies* – Similar to criterion 3 above, this qualitative analysis ranked projects by whether or not technologies that support market transformation are supported by the proposed projects. Staff used ARB’s Vision for Clean Air document 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 2015-16 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 under AB 8. 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-24 summarizes the Total Benefit Index score for all of the projects currently proposed in the FY 2015-16 Funding Plan.

Table A-24: Total Benefit Index Score of Proposed Projects in FY 2015-16 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	
Low NO _x Engines	5	5	3	4	5	4.4	5	4.9
Truck Loan Assistance Program	4	5	0	0	0	1.8	5	4.2
CVRP	1	2	5	2	5	3	4	3.8
EFMP Plus-up	1	2	5	1	5	2.8	4	3.7
HVIP	2	4	3	2	5	3.2	3	3.1
Zero-Emission Truck and Bus Pilots	5	5	5	5	5	5	1	2.0
Advanced Technology Freight Demonstrations	3	5	5	3	5	4.2	1	1.8
Public Fleets in Disadvantaged Communities	1	2	5	3	5	3.2	1	1.6
Car Sharing Pilot Project	1	2	5	1	5	2.8	1	1.5

APPENDIX B

**SB 1204 REQUIREMENTS AND PERFORMANCE CRITERIA
EVALUATION FOR HEAVY-DUTY PROJECTS**
(Health & Safety Code Section 39719.2(c) and (d))

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Overview

SB 1204 (Lara, Chapter 452, Statutes of 2014) created the California Clean Truck, Bus, and Off-road Vehicle and Equipment Technology Program funded with auction proceeds from GGRF, to support the development, demonstration, pre-commercial pilot, and early commercial deployment of zero- and near zero-emission technologies with priority given to projects that benefit disadvantaged communities. This appendix describes the ten requirements of SB 1204 and how ARB is addressing each of these requirements, followed by an evaluation of how each heavy-duty project proposed in the FY 2015-16 Funding satisfies the proposed performance criteria.

ARB's proposed heavy duty projects were evaluated based on a range of criteria that address emission reductions, technology viability and advancement, and market acceptance. Both SB 1204 and AB 8 (Perea, Chapter 401, Statutes of 2013) provide important policy drivers behind the ARB's process of evaluating heavy-duty projects for funding consideration. Projects funded by AQIP must be evaluated based on the benefit-cost of criteria pollutant reductions and five additional preference criteria consistent with the requirements of AB 8 detailed in Appendix A – AB 8 Project Scoring Criteria. While some of the heavy duty projects receive funding from AQIP, most are predominantly funded from ARB's Low Carbon Transportation appropriation and must satisfy the requirements of SB 1204, discussed in this appendix. Therefore, to ensure compliance with the requirements from both bills, ARB evaluated all proposed heavy-duty projects consistent with the benefit-cost and additional preference criteria requirements of AB 8 and the requirements of SB 1204 regardless of the project funding source. The complete AB 8 analysis is detailed in Appendix A, and the GHG evaluation results for heavy duty projects is summarized in this appendix.

1. Addressing SB 1204 Requirements

SB 1204 establishes specific program planning and project eligibility requirements and directs ARB to use the existing AQIP Funding Plan process to develop the guidance necessary to implement the program (Health and Safety Code section 39719.2(c)). The Funding Plan coordinates AQIP and Low Carbon Transportation investments in the heavy-duty sector, while implementing the specific statutory requirements that apply to each program.

SB 1204 establishes ten goals for California Clean Truck, Bus, and Off-Road Vehicle and Equipment Technology Program in Health and Safety Code section 39719.2(d) that should be addressed in ARB's guidance. The following describe how ARB will address each of these requirements, either by continuing procedures and processes that have been in place for previous AQIP or Low Carbon Transportation funding cycles or through new requirements proposed in this Funding Plan, followed by ARB's overarching vision for heavy-duty vehicle investments.

SB 1204 Requirement 1: Outline performance criteria and metrics for deployment incentives. The goal shall be to design a simple and predictable structure that provides incentives for truck, bus, and off-road vehicle and equipment technologies that provide significant greenhouse gas reduction and air quality benefits.

