

Voucher Incentive Programs: A Tool for Clean Commercial Vehicle Deployment



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Executive Summary

Investments and innovations in clean buses and trucks are progressing at a rapid pace in the United States and across the world, yet fleet adoption of alternative fuel vehicles has been hampered by the comparatively high costs of the new technologies. Policymakers, manufacturers, and end users have experimented with a number of policy tools to promote clean vehicle adoption, and in several locations these groups have come together to efficiently deploy vehicles through an innovative, flexible tool – the **Voucher Incentive Program (VIP)**.

A New Incentive Needed for Clean Commercial Vehicles

High incremental cost is cited by fleet purchasers as the prime barrier preventing clean vehicle purchases. Incentives for the purchase of medium- and heavy-duty commercial vehicles are needed to help create a robust, sustainable market. Tax credits have been valuable in advancing consumer light-duty vehicle uptake, though rebates that reduce the upfront purchase price have been shown to be more effective than incentives distributed through tax credits. In the medium- and heavy-duty commercial vehicle segment, however, tax credits have not been as successful in promoting uptake of clean vehicles. To enable uptake of clean trucks, buses, and other commercial vehicles, CALSTART and the California Air Resources Board (CARB) developed the voucher incentive model to provide upfront reductions in the price of new vehicles.

The VIP Model

A VIP is a well-structured, highly transparent tool that government agencies can use to attract industry participants, engage fleets, and distribute public funding efficiently, equitably and directly to clean vehicle projects by reducing technology costs at the point of purchase. The VIP model's strengths include 1) making abundantly clear how the program operates and the available level of funding (transparency), 2) laying out up front the streamlined responsibilities and processes for manufacturers, vendors, and fleets (simplicity), and 3) providing support and certainty of outcome for participants while reducing the administrative burden on sponsoring agencies (cost-effectiveness). Most importantly, VIPs make fleet acquisition of clean trucks, buses, and other commercial vehicles easier and more affordable.

Public funds are used to reduce the incremental cost between a conventionally-fueled vehicle and an alternative fuel vehicle. Caps for each category of vehicle may set an upper limit of public funds for each vehicle project. Dealer networks help fleets navigate the VIP process and take on the financial responsibility of completing voucher redemptions. Fleets see a lower purchase cost, while dealers receive full price for the vehicles because public funds make up the difference between the original price and the reduced voucher price. The basic steps in a VIP are laid out in figure ES-1.

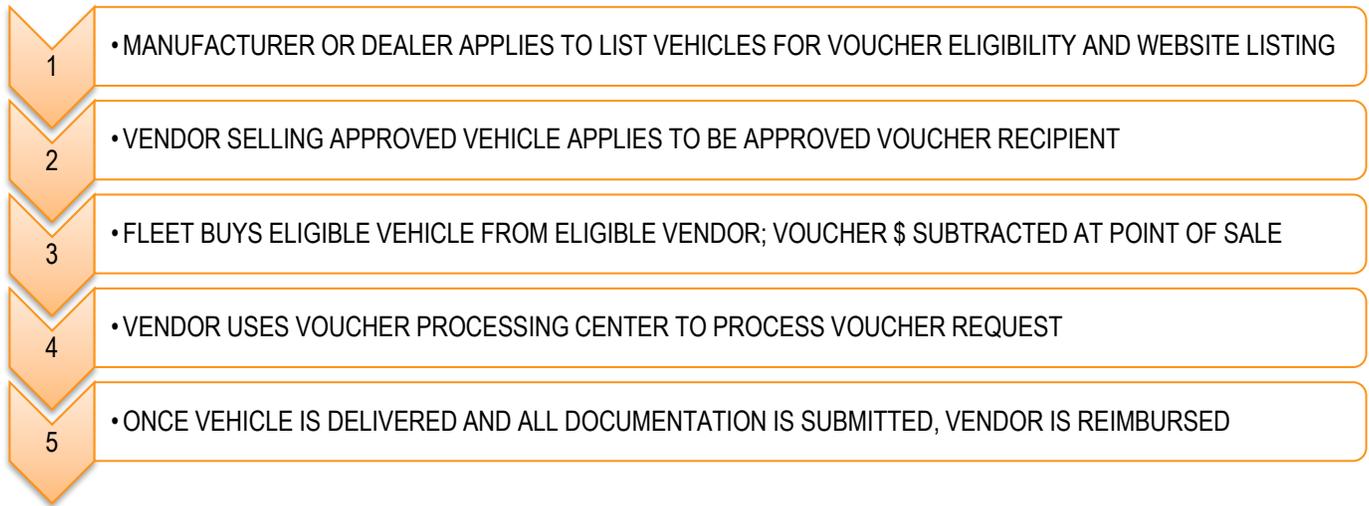
VIP designs are highly customizable to allow program planners to express preferences for clean air goals, invest in targeted communities, and evolve to add new technologies. The VIP model can be designed to accommodate a wide range of policy objectives, such as:

- Promoting or excluding fuels or technologies based on their greenhouse gas or criteria pollutant impacts;
- Adjusting funding caps by gross vehicle weight or by technology type to emphasize development and deployment of particular classes of vehicles or technologies; or

- Reserving incentives or adding additional incentives for vehicles domiciled in or predominantly serving areas that are identified as environmentally or socially disadvantaged.

To promote the fullest flexibility to meet any jurisdiction’s clean transportation goals, CALSTART endorses an inclusive, multi-fuel and multi-technology approach to allow the market to decide clean vehicle outcomes.

Figure ES-1: Major stages of voucher application and processing in a VIP



Flexible to Funding Source Requirements

The design flexibility of a VIP can also be extended to meeting the requirements set forth by different sources of publicly available funding. Funding for VIPs has been allocated through state and federal programs, as well as from Appendix D (“the “Mitigation Trust”) of the Volkswagen Settlement. In each of these cases, the regional VIP has been configured to accommodate requirements or goals from each funding source:

- California’s HVIP features a “Low NOx” engine option for vehicles that are fueled by natural gas. These vehicles are required to produce low levels of nitrogen oxides. Because California’s program is funded by the state’s cap-and-trade program designed to reduce greenhouse gas emissions, fleets operating Low NOx vehicles must sign purchase agreements to run their vehicles on renewable, low-carbon natural gas.
- Programs in Chicago and New York used federal dollars distributed through the Congestion Mitigation and Air Quality Improvement (CMAQ) program by the Federal Highway Administration (FHWA). Vehicles deployed through these VIPs were compliant with waivers for the federal “Buy America” requirement for vehicle purchases.
- The New York program is incorporating funding from the Volkswagen Settlement, which requires scrapping old vehicles as a prerequisite for earning incentives on new, clean vehicles. The VIP model for New York was revised to create a network of scrap yards throughout the state and to establish a clear process for scrapping vehicles before voucher reimbursements are issued.

Though the VIP design is highly effective, each funding source offers great potential benefits while also introducing constraints relative to VIP design and implementation. In each jurisdiction where the voucher incentive model has been implemented, funding requirements have been seamlessly integrated to produce a simple, effective program.

VIP Successes Across the United States

The VIP model has been implemented successfully in several locations around the United States. Established in 2009, California's Hybrid and Zero-Emission Truck and Bus Voucher Incentive Project (HVIP) was an immediate success that validated the VIP design. In its first year of operation, HVIP disbursed its funds faster than any program in CARB history and was recognized as the number one emerging state energy project by the American Council for an Energy Efficient Economy.¹ The HVIP program has deployed nearly 4,000 all-electric and hybrid vehicles and low-NOx engines. Another 3,000 vouchers have not yet been redeemed. Total voucher requests total over \$400 million.

Ensuing programs in New York state and Chicago have used CMAQ funding with innovative program designs tailored to each jurisdiction's particular regional needs. The New York Truck Voucher Incentive Program deployed 470 all-electric, CNG, and hybrid trucks and buses with \$12.1 million. The Drive Clean Chicago Truck program deployed 288 vehicles with \$11.3 million. Total funding amount, eligible technologies, and per-vehicle incentive levels differ between these programs, but each provides a simple, streamlined purchase incentive to reduce upfront costs for clean trucks.

By comparing the programs' designs, a few common principles of a successful VIP emerge. These commonalities demonstrate the core strengths of the VIP design and should be preserved in any proposed new program.

- **Technological Neutrality:** Multiple clean transportation technology options allow fleets to choose the best option for their unique needs and thus provide the best chance of success and of these fleets becoming ambassadors for clean vehicle technologies.
- **Transparency:** The clear, highly structured design among all programs creates certainty of outcomes for manufacturers, vendors, and fleets, in addition to state and/or local sponsors.
- **Adaptability:** Design choices can tailor the basic VIP structure to accommodate funding requirements or other local priorities.

Extended Benefits of Clean Vehicle Investment

A VIP lays the groundwork for a regional clean vehicle economy. The impact of clean vehicle investments is felt beyond the simple deployment of alternative fuel trucks or buses; these vehicles all require manufacturing and shipping, as well as new methods and systems of fueling, servicing, and operating the vehicles. The clean vehicle investment made through a VIP is accompanied by a growth in related

¹ The American Council for an Energy-Efficient Economy. "18 State-Led Energy Efficiency Programs Recognized As Best In U.S." ACEEE. October 15, 2018. Accessed February 19, 2019. <https://aceee.org/press/2010/09/18-state-led-energy-efficiency-programs-recognized-best-us>.

manufacturing and services. With continued clean vehicle investments, a regional clean vehicle economy may grow and mature into a sustainable, thriving industry.

A broader network of incentives will increase the size and scope of the early market, leading directly to additional air quality and petroleum reduction benefits. It also leads to increase vehicle sales, creating and retaining jobs in this industry. Perhaps most importantly, a broader network of incentives will help boost volumes and drive down costs through economies of scale, creating a virtuous cycle that will increase deployment, further driving down costs.

In the short term, a VIP helps immediately reduce the upfront cost and technological acquisition barriers of clean commercial vehicle adoption. In the longer term, VIPs may help create innovative, self-sustaining centers of excellence that enable industry to meet the growing needs for clean trucks and buses.

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1. Introduction: Why Vouchers?

Investments and innovations in clean buses and trucks are progressing at a rapid pace in the United States and across the world. These accelerated changes are driven by a combination of factors, including more rigorous fuel economy and carbon reduction requirements for commercial trucks and buses, volatility in fuel prices, state and city pushes to reduce criteria pollutants and promote environmental justice, and concerns over energy security and fuel diversity. Through accelerating the deployment of low-emission buses and trucks, cities and states can meet climate and air quality policy goals more quickly.

Government agencies and fleet manufacturers across the United States are working to meet these goals by encouraging the use of more efficient, cleaner vehicles and fuels. Yet in this highly dynamic and rapidly evolving technological environment, fleet adoption of alternative fuel vehicles has been hampered by the comparatively high costs of the new technologies. Policymakers, manufacturers, and end users have experimented with a number of policy tools to promote clean vehicle adoption, and in several locations these groups have come together to efficiently deploy vehicles through an innovative, flexible tool – the **Voucher Incentive Program (VIP)**.

This brief provides an overview of motivations for and mechanics of a VIP, a proven incentive model that has been successfully implemented in forward-thinking regions throughout the North America.² In the following sections, this brief will:

1. Explain the need for purchase incentives and the merits of a voucher incentive program;
2. Review program design elements;
3. Demonstrate the VIP flexibility to meet a range of funding sources;
4. Highlight the jurisdictions that have instituted VIPs and the clean vehicle successes in each location; and
5. Review lessons learned from the existing VIPs, provide recommendations for program design, and suggested next steps for interested stakeholders.

1.1 The Need for New Incentives

High incremental cost is cited by fleet purchasers as the prime barrier preventing clean vehicle purchases.³ While these higher costs should diminish as production volume increases, they persist as an impediment

² "Programme D'aide Écocamionnage." Lien Vers Le Site Du Ministère Des Transports. Accessed July 2019. <https://www.transports.gouv.qc.ca/fr/aide-finan/entreprises-camionnage/aide-ecocamionnage/Pages/aide-ecocamionnage.aspx>

³ Van Amburg, Bill, and Jaime Hall. *Speeding High-Efficiency Truck Adoption: Recommended Policies, Incentives and Investments*. Report. 2010. https://calstart.org/libraries-publications-speeding_high-efficiency_truck_adoption-sflb-ashx/

to early market growth and necessitate effective incentive structures that can mitigate these upfront cost disparities in the near term.

Traditionally, incentives have taken the form of tax credits because these were the most politically viable incentive structures at the federal level and generally required no direct funding. Rather than appropriating funds, a tax credit simply reduces future government revenue.

Tax credits have been valuable in advancing consumer light-duty vehicle uptake, though rebates that reduce the upfront purchase price have been shown to be more effective than incentives distributed through tax credits.^{4 5} In the medium- and heavy-duty commercial vehicle segment, however, tax credits have not been as successful in promoting uptake of clean vehicles for many reasons; primarily, a tax credit has no immediate financial impact at the time of a purchase decision, and thus fails to address the issue of greater capital outlay for fleets. Additionally, many fleets are unable to benefit from tax credits, either because they lack sufficient tax liability or because the credit is monetized elsewhere in the company and does not “flow down” to the fleet manager’s budget. In other cases, fleets may be tax-exempt public or municipal fleets that are ineligible for tax credits.

1.2 The Voucher System Solution

To remedy the market shortcomings of the tax credit approach, a team of fleet, government, and industry representatives designed an alternative approach that more directly addresses the barrier of high upfront cost – the point-of-purchase voucher. According to an industry survey, streamlined vouchers that reduce vehicle purchase cost rank most effective on the list of incentives and support policies for advanced truck technologies, ranking above research and development investments, tax credits for vehicle purchases, and oil surcharges to create price signals.⁶ Since their implementation, vouchers have become the preferred incentive for purchasers of clean vehicles.⁷ In a voucher program, public funds are used to reduce technology costs at the point of purchase. Vouchers can encourage the purchase of new vehicles or certified retrofits that provide similar benefits and meet the relevant standards and criteria. Fleets see a lower purchase cost, while dealers receive full price for the vehicles or retrofits because public funds make up the difference between the original price and the reduced voucher price.

Vouchers are preferable to tax credits, grants, loans, accelerated depreciation and other purchase incentives because they are simple, direct, and immediate.

- Vouchers directly lower the incremental price of the advanced technology at the point of purchase, with immediate certainty of incentive funding availability, which is a valuable approach for fleet managers that are working with fixed budgets and may never see the benefits of tax credits.

⁴ ZEV State Policy Rankings, Electrification Coalition, 2018: https://www.zevscorecard.com/wp-content/themes/ec/assets/doc/zev_state_policy_rankings_embargo_6_14_2018.pdf

⁵ Descant, Skip. "Research Shows Incentives to Purchase Electric Vehicles Are Working." *Government Technology*, June 27, 2018. Accessed July 2018. <https://www.govtech.com/fs/transportation/Research-Shows-Incentives-to-Purchase-Electric-Vehicles-Are-Working.html>.

⁶ Van Amburg, *Speeding High-Efficiency Truck Adoption: Recommended Policies, Incentives and Investments*. Report

⁷ CALSTART. *Best Fleet Uses, Key Challenges and the Early Business Case for E-Trucks: Findings and Recommendations of the E-Truck Task Force*. Report. 2012. https://calstart.org/libraries-e-truck_task_force_documents-best_fleet_uses_key_challenges_and_the_early_business_case_for_e-trucks_findings_and_recommendations_of_the_e-truck_task_force-sflb-ashx/

- The administrative burden for agency staff is small with minimal delay and involves no grant writing. Trained vehicle dealers handle all documentation, reducing the burden on the fleet customer.
- Vouchers can include a range of alternative fuel technologies.
- The purchasing organization does not need to have tax liability to take advantage of a voucher. Tax-exempt entities, such as government fleets, can take advantage of vouchers, whereas they cannot take advantage of tax credits.
- There is no question as to whether a fleet will receive a voucher based on subjective judgment of their project or grant proposal. Designed properly, vouchers have clear rules and pre-set amounts for vehicle types, so the voucher provides certainty of outcome for requesters who follow eligibility guidelines.

Vouchers are preferable to tax credits, grants, loans, accelerated depreciation and other purchase incentives because they are simple, direct, and immediate.

The result is a lower purchase price for fleets and an increase in sales for manufacturers and suppliers, leading to reduced greenhouse gas emissions, improved air quality, and support for a regional clean commercial economy.

1.3 Growing Markets Locally and Globally with Incentives

By helping to spur a network of clean vehicles within a particular city or state, a VIP lays the groundwork for a regional clean vehicle economy. The impact of clean vehicle investments is felt beyond the simple deployment of discrete alternative fuel trucks or buses; these vehicles all require manufacturing and shipping, as well as new methods and systems of fueling, servicing, and operating the vehicles. The clean vehicle investment made through a VIP is accompanied by a growth in related manufacturing and services. With continued clean vehicle investments, a regional clean vehicle economy will grow and mature into a sustainable, thriving industry.

The strategy of investing in targeted, forward-thinking regions is critical to the Global Commercial Vehicle Drive to Zero program (“Drive to Zero”) led by CALSTART and a coalition of supportive industry and governmental stakeholders. A region may be defined as a subnational clean vehicle market and may range from a large city or a state to a connected series of cities and states. These subnational actors and clean vehicle industry drivers are encouraged to sign a pledge toward achieving global zero emissions through commercial zero emission vehicle deployments. Drive to Zero signatories commit to a strategy that will “significantly reduce criteria pollutants and greenhouse gases by enabling and expanding the use of zero emission technology in targeted segments (“beachheads”) of the medium- and heavy-duty vehicle market on a worldwide basis.” Though “beachhead” markets may evolve separately and distinctly from regions with VIPs, jurisdictions that adopt VIPs and establish economies around new vehicle technologies that reduce tailpipe emissions may be more likely to develop into early “beachheads.” These markets can foster advanced, clean technologies in a developing marketplace and will provide transformative examples for the next wave of cities and states looking to advance their clean vehicle economies. They will also then contribute to the creation of a global supply chain for common components, contributing to increased production volumes and lower prices in future years.⁸

⁸ CALSTART. “The Strategy.” Global Commercial Drive to Zero Program. Accessed July 2019. <https://globaldrivetozero.org/about/strategy/>

2. How Do Voucher Incentives Work?

Once an emerging efficient vehicle technology has advanced past the preliminary test and demonstration stage and has established commercial availability, jurisdictions seeking to promote this technology to advance clean air and climate goals need policy support to quickly and efficiently facilitate uptake of these vehicles. Vouchers play a critical role in accelerating markets for cutting-edge but established technologies.

The earliest model to demonstrate the function, flexibility, and effectiveness of a voucher-based incentive program for commercial vehicles was the California Hybrid and Zero-Emission Truck and Bus Voucher Incentive Project (HVIP). HVIP was developed and is funded by the California Air Resources Board (CARB) and is administered by CALSTART on its behalf. The project started in February 2010, using state funds from license fees specifically dedicated to supporting advanced vehicle and fuel demonstration and deployment. Since 2012, HVIP has been funded by auction proceeds from California's statewide greenhouse gas (GHG) cap-and-trade program, designed pursuant to California Assembly Bill 32 (Global Warming Solutions Act of 2006, or AB 32). HVIP is a key component of CARB's Low Carbon Transportation Investments and Air Quality Improvement Program (AQIP), which is focused on supporting development and deployment of the advanced technologies needed to meet California's longer-term, post-2020 air quality goals. Its success as a powerful tool for rapid deployment has encouraged regional adaptations of the voucher model in other states and on a more localized basis, such as within air districts in California.