As Low Carbon Transportation program and AQIP evolve, there is a clear need to evaluate the effectiveness of program investments. Staff has and will continue to work with stakeholders to identify appropriate metrics of success for each project funded under AQIP and the California Clean Truck, Bus, and Off-Road Vehicle and Equipment Program.

To achieve the pace of technology advancement needed to meet long-term air quality and climate goals, this funding should spur increasingly low-emission and low-carbon technologies as they are introduced and achieve market acceptance. The availability of significant Low Carbon Transportation funding will enable the progression of advanced heavy duty technologies toward commercialization at a faster pace. Similar to how light-duty vehicles transitioned from basic hybrids to plug-in and fuel cell electric vehicles, basic hybrid trucks are a 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 ARB's heavy-duty vehicle incentives have historically funded hybrid and zero-emission urban package and delivery trucks, California Clean Truck, Bus, and Off-Road Vehicle and Equipment Program funding is expected to also expedite widespread deployment of zero-emission urban buses, freight and line-haul trucks, and off-road equipment, which are responsible for the bulk of emissions from the heavy duty sector. Investments in HVIP, truck and bus pilot projects, and demonstrations all play a critical role in transitioning the entire freight and passenger transportation sector to zero-emission technologies, while at the same time providing immediate benefits to disadvantaged communities.

Proposed Performance Criteria for Evaluating Heavy-Duty Projects: Staff proposes the following performance criteria for evaluating heavy-duty projects funded through AQIP, California Clean Truck, Bus, and Off-Road Vehicle and Equipment Program, or both. These performance criteria are also intended to fulfill SB 1204 requirements:

- Potential for statewide and local emission reductions and health benefits.
 - Near-term reductions in both GHG and criteria emissions.
 - Long-term reductions in GHG and criteria emissions.
 - Emission reductions in non-attainment areas.
 - Emission reductions in and benefiting disadvantaged communities.
- Potential for technology viability.
 - Cost parity compared to conventional technology.
 - Reliability and durability in chosen application.

- Ability to transfer technology to other vehicle or equipment types.
- Fueling infrastructure support.
- Ability to integrate renewable fuels.
- Broad market acceptance.
 - Ability to leverage additional public and private funding.
 - Collaboration between multiple entities.
 - Ability to address market barriers.

SB 1204 Requirement 2: Ensure that program investments are coordinated with funding programs developed pursuant to the California Alternative and Renewable Fuel, Vehicle Technology, Clean Air, and Carbon Reduction Act of 2007 (Chapter 8.9 (commencing with Section 44270) of Part 5).

Developing a joint Funding Plan that covers both AQIP and Low Carbon Transportation funding sources ensures coordinated investments between these two programs. The California Clean Truck, Bus, and Off-Road Vehicle and Equipment Program complements and enhances the existing ARB/Energy Commission coordination in AQIP planning process by directing additional funding for the development, demonstration, pre-commercial pilot and early commercial deployment of zero- and near-zero emission truck, bus, and off-road vehicle and equipment technologies.

In developing the joint Funding Plan, ARB and the Energy Commission staff meet routinely during the development of each agency's funding/investment plans for these respective programs to ensure that investments are coordinated. ARB has a representative on the Advisory Committee that assists with the development of the Energy Commission's Alternative and Renewable Fuel and Vehicle Technology Program. Similarly, Energy Commission staff participate in the public workshops and work groups that are part of ARB's annual funding plan development.

SB 1204 Requirement 3: Promote projects that assist the state in reaching its climate goals beyond 2020, consistent with Sections 38550 and 38551.

In the FY 2014-15 Funding Plan, heavy duty projects focused on vehicles and industry sectors that, when transitioned to zero-emission, will have a significant impact on reducing climate change emissions. The FY 2014-15 Funding Plan included \$80 million in Low Carbon Transportation funding allocations for multi-source facility and drayage truck demonstrations and ongoing deployment of commercially available vehicles through HVIP and truck and bus pilot projects.