The VIP model expanded in 2013 to New York State and in 2015 to Chicago, following the same basic principles that made HVIP so successful while adapting to meet local policy goals and funding requirements. Where HVIP has been funded by dedicated state funding streams, the New York Truck Voucher Incentive Program (NYTVIP) and Drive Clean Chicago (DCC) have utilized federal funding programs to develop simple and effective medium- and heavy-duty vehicle deployment programs. The launch and subsequent success of these programs demonstrates the effectiveness of the VIP model and its robustness to new jurisdictional needs. Details on each of these programs are provided in Section 4.

2.1 Basic Framework of a VIP

The VIP method is effective because it reduces the upfront cost of vehicles. In response to industry research by CALSTART and the feedback of fleets and manufacturers, HVIP was designed to reduce the incremental purchase cost of eligible hybrid and battery-electric medium- and heavy-duty vehicles. HVIP initially set voucher amounts at half of the incremental cost for hybrid and electric vehicles—funding deemed critical by fleets and manufacturers to assist the early market. Incentive levels have been adjusted over time to continue to provide adequate market demand. HVIP zero-emission and low NO_x voucher amounts now target full incremental cost. In other jurisdictions, the incentives for each vehicle have been set at 80 percent of each incremental cost with a distinct cap based on gross vehicle weight rating. At any level of compensation, reducing upfront vehicle costs for fleets meets a crucially important need identified by stakeholders.

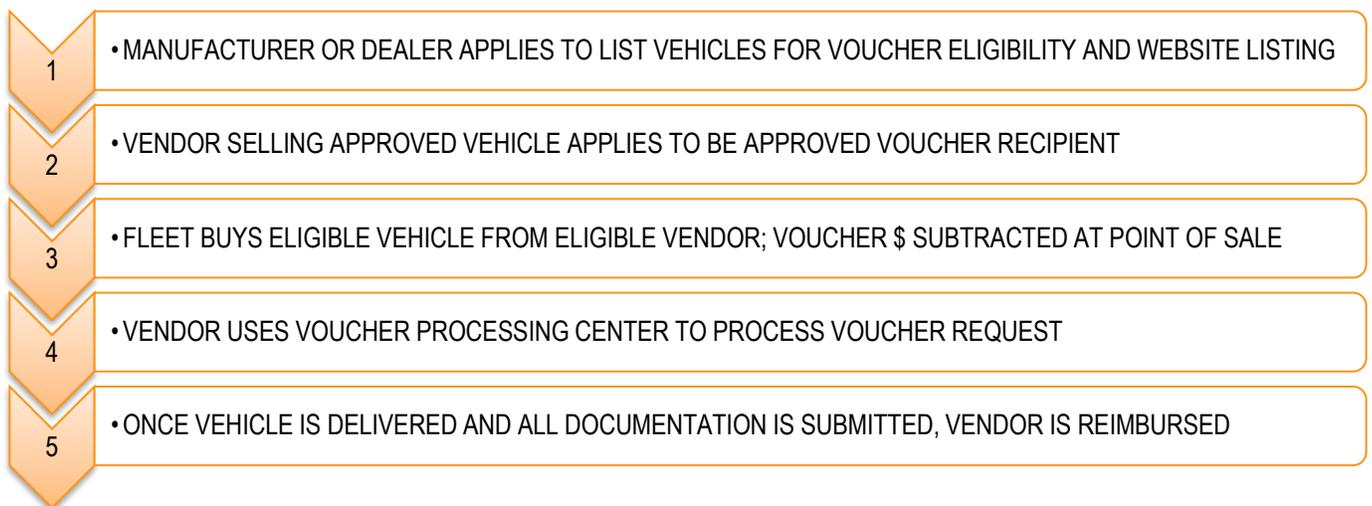
VIPs are designed to be as clear and easy as possible for all involved parties while providing transparency about how funds are used. The program identifies how much funding is available and provides clarity on which vehicle technologies are eligible and if any other restrictions apply, such as geographic boundaries or scrappage requirements. Once the program parameters have been established, the process of facilitating clean vehicle adoptions and voucher incentives begins in earnest.

In all VIPs administered by CALSTART, a voucher processing center (VPC) guides participants through the voucher program and tracks documentation. VIP participants fit into three categories: manufacturers, vendors, and fleets. Manufacturers are the original equipment manufacturers or equipment modifiers that produce eligible vehicles and submit vehicle information for listing on program websites. Vendors connect manufacturers and fleets to coordinate sales and usher parties through the voucher application and documentation processes. Frequently, vehicle dealers or manufacturers serve the role of the vendor, which is the party that works most closely with the program administrator and voucher processing center to complete the voucher process. These parties work to deliver clean vehicles to fleets, the end users that operate the vehicles according to the terms set forth by the program administrator and agency sponsor (e.g., term of ownership or lease, geographic boundaries for domicile and/or operation).

At the creation of the VIP, the local funding agency decides which vehicle technologies will be eligible for incentives. The administrator works with vehicle manufacturers to sign up eligible vehicles in the program and assign voucher amounts. Vendors who sell those vehicles are trained in the VPC and assigned user accounts. The VIP process begins when a sale is arranged. Vendors request vouchers on behalf of the fleet purchasers. The fleet pays the vendor for the cost of the vehicle, reduced by the value of the voucher, which will be reimbursed to the vendor through a voucher redemption request that begins at vehicle delivery. Vendors are responsible for collecting information from all parties and managing the voucher application through every phase of the program, including redeeming the voucher once the vehicle is ready for delivery to the customer.

The VPC tracks the voucher status and upon vehicle delivery and satisfactory documentation, approves the voucher for payment. The vendor must submit the voucher redemption information and all required sales documentation to the VPC. Once all the information is verified, the program administrator/sponsor pays the voucher amount to the vendor. At the end of the process, the manufacturer and vendor will have completed the sale of one or more clean vehicles and received full payment while a fleet operator will be reducing emissions and saving money on operations through a discounted truck or bus. Figure 1 below summarizes these stages of the VIP process.

Figure 1 Major stages of voucher application and processing in a VIP



Once vehicles purchased with the assistance of vouchers are delivered and operating, the fleet operator must adhere to program rules that may govern the use of the vehicle. To ensure compliance with these

rules, a VIP should include a process for vendors and fleets to acknowledge programmatic requirements. Program rules that fleet operators must adhere to may include, but are not limited to, documenting and reporting annual vehicle mileage for several years, retaining ownership of a vehicle for a set period, or domiciling and operating a vehicle within established geographic boundaries (e.g., disadvantaged communities, environmental justice areas, or counties in nonattainment with National Ambient Air Quality Standards (NAAQS)).

2.2 Design Flexibility to Advance Policy Goals and Conform to Funding Requirements

The VIP model can be designed to accommodate a wide range of policy objectives and funding requirements; the successful implementation of VIPs across three different jurisdictions with distinct policy goals and funding sources attests to its design flexibility. A single jurisdiction can modify a VIP to comply with a wide range of influences, which could include:

- Promoting or excluding fuels or technologies based on their greenhouse gas or criteria pollutant impacts (e.g., requiring renewable fuel for Low NO_x vehicles in HVIP);
- Adjusting funding caps by gross vehicle weight or by technology type to emphasize particular classes of vehicles or technologies (e.g., transit buses or heavy-duty trucks);
- Reserving incentives or adding additional incentives for vehicles domiciled in or predominantly serving areas that are identified as environmentally or socially disadvantaged (e.g., HVIP’s “plus-up” incentive adder for vehicles domiciled in disadvantaged communities);
- Scrapping old vehicles as a prerequisite for earning incentives on new, clean vehicles (as required for projects using Volkswagen settlement funds); and
- Ensuring that manufacturers comply with any production or assembly requirements mandated by funding sources (e.g., “Buy America” requirements associated with the Congestion Mitigation and Air Quality Improvement (CMAQ) program from the Federal Highway Administration (FHWA)).

Establishing which vehicle technologies will be eligible for incentives and setting the funding levels for those technologies and/or vehicle classes necessitates choices about how the program will be administered. As an example, CARB’s programmatic decisions for zero-emission trucks and buses are reflected in the incentives in Tables 2.2 and 2.3.

Just as VIPs can be adjusted to meet policy goals, they can also conform to meet strict funding requirements.

These tables demonstrate that CARB has created an additional incentive for vehicles operating in “disadvantaged communities” (or DACs), and created a separate incentive level for hydrogen fuel cell trucks and buses. CARB has also permitted lighter vehicles, starting at 5,000 pounds, to participate in HVIP if they produce zero emissions. CARB has varied incentive levels by GVWR for trucks and by length for transit buses. All of these decisions can be accommodated within a VIP owing to its design flexibility.

Just as VIPs can be adjusted to meet policy goals, they can also conform to meet strict funding requirements. For example, FHWA funds are subject to a Buy America requirement, which specifies that

projects must use domestic steel, iron, and manufactured products to receive funding.⁹ Through June 2018, VIPs funded through the FHWA’s Congestion Mitigation and Air Quality (CMAQ) program have received a Buy America waiver from FHWA, requiring only that a manufacturer complete final assembly of incentive-eligible vehicles in the United States. A VIP funded by CMAQ can reflect the applicable Buy America provisions by working with participating manufacturers to document domestic content and/or location of final assembly when determining vehicle eligibility.

Likewise, Appendix D of the 2016 Volkswagen Settlement requires that new vehicle projects correspond to scrapped older, polluting diesel engines. The scrappage requirement assures that new, clean technologies are replacing the polluting diesel vehicles and taking emissions off the road rather than adding to the total vehicle population (typically referred to as the problem of “additionality”). In this case, a VIP funded using a portion of a state’s Appendix D allocation could meet this funding requirement by designing a scrappage program to verify that an older diesel engine is destroyed prior to (or at the time of) vehicle delivery or voucher redemption.