By continuing to develop promising near zero- and zero-emission technologies for use in industry sectors that: (1) are significant GHG emitters; and (2) hold promise for technology expansion and transfer to other sectors, these investments will help the State reach its long-term climate goals. Some of the key performance criteria listed above are "potential for long-term GHG reductions" and "ability to transfer technology to

other vehicle or equipment types.” These criteria help to promote projects that will contribute to meeting post-2020 climate goals.

SB 1204 Requirement 4: Promote investments in medium- and heavy-duty trucking, including, but not limited to, vocational trucks, short-haul and long-haul trucks, buses, and off-road vehicles and equipment, including, but not limited to, port equipment, agricultural equipment, marine equipment, and rail equipment.

Since the launch of AQIP with the first annual Funding Plan in 2009, ARB has funded the types of projects identified by SB 1204, and staff proposes to continue and expand these investments. As shown in Table 2 in Chapter 2 of this Funding Plan, staff proposes about \$150 million for demonstrations, pilots, and deployment projects in the truck, bus, and off-road vehicle and equipment sectors.

SB 1204 Requirement 5: Implement purchase incentives for eligible technologies to increase use of the cleanest vehicles in disadvantaged communities.

Consistent with this requirement, the Board approved the FY 2014-15 Funding Plan with the commitment that at least half of the total Low Carbon Transportation funding be invested in projects that provide benefits to disadvantaged communities. Staff proposes to continue this level of incentives in disadvantaged communities. In addition, staff’s proposal ensures that at least 10 percent of these funds will be invested in disadvantaged community census tracts. This will ensure that ARB’s heavy-duty vehicle incentives increase the use of the cleanest vehicles in these communities.

Over past funding cycles, ARB has provided AQIP and Low Carbon Transportation funding for purchase incentives for clean technologies, reducing emissions from the heavy-duty sector and providing benefits to disadvantaged communities. To date, nearly 2,000 vouchers have helped fund hybrid and battery electric delivery trucks and buses through HVIP, with about 75 percent of HVIP funding providing benefits to disadvantaged communities, and about 45 percent spent in disadvantaged communities. In addition, new Truck and Bus Pilot Commercial Deployment projects that ARB will launch later in 2015 will also increase use of the cleanest vehicles and benefit disadvantaged communities.

SB 1204 Requirement 6: Allow for remanufactured and retrofitted vehicles to qualify for purchase incentives if those vehicles meet warranty and emissions requirements, as determined by the state board.

Currently, ARB is allowing conversions of existing in-use vehicles to zero-emission as an eligible vehicle category in the multi-source facility demonstration project, zero-emission drayage truck demonstration project, and the truck and bus pilot project being funded as part of the FY 2014-15 Funding Plan. In addition, staff is proposing that eligibility for hybrid and zero-emission conversions of original equipment manufacturer (OEM) vehicles be added to HVIP for the first time.

SB 1204 Requirement 7: Establish a competitive process for the allocation of moneys for projects funded pursuant to this section

ARB has used an established process for awarding AQIP funding through competitive solicitations since 2009. This process is serving as the basis for allocating most Low Carbon Transportation funding in the FY 2014-15 funding cycle, and staff proposes using the same process moving forward to solicit and award California Clean Truck, Bus, and Off-Road Vehicle and Equipment Program funding. Staff also proposes to allow funding allocations to be directed to a local air district or other agency to administer first-come first-served funding projects that more effectively address local needs.

SB 1204 Requirement 8: Leverage, to the maximum extent feasible, federal or private funding.

Currently, most grant solicitations require a minimum level of match funding, and projects that offer more match funding will receive scoring preference. Proponents are encouraged to seek additional funding from federal, state, and local public sources, as well as private sources. Staff proposes continuing the solicitation scoring criteria to encourage leveraging, and is working with other funding providers to maximize federal and private funding.

SB 1204 Requirement 9: Ensure that the results of emissions reductions or benefits can be measured or quantified.