2.3 Key Takeaways

A VIP is a well-structured, highly transparent tool that 1) makes abundantly clear how the program operates and the available level of funding, 2) lays out the responsibilities and processes for manufacturers, vendors, and fleets, and 3) provides support and certainty for participants. VIP designs are not entrenched or rigid, but rather are highly customizable to allow program planners to express preferences for clean air goals, invest in targeted communities, and evolve to add new technologies.

CALSTART recommends that additional city, state, and regional government agencies adopt the VIP model for clean vehicle funding programs using available funding, and endorses an inclusive, multi-fuel and multi-technology approach. Each jurisdiction should emphasize the technologies and fuels of greatest interest inherent to their goals and consider how to engage organizations such as CALSTART to serve as a resource to help implement and administer their VIPs.

Table 2.2 HVIP Zero-Emission Truck Voucher Amounts

GVWR (lbs)	Outside DAC	In DAC
5,001 – 8,500	\$20,000	\$25,000
8,501 – 10,000	\$25,000	\$30,000
10,001 – 14,000	\$50,000	\$55,000
14,001 – 19,500	\$80,000	\$90,000
19,501 – 26,000	\$90,000	\$100,000
26,001 – 33,000	\$95,000	\$110,000
>33,000	\$150,000	\$165,000
>33,000 Hydrogen Fuel Cell	\$300,000	\$315,000

Table 2.3 HVIP Zero-Emission Transit Bus Voucher Amounts

Bus Length	Outside DAC	In DAC
20 ft – 24 ft	\$80,000	\$90,000
25 ft – 29 ft	\$90,000	\$100,000
30 ft – 39 ft	\$120,000	\$135,000
40 ft – 59 ft	\$150,000	\$165,000
≥ 40 ft Double Decker	\$175,000	\$190,000
≥ 60 ft Articulated	\$175,000	\$190,000
≥ 40 ft Hydrogen Fuel Cell	\$300,000	\$315,000

⁹ Federal Highway Administration. “Buy America Provisions Side by Side.” U.S. DOT. Accessed July 2019. <https://www.epa.gov/sites/production/files/2016-10/documents/amended20lpartial-cd.pdf>

3. Flexible Designs for Any Funding Source

This section identifies three primary funding sources for voucher incentive programs: state-level funding, federal funding from the CMAQ program, and funding distributed through a series of 2016 and 2017 settlements between Volkswagen and the U.S. Environmental Protection Agency (EPA). Examples of state-level funding sources include proceeds from policy initiatives, such as a cap-and-trade market (such as California's AB 32 market or the Regional Greenhouse Gas Initiative (RGGI) in Northeast and Mid-Atlantic states) or low carbon fuel standards. Additionally, states may pass legislation directing discretionary funding to clean vehicle programs. Because state-level funding has specific constraints that apply only to a state or region, and because fewer jurisdictions have access to state-level funding than to CMAQ and Volkswagen Settlement funding, the latter two funding sources will be explored in greater detail.

3.1 State Funding: California Cap-and-Trade

The original clean vehicle VIP, California's HVIP, was developed and is funded by CARB and is administered by CALSTART on its behalf. The project started in February 2010, using state funds from license plate and registration fees specifically dedicated to supporting advanced vehicle and fuel demonstration and deployment. HVIP is a key component of CARB's Air Quality Improvement Program (AQIP), which is focused on supporting development and deployment of the advanced technologies needed to meet California's longer-term, post-2020 air quality goals.

HVIP was initially structured in 2010 to help speed the early market introduction of clean, low-carbon hybrid trucks and buses by addressing the biggest barrier to their purchase—high incremental cost. At that time, production volumes were too low to realize price reductions through production volumes or design improvements. Recognizing that market growth for new technology takes time and requires predictability, CARB funded HVIP as a multi-year program to support initial fleet deployment of primarily hybrid trucks and support early clean truck and bus manufacturers.

As the market for clean trucks and buses has evolved, so too has the funding structure for HVIP. After the inception of a cap-and-trade program¹⁰ to curb greenhouse gas emissions in furtherance of California's Global Warming Solutions Act of 2006 (AB 32),¹¹ subsequent legislation (SB 1204) authorized the use of cap-and-trade auction proceeds to fund a Low Carbon Transportation Program in California to including investments in clean trucks and buses. HVIP is currently supported by funds from the Low Carbon Transportation Program, reauthorized annually.

As additional technologies entered the early market, such as all-electric trucks and buses, HVIP has adapted, adding those products into the voucher structure. The value of hybrid incentives has decreased in step with the growing maturity of the market for hybrid medium- and heavy-duty vehicles. Notably, because of CARB priorities and the GHG focus of the program's current funding source—California's cap-and-trade program—voucher incentives are not available for standard-emission natural gas vehicles under

¹⁰ California Air Resources Board. "Cap-and-Trade Program." California Air Resources Board. Accessed July 2019. <https://ww3.arb.ca.gov/cc/capandtrade/capandtrade.htm>

¹¹ California Air Resources Board. "Assembly Bill 32 Overview." California Air Resources Board. Accessed July 2019. <https://ww3.arb.ca.gov/cc/ab32/ab32.htm>

HVIP. However, a complementary Low NOx program that requires the purchase of renewable fuel is described below.

HVIP's funding structures have also evolved over the life of the program, specifying how voucher funding can interact with other grant incentives and bringing funding from similar clean vehicle programs under the HVIP umbrella. The South Coast Air Quality Management District and the San Joaquin Valley Air Pollution Control District have provided additional funding for vehicles deployed in their respective regions. The California Energy Commission (CEC) has also provided additional incentives for all-electric buses and trucks. These secondary incentives can be "stacked," offering a greater incentive than the standard voucher amount alone.

HVIP can also use separate funding sources dedicated to specific technologies. Low NOx engine incentives were established for the purchase of engines certified to the optional CARB Low NOx standard. These natural gas engines that are eligible through HVIP emit ten times fewer nitrogen oxides than their conventional diesel counterparts. Initially the Low NOx incentives were administered with a dedicated fund in HVIP, but have now been incorporated as a complementary component to the hybrid and electric commercial vehicle voucher program within HVIP. To comply with HVIP's low-carbon requirement, Low NOx vouchers require vehicles to use renewable fuels to power vehicle deployments.

Other states can follow California's self-funding example by tapping similar revenue-generating sources; in Northeast and Mid-Atlantic states, the Regional Greenhouse Gas Initiative (RGGI)¹² provides predictable funding from a long-term power sector cap-and-trade system, while the Transportation and Climate Initiative (TCI) offers promise for a transportation-specific cap-and-invest framework for a similar grouping of states.¹³

3.2 Federal Funds: The Congestion Mitigation and Air Quality Improvement (CMAQ) Program

Newer VIPs in parts of the country without elevated levels of state funding to direct toward clean vehicle incentives have instead leveraged existing federal and state dollars. Unlike California HVIP, which required state-level legislation to appropriate funding from cap-and-trade auction proceeds, the VIPs in New York and Chicago have used CMAQ funding, eliminating the need to pass authorizing legislation or to raise revenues to pay for the programs.

CMAQ is a federally funded program administered by FHWA and designed to improve air quality and reduce congestion in all 50 states and the District of Columbia. CMAQ is supported with an average annual

¹² The Regional Greenhouse Gas Initiative. Accessed July 2019. <https://www.rggi.org/>

¹³ Transportation and Climate Initiative. "Nine States and D.C. to Design Regional Approach to Cap Greenhouse Gas Pollution from Transportation." Transportation and Climate Initiative of Northeast and Mid-Atlantic States. Accessed July 2019. <http://transportationandclimate.org/nine-states-and-dc-design-regional-approach-cap-greenhouse-gas-pollution-transportation>.

funding level of \$3.1 billion.¹⁴ The program's requirements stipulate that these funds must be spent on projects that improve air quality in regions that do not meet NAAQS for ozone, carbon monoxide, or particulate matter (non-attainment areas), or in areas that are newly in compliance (maintenance areas).¹⁵

CMAQ is a flexible funding source. Funds are allocated to local and regional planning organizations and municipal and state transportation departments, which in turn have a large degree of autonomy in deciding what projects to fund, provided that those projects meet federal guidelines and advance the goals of the federal CMAQ program. Key decisions on how to spend CMAQ dollars are therefore made at the state and local levels, and processes differ by region. Clean vehicle incentives and vouchers are an eligible use of CMAQ dollars, as demonstrated by the existing CMAQ-funded voucher programs.

Important Considerations for CMAQ-Funded Voucher Programs

Although FHWA has ultimate discretion over broad CMAQ project eligibility rules, the specific types of projects supported with CMAQ funds are determined at the state and local level and the key considerations vary from place to place. From a federal perspective, vehicle incentive programs (such as VIPs) are an eligible use of CMAQ funds and are included in CMAQ approved use language. Proposed projects must be included in a state's Transportation Improvement Plan (TIP), which is a prioritized list of projects and investments for a given area over a multi-year period. The process of getting a project such as a VIP included in the TIP and then funded and operational may be complex, and proposed projects will likely compete against other government and non-profit proposals.

Each jurisdiction balances these considerations through separate processes, which can be seen in both locations that have operated CMAQ-funded VIPs. Though the CMAQ funding is disseminated from the same federal sources, the VIPs in New York State and Chicago have worked with FHWA to reserve CMAQ funding based on projected demand for eligible projects; once reserved, the funding is reimbursed to the sponsoring agency after a voucher award is made. As such, jurisdictions interested in using CMAQ to capitalize a VIP should be prepared to first document likely incentive projects, then to request reimbursement from FHWA as the program is implemented.

CMAQ Limitations

The primary advantage of using CMAQ funding for state and local voucher programs is clear—CMAQ provides the flexibility to fund a program with readily available funding sources, bypassing the need to pass new legislation or apply for budget appropriations. However, while CMAQ is a flexible funding source, it also comes with conditions attached that may meaningfully impact how the program can be designed and implemented.

¹⁴ Federal Highway Administration. "A Summary of Highway Provisions - MAP-21 - Moving Ahead for Progress in the 21st Century: Federal Highway Administration." U.S. Department of Transportation/Federal Highway Administration. July 17, 2012. Accessed July 2019. <https://www.fhwa.dot.gov/map21/summaryinfo.cfm>.

¹⁵ Federal Highway Administration. "MAP-21 - Fact Sheets - Congestion Mitigation and Air Quality Improvement Program (CMAQ): Federal Highway Administration." U.S. Department of Transportation/Federal Highway Administration. Accessed July 2019. <https://www.fhwa.dot.gov/fastact/factsheets/cmaqfs.cfm>

Purchase incentives for CMAQ-funded vehicles are tied to the federal Buy America requirement that obligates manufacturers to demonstrate that the “steel, iron, and manufactured products” in their vehicles are produced entirely in the United States.¹⁶ Traditionally, FHWA has granted waivers that have permitted vehicle manufacturers to complete the final assembly of incentive-eligible vehicles in the United States in lieu of sourcing all of their metals and manufacturing domestically.¹⁷ New waivers for the Buy America requirement have not been issued for clean vehicle programs since projects proposed in 2016 were approved in April 2018,¹⁸ though programs are able to continue deploying vehicles under existing programs with existing waivers. Until waivers for clean vehicle programs are renewed, or Buy America standards are modified, CMAQ funding may be inaccessible for new VIPs or other clean vehicle deployment programs.

CMAQ states that “funds must be invested in a State’s non-attainment and maintenance areas” on projects that reduce specific criteria air pollutants. This directive creates geographical limits on a program funded through CMAQ, and consequently some potentially interested fleets operating in less polluted counties may not be able to participate. Those states without areas in non-attainment and maintenance will receive a minimum percentage of total CMAQ funding to spend on projects without geographic restrictions, but must meet CMAQ or Surface Transportation Program eligibility.¹⁹

The CMAQ funding process can be complicated but does offer a potential source of funds for VIPs that does not require legislative action. This funding model currently used in Chicago and New York could and should expand to other areas and spread the use of clean vehicles once a solution for the Buy America requirement has been established.

Collaborating on CMAQ Program Design

As noted above, the process for proposing new CMAQ-funded projects can be complicated. To improve the chances of success, interested stakeholders in a given area should work together to understand and navigate the CMAQ funding landscape in a given area, starting with answering the following questions:

- **Decision-making Process:** What is the process and timeline? What is required in a proposal? Who makes the ultimate decisions and what are the decision-making criteria?
- **Priorities:** What are the local priorities for CMAQ funding? What is eligible, and what sorts of projects have actually received CMAQ funding in this area?
- **Stakeholders:** Who are the key stakeholders? Who would support a truck voucher program and what sorts of resources can they bring to bear in

Navigating the CMAQ funding process for a VIP unlocks a potential source of funds for VIPs that does not require legislative action.

¹⁶ Federal Highway Administration. “Buy America Provisions Side by Side.” U.S. DOT. Accessed July 2019.

<https://www.epa.gov/sites/production/files/2016-10/documents/amended20lpartial-cd.pdf>

¹⁷ FHWA granted Buy America waivers for both DCC and NYTVIP for voucher projects completed as recently as mid-2018; under the conditions of these waivers, while participating manufacturers in these programs would not have been able to demonstrate that all metals in their vehicles are domestic, they have been able to qualify for vouchers by demonstrating that they complete their vehicle assemblies in the United States.

¹⁸ FHWA. *83 FR 16421 - Buy America Waiver*. Report no. 2018-07901. April 2018. Accessed Feb 2019:

<https://www.federalregister.gov/documents/2018/04/16/2018-07901/buy-america-waiver-notification>

¹⁹ FHWA. “Congestion Mitigation and Air Quality Improvement (CMAQ) Program.” U.S. Department of Transportation/Federal Highway Administration. Accessed July 2019.

https://www.fhwa.dot.gov/Environment/air_quality/cmaq/reference/cmaq_essentials/

designing and supporting the program? Who might oppose this idea - what other groups would be potential “competitors” for CMAQ dollars in this area?

Navigating the CMAQ funding process for a VIP unlocks a potential source of funds for VIPs that does not require legislative action. This funding model currently used in Chicago and New York could and should expand to other areas and spread the use of clean vehicles once a solution for the Buy America requirement has been established.

3.3 The Volkswagen Settlement, Appendix D: The NOx Mitigation Trust

Since the discovery of defeat devices on Volkswagen diesel-powered passenger cars and the ensuing settlement with the U.S. Department of Justice in 2016, an appetite for clean vehicle technologies and funding to enable their deployment has blossomed broadly across the United States. All 50 states, the District of Columbia, and U.S. and tribal territories are eligible for allocations from more than \$2.7 billion established through Appendix D of the Volkswagen Settlement, also called the “NOx Mitigation Trust.”²⁰ Appendix D funding, which is reserved for medium- and heavy-duty vehicle deployments (Class 4 and higher), provides a ready funding stream for every state’s and territory’s clean vehicle investments. FHWA’s definitions of vehicle classes are included in Table 3.1 for reference.²¹

In late 2018, the Wilmington Trust began to accept proposed Beneficiary Mitigation Plans (BMP) from states as the appointed national trustee for the Mitigation Trust.

Important Considerations for Mitigation Trust-Funded Voucher Programs

Each state’s BMP describes how it plans to spend its funding allocated through the Settlement among ten distinct eligible mitigation actions, as laid out by the Settlement and the U.S Environmental Protection Agency. Mitigation actions fall under one of the following 10 categories:²²

1. Class 8 Local Freight Trucks and Port Drayage Trucks
2. Class 4-8 School Bus, Shuttle Bus, or Transit Bus
3. Freight Switchers
4. Ferries and Tugs
5. Ocean Going Vessels’ Shore Power
6. Class 4-7 Local Freight Trucks
7. Airport Ground Support Equipment
8. Forklifts and Port Cargo Handling Equipment
9. Light Duty Zero Emission Vehicle Supply Equipment
10. Diesel Emission Reduction Act (DERA) Option

²⁰ Center for Climate and Energy Solutions. *Volkswagen Settlement Funding: What Cities Should Know*. Report. December 2016. Accessed July 2019. <https://www.c2es.org/site/assets/uploads/2016/09/vw-settlement-funding-what-cities-should-know.pdf>

²¹ U.S. Department of Energy. "Maps and Data." Alternative Fuels Data Center: Vehicle Weights and Categories. Accessed July 2019. <https://afdc.energy.gov/data/10380>

²² *United States of America vs Volkswagen Partial Consent Decree*. Case No. 2672. 210-219. (2016) Accessed July, 2019: <https://www.epa.gov/sites/production/files/2016-10/documents/amended20partial-cd.pdf>

Table 3.1 Vehicle Class Definitions by Weight

Appendix D explicitly lists the type of vehicle technologies that are eligible for funding and provides percentages of total costs for each eligible vehicle based on fuel type. All-electric, hybrid, CNG, propane, diesel replacement, all-electric repower, and diesel repower technologies are all eligible for funding through the Mitigation Trust. The terms of the settlement also provide a differentiated percentage cap of costs for vehicles depending on the ownership of a fleet. For example, privately owned class 8 trucks may receive up to 75 percent of the cost of a new all-electric truck or 50 percent of the cost of a new diesel or alternate fuel vehicle, whereas the same vehicles owned by public fleets would be eligible 100 percent of the new costs of the vehicles.

Vehicle Class	Gross Vehicle Weight Rating (GVWR) (lbs)	GVWR Category
1	<6,000	Light Duty ≤10,000 lbs
2	6,000-10,000	
3	10,001-14,000	Medium Duty 10,001 - 26,000 lbs
4	14,001-16,000	
5	16,001-19,500	
6	19,501-26,000	
7	26,001-33,000	Heavy Duty >26,001 lbs
8	>33,000	

Each jurisdiction may choose how to apply the terms of the Mitigation Trust to a proposed or existing VIP. The differentiated cap based on ownership allows for voucher amounts that pay for the entire cost of a new vehicle, but each jurisdiction may prefer to stretch its funding across more projects by reducing the voucher limits to smaller amounts. The standard VIP practices of providing payments for incremental vehicle costs are consistent with the Mitigation Trust terms. Eligible vehicles may receive up to the Trust-prescribed percentage of costs, but each VIP administrator may set vehicle caps as they deem fit within those prescribed award percentages. Similarly, cities and states have considerable flexibility to choose which vehicle technologies are eligible under a VIP, and if using Settlement funds can structure the program to award funds to any subset of the technologies listed above. Jurisdictions emphasizing greenhouse gas emissions reductions may prefer to exclude fossil fuel-powered alternative fuel or diesel-powered vehicles, while those technologies are likely to be included in programs seeking immediate air quality benefits.

The types of investments that a state prefers will be demonstrated in its BMP, which will include proposed estimates for funding, vehicle deployments, and air pollutant and greenhouse gas reductions by eligible mitigation action. Some states may emphasize replacing on-road trucks and buses with cleaner alternatives, and other states may choose to invest in port and marine equipment. Regardless of a state’s BMP allocation decisions, a VIP provides a flexible and administratively simple method of implementing its clean transportation funding strategy.

Mitigation Trust Funding Limitations

Funding from the Volkswagen Settlement, unlike CMAQ funding, is only available within a limited timeframe. Once BMPs have been approved and funding is disbursed to each state, the funds must be spent within 10-15 years and will not be replenished. Up to a third of each state’s funds may be spent within the first year, and a second third may be spent within the second year, with the remainder available to be spent over the duration of the funds’ availability.