Since the inception of AQIP, all grant solicitations require that the project proponent report various metrics associated with vehicle operation and fuel consumption. Emissions from vehicles certified to a cleaner standard (i.e., low NOx) will be compared to a diesel baseline to determine emission reductions. Fuel consumption and carbon intensity will be used to quantify GHG emissions benefits from hybrids, battery electric and fuel cell electric vehicles, as well as from vehicles using renewable fuels, compared to their conventional counterparts. All program-level emission reduction benefits will be quantified by comparing to conventional technologies on a well-to-wheel basis. In addition, telematic devices will be used when possible to monitor in-use data and provide information on usage in disadvantaged communities and other designated areas. Staff proposes to contract with a third party to collect and analyze operation, maintenance, and performance data associated with demonstration and pilot projects.

SB 1204 Requirement 10: Ensure that activities undertaken pursuant to this section complement, and do not interfere with, efforts to achieve and maintain federal and state ambient air quality standards and to reduce toxic air contaminants.

The zero- and near zero-emission technologies funded in California Clean Truck, Bus, and Off-Road Vehicle and Equipment Program provide GHG reductions as well as

criteria pollutant and toxic air contaminant reductions, consistent with the existing AQIP program. These technologies operating in and near disadvantaged communities will reduce NOx and diesel particulate matter, contribute to criteria pollutant emission reductions, and reduce GHG emissions in the heavy-duty transportation sector.

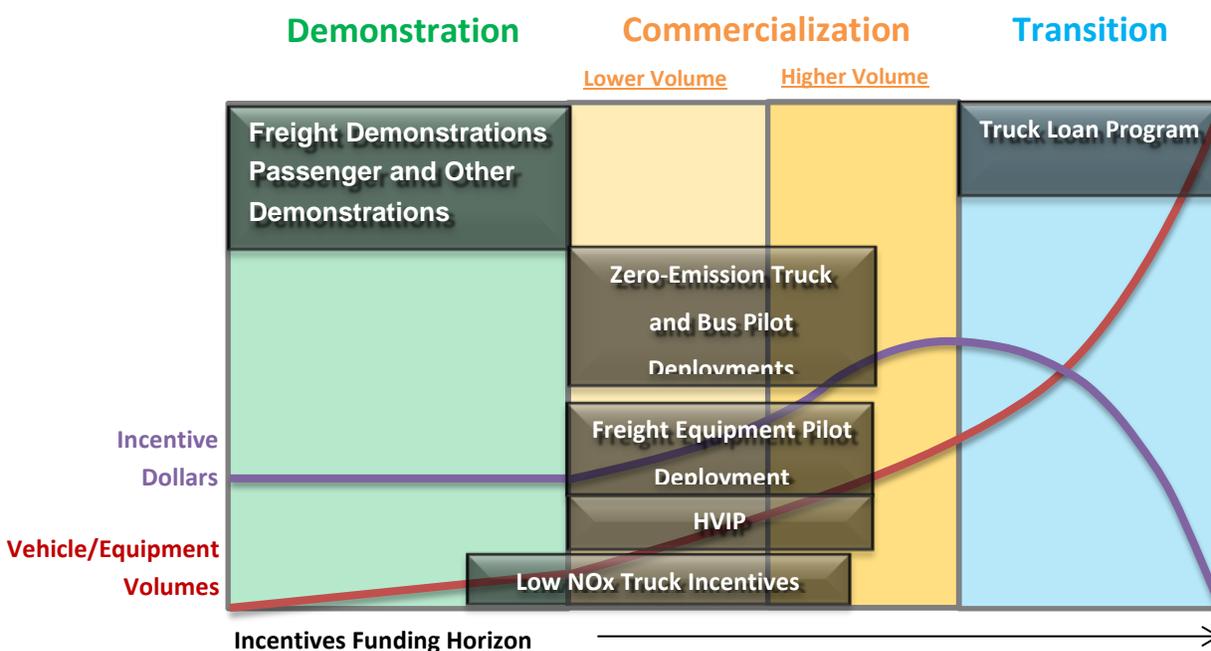
OVERARCHING VISION FOR HEAVY-DUTY VEHICLE INVESTMENTS

SB 1204 directs that the annual framework and plan required under Health and Safety Code Section 39719.2(f):

Articulate an overarching vision for technology development, demonstration, precommercial pilot, and early commercial deployments, with a focus on moving technologies through the commercialization process.