Notably, the Mitigation Trust identifies eligible clean truck and bus applications for classes 4-8. These medium- and heavy-duty class segments operate widely across occupations and services, but the designation of classes 4-8 as eligible omits lighter vehicles that have been eligible under VIPs, namely

those in classes 2b and 3. Vehicles in these classes include delivery vans, shuttles, fleet work trucks, and more. In HVIP's most recent full year of voucher deliveries, class 3 vehicles accounted for 10 percent of all-electric vehicle sales, or approximately 3 percent of all HVIP vouchers. More striking, vouchers for class 2b and 3 vehicles have accounted for more than 46 percent of all vouchers in NYTVIP through the end of 2018. Though the Mitigation Trust will provide funding for a wide range of vehicle technologies, it will not accommodate a representative range of vehicle technologies because market-ready lighter vehicle applications will not be eligible to participate.

To ensure that the Settlement produces air quality improvements, the Mitigation Trust requires an eligible truck or diesel engine to be scrapped. The scrappage requirement specifies that the vehicle must match the description of new vehicles made available under each Mitigation Action with diesel engines from model years 1992-2009 (in some cases, model years 2010-2012 are also eligible for scrappage). All eligible projects must pair new vehicle proposals with eligible vehicles or engines to scrap. Engines must be rendered inoperable and available for recycling by cutting a 3-inch hole in the engine block for all engines. Vehicles that will be replaced must have their chassis disabled by cutting the vehicles' frame rails completely in half (this step does not apply to repowers). These requirements must not only be performed, but also verified, to qualify for Settlement funding.

No current VIP requires scrappage, but adding a scrappage program into the VIP framework is easily manageable. Similar programs, such as the Hunts Point Clean Truck Program in the Bronx, NY, require scrappage and certification to correspond to new the vehicles deployed through the programs. Adding a scrappage requirement may take multiple forms and borrow from existing programs.

The new scrappage requirement will add a step for vendors, as well as for program administrators, but will unlock funding and capitalize on interest for clean vehicles while verifiably removing the dirtiest engines from operation. Similarly, the scrappage step adds scrap yard operators as significant stakeholders in the VIP process while creating economic opportunities for removing older, polluting vehicles from roads. By integrating this orderly, reliable, and replicable scrappage process, states and cities with VIPs will encourage participation in the clean vehicle adoption process and facilitate the retirement of older, polluting vehicles in favor of cleaner options.

Example of scrappage requirement added to existing VIP

To comply with Mitigation Trust funding requirements, a scrappage step must be added to the current VIP process. The scrappage process must be simple, replicable, and effective.

The actual scrappage should be performed at a dedicated and approved scrap yard. To ensure reliable and accurate compliance with Settlement and existing voucher incentive program requirements, scrap yards should be licensed and registered as eligible sites that can perform the specific required scrappage tasks and provide reliable documentation. To facilitate the scrappage process for Vendors, a statewide network of certified scrap yards that can perform Settlement-eligible scrappage actions should be established. This step will allow Vendors to regularly and reliably contact known scrap yards to perform the required actions, reducing uncertainty and streamlining the process of determining scrap yards' eligibility. The network should be made readily available to verified Vendors. Each eligible scrap yard will need to demonstrate that it possesses the required materials and expertise to scrap vehicles and accurately verify compliance. Once a network of eligible scrap yards has been established, the following practices should help to create a simple, replicable process for performing and reporting scrappage:

The Vendor should coordinate scrappage with a vehicle purchaser and an eligible scrap yard. From the vehicle purchaser perspective, the interaction would be similar to a vehicle buyback, earning value for an old vehicle while acquiring a new vehicle. The scrappage company should be responsible for transporting old vehicles from Vendors to scrap yards for retirement. Scrap value should be negotiated independently from the voucher amount, which is already firmly established within the voucher incentive program.

Vehicles should be scrapped after the delivery of new vehicles and approval for vouchers under the Settlement. This process will avoid retiring an old vehicle before funding for a new vehicle has been approved and delivery has been completed. Once the rebate has been approved and vehicle has been delivered, scrappage should be performed and verified. This would be the final step to demonstrating compliance and releasing the approved funding to the vendor.

In cases where a fleet would like to take advantage of available incentives to upgrade from an older model all-electric, hybrid, or alternative fuel vehicle, or a more recent diesel engine, the existing vehicle may be transferred to another fleet to replace an older vehicle eligible for scrappage under Settlement guidelines. In this manner, the voucher program can comply with the scrappage requirement while upgrading the environmental performance of multiple vehicle fleets.

3.4 Key Takeaways

The voucher incentive design can be revised to accommodate each of the funding sources for clean commercial vehicles described in this section. Though the VIP design is highly effective, each funding source offers great potential benefits while also introducing constraints relative to VIP design and implementation. States and cities interested in developing a clean vehicle VIP should explore the merits of each resource and consider how any limitations would affect their proposed programs.

- A state-funded program is highly effective to meeting local and regional needs, such as California's programs that reward deployments in disadvantaged communities, but passing new legislation to fund clean vehicle programs may be difficult.
- CMAQ is a ready funding source available to all 50 states and the District of Columbia that has proven effective in deploying clean vehicles in Chicago and New York. However, geographic requirements for vehicle deployments may impact program implementation, and uncertainty over

the FHWA Buy America requirement may impede jurisdictions' ability to leverage CMAQ funds for clean vehicle projects.

- Funding through the Volkswagen Settlement's Mitigation Trust is also nationally available to all states and territories and will provide more than \$2.7 billion for clean vehicles, but will not be available on an ongoing basis. This funding source requires eligible vehicle projects to include a scrapped diesel engine at minimum and does not include funding for on-road vehicle classes lighter than class 4.

4. A Solution Across Regions: Successful Voucher Programs Across the United States

California's HVIP was an immediate success that validated the VIP design. In its first year of operation, HVIP disbursed its funds faster than any program in CARB history and was recognized as the number one emerging state energy project by the American Council for an Energy Efficient Economy.

The programs in New York and Chicago are promising among clean vehicle programs using CMAQ funding because of their large scale and innovative designs tailored to their particular regional needs. Total funding amount, eligible technologies, and per-vehicle incentive levels differ between these programs, but each uses federal funding to provide a simple, streamlined purchase incentive to reduce upfront costs for clean trucks.

This section highlights the successes each program has had in placing clean vehicles on U.S. roads, outlines the components of each program's design features, and compares the details of the distinct VIP designs.

4.1 Comparing Voucher Program Design Elements

California's Hybrid and Zero-Emission Truck and Bus Voucher Incentive Project (HVIP)

California's HVIP was established in 2009 to spur the development and more rapid deployment of clean truck and bus technologies that will make substantial contributions to the needed air quality improvements over the decades to come. The program helps the state to meet its clean air and climate goals with an evolving suite of technologies and incentives. CARB reviews and approves all technologies for eligibility in the program. Though HVIP was initially funded for the deployment of hybrid vehicles, the number and type of eligible fuel and vehicle technologies has grown substantially with time as new vehicle technologies have become commercialized. Eligible vehicle technologies now include:

In its first year of operation, HVIP sold out faster than any program in CARB history and was recognized as the number one emerging state energy project by the American Council for an Energy Efficient Economy

- Hybrid or zero-emission (hydrogen fuel cell or all-electric) buses or trucks;
- Utility trucks with electric power takeoff (ePTO), including exportable power;
- Vehicle conversions to zero-emission and hybrid powertrains; and
- Certified engines that emit low levels of nitrogen oxides (NOx) ("Low NOx")

HVIP differentiates substantially in terms of voucher value for each technology. Vouchers for hybrid vehicles are capped at 50 percent of the incremental cost of the hybrid system, up to limits based on GVWR that range from \$8,000 to \$30,000. Base voucher amounts for battery-electric trucks are set to cover approximately the full incremental cost of the battery-electric truck, using GVWR-based incentive levels ranging from \$20,00 to \$150,000. Class 8 hydrogen fuel cell vehicles receive \$300,000 vouchers. These voucher amounts can increase depending upon where a vehicle operates and is domiciled, most notably including in disadvantaged communities (DACs). See Table 4.1 below for an example of eligible voucher amounts for zero-emission trucks.

As indicated in the table, voucher amounts differ not only between technology types, but also between different vehicles and deployments for the same technology. Factors that affect HVIP voucher amounts include:

- Fuel type
- Vehicle weight and length
- Vehicle deployment in a disadvantaged community
- Size of an engine (low-NOx)

The HVIP design has two features unique to the program: 1) zero-emission vehicles deployed in disadvantaged communities (DACs) are eligible for an additional incentive, and 2) purchasers of low-NOx engines are required to exclusively use renewable fuels.

Table 4.1: HVIP Zero Emission Truck Incentives

GVWR (lbs)	Base Vehicle Incentive	
	Outside DAC	In DAC
5,001 - 8,500	\$20,000	\$25,000
8,501 - 10,000	\$25,000	\$30,000
10,001 - 14,000	\$50,000	\$55,000
14,001 - 19,500	\$80,000	\$90,000
19,501 - 26,000	\$90,000	\$100,000
26,001 - 33,000	\$95,000	\$110,000
> 33,000	\$150,000	\$165,000
> 33,000 (Hydrogen Fuel Cell)	\$300,000	\$315,000

Case Study: Creating Equity in Stockton, CA with Zero Emission Transit Buses

The city of Stockton is the third most populous city in California's Central Valley, with approximately 300,000 residents. The U.S. EPA identifies the Central Valley as having "some of the nation's worst air quality, failing to meet federal health standards for both ozone (smog) and particulate pollution," owing to topography, on-road highway traffic, and off-road farming equipment.¹ Stockton sits at the junction of two major highways and experiences the negative health impacts of both highway and local pollution. City leaders saw an opportunity to improve local air quality, help meet California's greenhouse gas goals, and improve economic equality for the city's disadvantaged communities by adopting zero emission transit buses that were funded by HVIP.