As described in Chapter 1 of this Funding Plan, ARB included a vision in the FY 2014-15 Funding Plan that identifies how incentives support these phases of technology advancement. Staff proposes building on that vision and applying it to the California Clean Truck, Bus, and Off-Road Vehicle and Equipment Technology Program. This evolutionary role of incentives – through demonstration, pilot, commercialization, and transition – is described below, and shown in Figure B-1.

Figure B-1: Heavy Duty Advanced Technology Investments



In the *demonstration phase*, manufacturers are developing, testing, and placing pre-commercial vehicles and equipment in service under real-world operating conditions. In the demonstration phase, per-vehicle incentives are high because manufacturing is not standardized and is focused on smaller batches of vehicles.

Funding is also provided for *pilot projects* to help the technology evolve in the early commercialization phase by deploying a larger volume of vehicles and equipment. Pilot projects can include both precommercial pilots and commercial pilots depending on the stage of technology advancement. *Precommercial pilots* are focused on first-time demonstrations of advanced technologies in new applications. *Commercial pilots*, on the other hand, involve deployments of vehicles and equipment that have been demonstrated, are certified by ARB, come with a warranty, and are purchased or leased by the end user. Vehicles in commercial pilots are ready to be sold commercially, but in such small numbers that they would not be able to compete without incentive support.

Table B-1: Pilot Project Categories

Milestone	Demonstration or Precommercial Pilot	Early Commercial Deployment or Commercial Pilot
ARB Certification	Experimental permit	Vehicle/engine certification or zero-emission approval letter
Vehicle Ownership	Retained by manufacturer	Purchase or lease transaction
Manufacturer Warranty	No	Yes

In addition, many projects would not advance to commercialization without the appropriate fueling infrastructure. For this reason, ARB provides funding for fueling infrastructure that directly supports funded vehicles and equipment.

In the *commercialization phase*, incentives are provided to encourage consumer adoption of advanced technologies. The commercialization phase can be broadly separated into lower volume and higher volume production phases. 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. In this higher volume commercialization phase, while per vehicle incentives are decreasing, total sales are increasing and total incentive funding commitments increase as a result. 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, disadvantaged communities, and the secondary market.

As a technology moves from commercialization into the transition phase, incentives can be adjusted to focus specifically on moving the technology into new consumer demographic segments and on building upon earlier benefits in disadvantaged communities.

2. Project-Specific SB 1204 Performance Criteria Evaluation

As presented in Chapter 4 of this Funding Plan, the proposed medium and heavy-duty vehicle and equipment projects for the FY 2015-16 funding cycle include.

- HVIP
- Zero-Emission Truck and Bus Pilot Commercial Deployment Projects
 - Truck pilot projects
 - Bus pilot projects
 - School buses in rural school districts
- Low NOx Engine Incentives
- Advanced Technology Demonstration Projects
 - On-road trucks
 - Freight Locomotives
 - Off-road freight equipment
 - Non-Freight Off-Road Equipment

Following is an evaluation of each proposed heavy duty project in terms of how they satisfy the proposed performance criteria detailed earlier in this appendix, starting with HVIP.

HYBRID AND ZERO-EMISSION TRUCK AND BUS VOUCHER INCENTIVE PROJECT

Following is an assessment of the proposed Zero-Emission Truck and Bus Pilot Commercial Deployment Projects relative to the proposed SB 1204 evaluation and performance criteria.

Potential for statewide and local emission reductions and health benefits: Zero emission trucks and buses, along with hybrid trucks, are designed to achieve near term and long term emission reductions. Vouchers issued to date indicate that about 75 percent of HVIP funding has provided benefits to disadvantaged communities, and staff expects this trend to continue. HVIP is designed to encourage and accelerate the deployment of new hybrid and zero-emission trucks and buses in California, ultimately leading to long-term reductions in criteria and greenhouse gas emissions, and aiding California in attaining federal ozone and particulate matter standard within non-attainment areas.