From 2017-2018, San Joaquin Regional Transit District (SJRTD) purchased 13 Proterra-built all-electric transit buses. These buses were placed on bus rapid transit routes that are designed specifically to create greater ease of use and access to city centers, improving economic opportunity for residents with lower access to affordable and reliable transportation. City officials highlighted the improvements in air quality and noise pollution that all-electric buses would produce.¹ By emphasizing that these zero-emission buses would serve disadvantaged communities along Martin Luther King, Jr. Boulevard in Stockton, the city will improve air quality in areas of the city that are typically exposed to the highest impacts of on-road air pollution while gaining greater access to economic opportunity.

New York Truck Voucher Incentive Program (NYTVIP)

In 2013, the New York State Energy Research and Development Authority (NYSERDA), New York Department of Transportation (NYSDOT), and New York City Department of Transportation (NYCDOT) launched a \$19 million program to expand the use of diesel emissions controls, compressed natural gas (CNG), hybrid, and all-electric medium- and heavy-duty trucks in parts of New York State with poor air

quality.²³ During the first iteration of the program, NYTVIP was organized into three separate funds, each with a distinct technological and geographic requirements:

- **New York State Electric Vehicle-Voucher Incentive Fund (NYSEV-VIF):** Offered vouchers for the lesser of \$60,000 or 80 percent of net incremental cost for the purchase or lease of all-electric trucks or buses in one of 30 New York counties in non-attainment or maintenance status with respect to NAAQS; deployed \$5.7 million across 65 vehicles.
- **New York City Alternative Fuel Vehicle-Voucher Incentive Fund (NYCAFV-VIF):** Offered incentive vouchers for the lesser of \$40,000 or 80 percent of the net incremental cost for CNG, hybrid electric and battery-electric trucks for private vehicle fleets in New York City; deployed \$6.4 million across 405 vehicles.
- **New York City Diesel Emission Reduction-Voucher Incentive Fund (NYCDER-VIF):** Offered incentive vouchers for up to 80 percent of the cost of purchasing and installing emission reduction equipment on medium and heavy-duty diesel vehicles in New York City. In 2016 NYCDER-VIF was absorbed under NYCAFV-VIF to streamline administration further; deployed \$2.5 million across 124 DER retrofits.

Case Study: Beer Deliveries Powered by CNG

Manhattan Beer supplies iconic beer brands across New York City, from Red Hook’s growing restaurant scene to the roaring crowds of Yankee Stadium and beyond. Major national brewers such as Coors and Corona trust Manhattan Beer to reliably and cost-effectively deliver their goods to the thirsty patrons across the city. Manhattan Beer is delivering on that promise with an extensive and growing fleet of trucks powered by clean-burning compressed natural gas.

The beer distributor operates approximately 150 compressed natural gas (CNG) trucks in its broader vehicle fleet that makes deliveries across New York City and the greater metropolitan region. Purchased with the financial support of the New York Truck Voucher Incentive Program, the CNG trucks offer improved dependability and operational cost savings while contributing to sustainable communities and employee satisfaction. The cost savings from added space and reliability, reduced maintenance, and lower fuel costs help Manhattan Beer to save money using CNG trucks relative to operating diesel fleets while simultaneously improving air quality in the neighborhoods where the vehicles operate.

Table 4.2: NYTVIP Electric Vehicle Voucher Incentive Caps (2018)

GVWR (lbs)	Voucher Incentive Cap
10,001 - 14,000	\$60,000
14,001 - 19,500	\$90,000
19,501 - 26,000	\$100,000
26,001 - 33,000	\$110,000
33,001 - 38,000	\$120,000
> 38,000	\$150,000

The broad focus on several different clean technologies allows users to choose the best option for their operation and ensures that a wide variety of fleets can take part and benefit. Structuring more technology-specific voucher funds also allows vouchers for those technologies to more naturally conform to geographic requirements of the distinct funding sources (statewide non-attainment counties for NYSDOT’s CMAQ contribution and the five New York City boroughs for NYCDOT’s CMAQ contribution).

Each vehicle technology in NYTVIP differentiates voucher amounts by GVWR class. A cap is established for each section of vehicles depending upon the GVWR. Table 4.2

²³ NYSERDA, NYSDOT, and CALSTART. "Welcome to NYT-VIP!" NY Truck VIP. Accessed July 2019. <https://truck-vip.ny.gov/>

shows the voucher amount distribution by GVWR for all-electric vehicles, which can be deployed in any one of 30 counties currently or recently in non-attainment or maintenance for criteria air pollutants.

With the guidelines established for voucher amounts and eligibility, the program approves vehicles for participation and establishes the vouchers based on GVWR, the purchase price of a new vehicle, and the price of an equivalent new diesel-powered vehicle. For example, Table 4.3 lists a selection of approved all-electric school bus models and their associated voucher amounts.

In mid-2019, NYSERDA along with NYSDOT and NYS Department of Environmental Conservation (NYSDEC) are launching a new round of NYTVIP funding that commingles NYSDOT CMAQ funds (keeping in place the pre-existing Buy America waiver for class 3-8 battery electric vehicles) with VW Appendix D funds administered by NYSDEC. The different funding configuration will introduce a scrappage requirement to conform to the terms of the Volkswagen Settlement as well as altering the voucher amounts/caps and eligible project locations.

Table 4.3: Selected Approved Electric School Bus Models and Voucher Amounts for NYTVIP (2018)

OEM	Vehicle	Model Year	GVWR	Vehicle Cost	Incremental Cost	Incentive Amount
Blue Bird	Electric All American School Bus, 4x2	2018	>33,000	\$335,000	\$227,000	\$150,000
Lion Bus	eLion	2018	30,000	\$325,000	\$196,000	\$110,000
Motiv Power Systems	All-Electric Ford E-450 Chassis with 4 Batteries	2018	14,500	\$188,570	\$155,250	\$90,000
Motiv Power Systems	All-Electric Ford E-650 Chassis with 5 Batteries	2018	29,000	\$237,860	\$180,250	\$110,000

Drive Clean Chicago

The City of Chicago announced a \$14 million VIP for hybrid and all-electric trucks and buses in November 2012, Drive Clean Chicago. Like New York, Chicago uses CMAQ funding to capitalize its VIP, but because it is focused in a particular metropolitan region, eligible vehicles must operate 75 percent of the time in one of six approved counties in the Chicago area. Chicago has two programs that fund electrified medium- and heavy-duty vehicles, either hybrid or all-electric trucks and buses, and a second program for all-electric or CNG conversion taxis. A third, unique element to Drive Clean Chicago is a funding provision for CNG refueling and EV charging infrastructure. Vouchers issued and paid under the initial funding were completed in 2018. A subsequent round of CMAQ funding for Drive Clean Chicago has been awarded, pending an FHWA Buy America waiver that would allow the program to proceed.

- **Drive Clean Truck:** Offered incentive vouchers for the lesser of \$150,000 or 80 percent of net incremental cost for the purchase or lease of hybrid or all-electric trucks or buses; deployed \$11.3 million across 288 vehicles.
- **Drive Clean Taxi:** Offered incentive vouchers for \$10,000 for the purchase or conversion to an EV or CNG taxi or ride-share vehicle; deployed \$870,000 across 87 vehicles.
- **Drive Clean Station:** Offered incentive vouchers for up to 30 percent of the capital cost of purchasing and installing publicly available CNG and EV charging stations in areas where alternative fuel infrastructure is deemed to be “poorly lacking”; deployed \$300,000 for one CNG station.

Drive Clean Chicago uses a similar design to NYTVIP, creating a cap for incremental costs by GVWR and technology type. The caps by GVWR for electrified vehicles are listed in Table 4.4.

Table 4.4: Drive Clean Chicago Electrified Vehicle Voucher Caps

GVWR (lbs)	Zero Emission	Plug-in Hybrid	Hybrid
6,000 - 10,000	\$55,000	\$45,000	\$20,000
10,000 - 14,000	\$60,000	\$50,000	\$30,000
14,000 - 19,500	\$90,000	\$55,000	\$40,000
19,501 - 26,000	\$100,000	\$60,000	\$50,000
26,001 - 33,000	\$110,000	\$70,000	\$60,000
33,001 - 38,000	\$120,000	\$100,000	\$80,000
> 38,000	\$150,000	\$120,000	\$100,000

Case Study: Maintaining Power with Hybrid Power Take Off Systems

Commonwealth Edison (ComEd) is the largest electric utility provider in the state of Illinois. ComEd provides service to approximately 3.8 million customers (70% of the state’s population) in the Chicago and Northern Illinois area. To safely provide electricity throughout 400 municipalities and 25 counties, ComEd relies on its fleet of 4,700 vehicles to cover a territory of 11,411 square miles. The utility received \$384,000 in voucher incentives through Drive Clean Chicago for the purchase of six (6) Plug-in Hybrid Electric Vehicle (PHEV) systems from Odyne Hybrid Systems. The PHEV systems reduce idling, provide zero-emission HVAC and exportable power at the worksite, and save and produce energy through regenerative braking.

By using Odyne’s ePTO-based (electric Power Take Off) hybrid system on six utility trucks, ComEd is able to improve fuel efficiency and eliminate idling at the worksite. While operating on the highway, the PHEV system works in parallel with the diesel engine to maximize fuel efficiency and produce energy for the electric batteries through regenerative braking. At the worksite, the PHEV system provides zero-emission HVAC and exportable power to assist with maintenance and repair services. Compared to an all-diesel utility truck, the PHEV system saves ComEd close to ten gallons of fuel within a 12 hour shift per truck. Based on the technology price and estimated fuel savings, ComEd predicts a payback period of three years.

Direct Design Comparison

To make comparisons easier, Table 4.5 illustrates the differences and similarities between each of the current voucher incentive programs, their shared design elements, and the features that make them unique.