Potential for technology viability: The incremental cost for zero-emission trucks and buses is substantial when compared to their conventional counterpart. For hybrid trucks, the incremental cost is not as significant. Providing incentive funding towards the purchase of zero-emission trucks and buses, along with hybrid trucks accelerates the penetration of these technologies into the heavy-duty market. Increased production volumes will lead to cost reductions in vehicle components and assembly, energy storage systems, and fueling infrastructure. Making this funding available to medium heavy-duty vehicles (14,001 to 26,000 pounds GVWR) will help transition the technology to heavy heavy-duty vehicles (greater than 26,000 pounds GVWR), since advanced technologies are often implemented in lighter weight classes before evolving to heavier weight classes with longer duty cycles. Increasing the numbers of advanced technology vehicles and miles traveled will also result in increased demand for electricity and hydrogen fuels, which will help the state meet goals for transitioning from petroleum to fuels produced from renewable resources.

Broad Market Acceptance: HVIP is structured to encourage leveraging of local, State, federal funding and private funding. The collaboration between public agencies and their commitment to invest resources toward improving local air quality motivates advanced technology providers to invest in developing near- zero, and zero-emission technologies. Incentive funding, along with public and private partnerships, encourages the deployment of advanced technology, reduces production costs, and increases commercial viability within the truck and bus market.

ZERO EMISSION TRUCK AND BUS PILOT COMMERCIAL DEPLOYMENTS

Following is an assessment of the proposed Zero-Emission Truck and Bus Pilot Commercial Deployment Projects in terms of how they meet the proposed SB 1204 evaluation and performance criteria.

Potential for statewide and local emission reductions and health benefits: Zero emission transit truck and bus pilot deployments are designed to achieve near term and long term emission reduction targets. Displacing diesel-powered vehicles with zero-emission trucks and buses will result in immediate reductions of criteria, toxic, and GHG emissions. Centering projects in disadvantaged communities will ensure that the early criteria and PM reductions directly benefit disadvantaged communities as well as contribute to emission reductions in ozone non-attainment areas. Finally, the pilot deployments are designed to help overcome technology and market barriers to widespread adoption, ultimately leading to long-term reductions in criteria, toxic, and GHG emissions associated with the production and combustion of diesel fuel.

Potential for technology viability: Two key objectives of the truck and bus pilot deployments are to increase the numbers of zero-emission medium and heavy duty vehicles in use, and increase zero-emission miles. Increased production volumes will lead to cost reductions in vehicle components and assembly, energy storage systems, and fueling infrastructure. Economy-of-scale cost reductions combined with potential fuel and maintenance cost savings will help drive zero-emission technology closer to cost parity with conventional technologies. Increased miles traveled by zero-emission trucks and buses will greatly broaden industry's understanding of the technology, and help identify opportunities for cost savings, technology improvements, and technology transfer. Increasing the numbers of advanced technology vehicles and miles traveled will also result in increased demand for electricity and hydrogen fuels, which will help the state meet goals for transitioning from petroleum to fuels produced from renewable resources.

Broad Market Acceptance: Collaboration and commitment on the part of early users and beneficiaries of clean technology is essential to market acceptance. Fortunately, the need for air quality improvements is the impetus behind federal, state, and local funding for technologies that will result in lower emissions and increased use of transit buses and school buses. This funding coupled with commitments made by local air districts, transit agencies, and planning organizations to invest resources toward

improving local air quality motivates technology providers and entrepreneurs to invest in developing zero-emission technologies. For this reason, the truck and bus pilot deployment solicitation encourages local agency participation as well as leveraging of match funding from public and private sources. The deployment projects will increase public and industry acceptance of the technology through education, outreach, and positive exposure to new technologies. Trucks and buses that successfully perform the same functions as their conventional counterparts will send a strong signal to those considering adopting similar advanced clean technologies.

LOW NOX ENGINE INCENTIVES

Following is an assessment of the proposed low NOx engine truck incentives in terms of how they meet the proposed SB 1204 evaluation and performance criteria.

Potential for Statewide and Local Emission Reductions and Health Benefits: The Low NOx engine truck incentive project is expected to achieve near-term reductions of GHG and criteria pollutant emissions, particularly with the use of renewable fuels. These near-term reductions will complement the incentives provided for zero-emission pathway technologies that achieve long-term reductions. Staff expects at least 50 percent of the vehicles funded will benefit disadvantaged communities. However, the actual geographic locations of vehicle buyers and driving routes are unknown, staff will rely on required reporting and monitoring information to quantify the emission reductions in disadvantaged communities and federal ozone standard non-attainment areas.

Potential for Technology Viability: Funding to incentivize the purchase of early low NOx heavy-duty vehicles has significant potential for technology viability. The incremental costs for low NOx engines are not yet known but are expected to be significantly higher than today's conventional diesel, or even natural gas engines that already have a higher incremental cost compared to diesel. Incentivizing the production and purchase of vehicles with these engines will help support their penetration into the heavy-duty market, which in turn will positively impact cost differentials and consumer acceptability. Making this funding available to medium heavy-duty vehicles (14,001 to 26,000 pounds GVWR) will help transition the technology to heavy heavy-duty vehicles (greater than 26,000 pounds GVWR), since advanced technologies are often implemented in lighter weight classes before evolving to heavier weight classes with longer duty cycles. Lastly, this project encourages the development of renewable fuels by requiring renewable fueling for vehicles funded by Low Carbon Transportation Investments.

Broad Market Acceptance: Incentivizing the production and purchase of vehicles with low NOx engines will help support consumer acceptance and drive down costs. Staff will coordinate with the Energy Commission to ensure a clear, systematic implementation approach for this project. This coordination will be essential in addressing market barriers, since the Energy Commission has significant experience developing and implementing funding projects for alternative fueled vehicles.

ADVANCED TECHNOLOGY DEMONSTRATION PROJECTS

Following is an assessment of the proposed Advanced Technology Demonstration Projects in terms of how they meet the proposed SB 1204 evaluation and performance criteria.

Potential for Statewide and Local Emission Reductions and Health Benefits: Advanced Technology Demonstration Projects are focused on demonstrating technologies that are on the cusp of commercialization and have the potential for significant emission reductions. The proposed projects for conventional on-road trucks will demonstrate how increasing efficiencies in conventional technologies can result in near-term emission reductions, while the zero-emission truck demonstrations will demonstrate technologies that can replace conventionally fueled trucks, leading to long-term emission reductions in the trucking sector once fully commercialized. In addition to cleaner on-road trucks, the projects focusing on demonstrating zero-emission rail and cargo handling technologies will result in immediate air quality benefits to communities located near rail yards, ports, distribution centers, and airports – which in many instances are within or near disadvantaged community census tracts. Due to their relatively small scale, these demonstration projects will result in modest emission reductions in the short term while, more importantly, supporting the potential for longer term emission reductions from the demonstrated technologies once fully deployed into the marketplace.

Potential for Technology Viability: Advanced Technology Demonstration Projects can achieve several objectives: (1) determining the viability of applying advanced technologies in revenue service through real-world field demonstrations; (2) evaluating the potential for expanding use of the technology in similar sectors or vocations; and (3) evaluating the use of demonstrated technologies in new applications and industry sectors. The locomotive freight projects, for example, demonstrate the use zero-emission technologies within and near the rail yards, while providing data to evaluate the potential for increasing the use of zero-emission technologies in line-haul locomotives. Similarly, the zero-emission short and regional haul truck demonstrations will build on the advances made through the demonstration of zero-emission drayage trucks from the FY 2014-15 funding Plan. The non-freight off-road projects will transfer proven hybrid technologies to agricultural and construction equipment, and are expected to lead to increased operational efficiencies and reduced operation and maintenance costs. Because many of these demonstration projects will require the installation of fueling infrastructure, they provide the opportunity to demonstrate hydrogen and charging fueling infrastructure in heavy duty on-and off-road applications, and provide increased opportunities to integrate renewable fuels.

Broad Market Acceptance: The success of any Advanced Technology Demonstration Project is forged on strong public-private partnerships, requiring collaboration between many entities, such as the state, regional municipalities, local air districts, ports and railyards, fleet owners and equipment operators. Demonstration projects require private technology firms to team with public agencies or non-profits in submitting their

application for funding and a significant contribution of match funds. ARB requires a minimum of 25 percent cost share from the project applicants, where a higher contribution from the project proponents is scored higher than those projects that just meet the minimum match requirements. Ground support equipment and cargo handling equipment, such as baggage equipment, forklifts, reach stackers and yard trucks, are used throughout the state. Successful demonstrations of precommercial zero-emission ground support and cargo handling equipment support broad market utilization of these technologies and future cost-reductions due to economy-of-scale production.

FREIGHT EQUIPMENT COMMERCIAL DEPLOYMENT PILOT PROJECT

Following is an assessment of the proposed Freight Equipment Commercial Deployment Pilot Project in terms of how it meets the proposed SB 1204 evaluation and performance criteria.

Potential for Statewide and Local Emission Reductions and Health Benefits: The proposed project is expected to achieve near-term greenhouse gas reductions along with co-benefits reductions in toxic and criteria pollutant emissions. Longer term reductions in GHG, criteria and toxic pollutant emissions will be realized as the off-road zero-emission technology pilots increase in scale over time, and as more end-users take advantage of the incentive funding for these technologies. Staff expects at least 50 percent of the equipment funded will benefit disadvantaged communities, which will have the added benefit of improving air quality in areas non-attainment.

Potential for Technology Viability: Funding to incentivize the purchase of zero emission off-road freight equipment has significant potential for technology viability. Incentivizing the production and purchase of zero emission freight equipment will help support their penetration into the broader market, which in turn will positively impact cost differentials and consumer acceptability. The availability of funds for current commercialized freight equipment will also help transition zero emission technology to similar freight related applications that require higher horsepower and longer operating timeframes.

Broad Market Acceptance: Collaboration and commitment on the part of early users and beneficiaries of clean technology is essential to market acceptance. Fortunately, the need for air quality improvements is the impetus behind federal, state, and local funding for technologies that will result in lower emissions and increased use freight technology. The pilot projects will increase public and industry acceptance of the technology through education, outreach, and positive exposure to new technologies. Zero emission freight equipment that successfully perform the same functions as their conventional counterparts will send a strong signal to those considering adopting similar zero emission technologies.

3. Heavy-Duty Project Greenhouse Gas Evaluation

AB 8 identifies the “ability to achieve GHG emission reductions” as one of the criterion that may be used to provide additional funding preference under AQIP. To evaluate heavy-duty projects against this preference criterion, ARB conducted a lifetime well-to-wheels GHG emissions analysis for the vehicles and equipment supported by the proposed projects. Where information was available, staff determined expected GHG emission reductions for each category of vehicle or equipment funded; these results are summarized in Table B-2. The complete methodology, emission factors, and other assumptions can be found in the Methodology section of Appendix A.

Table B-2: Results for Additional Preference Criterion 4 – Ability to Achieve GHG Emission Reductions

Proposed Projects	Supported Technologies	Near-term (MTCO ₂ e)	Near-term Average (MTCO ₂ e)	Vehicle Life (years)	Total GHG Emissions Reduction (MTCO ₂ e)
Truck Loan Assistance Program	No advanced technology or alternative fuels used	NA	NA	5	NA
HVIP	Battery-electric	8.5	4.6	15	69
	Hybrid	4.4			
Advanced Technology Demonstrations	Battery-electric	66.0	61.7	3	185
	Fuel Cell	57.3			
Zero-Emission Truck and Bus Pilots	Battery-electric	105.4	85.4	15	1,281
	Fuel Cell	65.5			
Low NO _x Engines	RNG	47.5	47.5	15	713