Table 4.5: Side-by-Side Comparison of Design Details for VIPs Administered by CALSTART

Program	California HVIP	NYTVIP	Drive Clean Chicago
Agency partners	CARB	NYSERDA, NYSDOT, NYCDOT	Chicago DOT
Funding amount (as of 1/1/19)	\$444 million	\$19 million	\$14 million
Funding source	CA Cap-and-Trade Auction Revenues	CMAQ	CMAQ
Voucher types	<ul style="list-style-type: none"> Electric technologies (all-electric, hydrogen fuel cell, hybrid-electric, electric power take-off/utility) Low-NOx Engines 	<ul style="list-style-type: none"> Alternative fuel vehicles (hybrid-electric, natural gas) in NYC Diesel emission control devices in NYC All-electric vehicles statewide 	<ul style="list-style-type: none"> Trucks and Buses: hybrid and all-electric Taxis: hybrid and all-electric
Voucher amount	<ul style="list-style-type: none"> Zero-Emission: targeting incremental cost, up to \$300,000 Hybrid: 50% of incremental cost up to \$30,000 Low NOx: \$45,000 	<ul style="list-style-type: none"> Alternative Fuels: 80% of incremental cost, up to \$150,000 Diesel Emission Controls: All-Electric: 80% of incremental cost, up to \$150,000 	<ul style="list-style-type: none"> Truck and Buses: 80% of incremental cost, up to \$150,000; Taxi: 80% of incremental cost, up to \$10,000
Truck vehicle classes	1-8 (GVWR >5,000)	2b-8 (GVWR >8,500)	2b-8 (GVWR >8,500)
Eligible fleets	Private, public, non-profit	Private, public, non-profit	Private, public, non-profit
Availability	First-come, first-served	First-come, first-served	First-come, first-served
Geographic Distinctions	Escalators for vehicles domiciled in disadvantaged communities	All-electric vehicles must be domiciled ≥70% of time in one of 30 non-attainment counties	Must operate in 6-county Chicago area
Distinguishing features	Engines that are certified to produce low NOx emissions are eligible and must be used with renewable fuels	Diesel Emission Control devices have been eligible for funding	EV charging stations and light-duty vehicles are eligible for funding

4.2 VIP Results

With more than \$400 million in total funding made available since the inception of the program, HVIP has had the most striking success in placing clean vehicles California’s roads. Though the programs in Chicago and New York are newer and draw from a smaller funding source, the voucher incentive structure has provided a framework that has deployed hundreds of vehicles in these locations as well. Figure 2 below provides an accounting of the technologies deployed under each program and how the funding was spent. The number of hybrid vehicles deployed in all programs is significantly higher than other technology or fuel types, reflecting the longer lifespan of commercial hybrid vehicle technologies.

Figure 1: Comparison of Regional VIP Vehicle Types, Fleet Deployments, and Total Expenditures (as of Jan 2019)



Technology	# Vehicles	%	Amount
Hybrid-electric	2,405	62%	\$ 62,644,776.12
Zero-emission	1,286	33%	\$ 119,745,335.00
ePTO	161	4%	\$ 3,898,000.00
Total Electric	3,852	100%	\$ 186,288,111.12
Low-NOx Engines	1,044	100%	\$ 11,554,933.00



Technology	# Fleets	# Vehicles	Voucher Funds
DPF	9	124	\$2,452,304.80
EV	18	65	\$5,673,093.00
CNG	4	71	\$3,033,524.00
CNG Conversion	4	15	\$334,272.00
Hybrid	22	83	\$1,198,179.20
Hybrid Conversion	3	236	\$1,830,776.00
Total	60	594	\$14,522,149.00



Technology	# Fleets	# Vehicles	Voucher Funds
EV-Truck	18	49	\$5,846,717.00
Hybrid-Truck	37	239	\$5,430,160.00
Total Truck	55	288	\$11,276,877.00
EV-Taxi	4	85	\$855,440.00
CNG-Taxi	1	2	\$16,000.00
Total Taxi	5	87	\$871,440.00

4.3 Key Takeaways

Using the same core VIP design, programs in California, New York, and Chicago have successfully deployed clean vehicles, reducing harmful criteria air pollutant and greenhouse gas emissions. Though the jurisdictions are separate and distinct, and each program features unique design elements, the VIP

framework has accommodated and benefited funders and the stakeholders that are responsible for deploying clean vehicles.

By comparing the programs' designs, a few common principles of a successful VIP emerge:

- **Technological Neutrality:** Each program provides a range of fuel and vehicle technologies that meet the criteria for clean or low-polluting. The accommodation of multiple clean transportation technologies allows fleets to choose the best option for their unique needs and thus provides the best chance of success and of these fleets becoming ambassadors for clean vehicle technologies.
- **Transparency:** The clear, highly structured design among all programs creates certainty of outcomes for manufacturers, vendors, and fleets, in addition to state and/or local sponsors. The VIP design establishes program rules and processes, publicizes the amount of available and remaining funding, and provides those funds on an open, first-come, first-served basis that provides certainty in a rapidly evolving marketplace for clean vehicles.
- **Adaptability:** Design choices can tailor the basic VIP structure to accommodate funding requirements or other local priorities. For example, since CMAQ funds require that vehicle deployments in NYTVIP and Drive Clean Chicago are directed towards counties with worse air quality, a geographic restriction on where voucher-funded vehicles may be domiciled and/or operate was written into the rules for each program. Though HVIP does not require vehicles to be deployed in more polluted areas, its design has evolved to include a bonus incentive to reward clean vehicle deployments in disadvantaged communities. These adaptations demonstrate the ready adaptability of the VIP model.

5. Lessons Learned, Recommendations, and Expanding the Voucher Impact

Voucher programs fit a clear need to efficiently deploy clean commercial vehicles, providing greater cost certainty and including a wider range of eligible fleets that tax incentives. This brief has explored the flexibilities of program design, demonstrated the successful application of VIPs across the country, and identified funding sources for additional or renewed voucher programs. To conclude, this section will impart lessons learned from existing programs, recommend best practices for program design, and place voucher programs and the need for clean commercial vehicles in the context of efforts to reduce greenhouse gas emissions and improve air quality. Resources on VIPs and CALSTART contacts are made available to encourage readers to take action and explore how to implement an innovative voucher program in their jurisdictions.

5.1 Lessons Learned

CALSTART has collaborated with funders and industry experts on an ongoing series of outreach meetings with program participants to take the pulse of the industry and to identify potential and existing clean vehicle opportunities. The lessons learned from these conversations are shared below:

- **Lack of reliable information on TCO and technology:** Despite the success of the program, many fleets and dealers still have misperceptions about technology performance and the impacts of alternative fuel vehicles on their total cost of ownership (TCO). Vehicle technologies are advancing rapidly, so a knowledge gap on vehicle technology and TCO performance may be expected but must be addressed. The largest misconceptions among fleets and dealers for hybrid and electric vehicles were based on battery life and costs. Many fleets, and even medium-duty salespersons, have expressed their beliefs that battery life lasts approximately five years, whereas the useful life of a battery has improved to approximately 10 years. Such misperceptions greatly affect fleets' calculations for return on investment and residual value.

Outreach needed to realize program benefits. Conversations with dealers and fleets have indicated that continued outreach is a valuable component to growing confidence in, and uptake of, clean vehicle technologies. A program administrator or partner may reach out to new market participants or segments to provide information and education about the technological and TCO improvements of alternative fuel vehicles, and in doing so may make additional fleets and dealers aware of the availability of clean vehicle vouchers. Outreach also reducing uncertainty, providing a personal component that creates trust in the program and its administrators.

- **Incentives needed in more than one state:** Manufacturers and large national fleets view markets as separate and distinct, based partially on supply chains and policies that impact vehicle deployments. Though HVIP has created tremendous interest and spurred clean vehicle sales in California, and Chicago and New York have each generated initial growth in clean truck and bus markets, there is a clear need to expand these voucher programs to new states to introduce additional clean vehicles into those markets.

Longer-term certainty creates opportunity for growth: Market growth takes time; voucher programs need to build awareness and confidence in the program while engaging manufacturers and fleets on adopting or developing new vehicle technologies. Vouchers that are available over a

long time period create predictability and cost certainty for fleet adoption. For example, the California HVIP program was initially envisioned as a three- to five-year effort, which provided the base for early adoption, but annual funding increased through AB 32 have assured manufacturers and fleets that volume and scale points can be reached to create sustainable cost reductions. Annual HVIP vehicle voucher demand has grown to \$175 million in 2018. Additional certainty could be provided if the funding sources were allocated for several years at a time rather than via the uncertainty of single year allocations.

- **Clarify and promulgate program participation requirements at all level:** The VIP program design provides funding for fleets and sales for manufacturers and vendors, but these programs also designate clear and ongoing requirements for participants. For instance, NYTVIP requires each fleet that receives voucher funding to submit a semi-annual mileage report, but fleets may not properly comply due to not knowing of the requirement or not training or maintaining staff to fulfill the report. Other fleets have enthusiastically embraced alternative fuel vehicles through voucher programs but have been unable to purchase additional vehicles due to a program rule that allocates no more than 25 percent of total voucher funding to an individual fleet. In these circumstances and more, engaging with vendors and fleets early to clearly review and demonstrate understanding of program requirements will help participants and administrators with compliance and efficient voucher applications.

The experience derived from leading VIPs and engaging directly with manufacturers, fleets, and vendors in three distinct jurisdictions has been beneficial to improving the program's performance and facilitating the deployment of clean vehicles. Because VIPs are flexible and adaptable, any new program should seek the perspectives of valued program participants to continue to improve the voucher experience.

5.2 Recommended Steps for Voucher Program Design

The flexibility inherent in the VIP design allows each jurisdiction to choose from a wide range of program design options. CALSTART endorses design choices that would make a program more suitable to local conditions, but broadly recommends that each jurisdiction follow these basic steps to develop an appropriate, effective voucher incentive program.

Establish Technologies to Include and Incentivize

The commercial vehicle segment includes an extensive variety of vehicle types, classes, and technologies. Programs that prioritize improving air quality may include technologies such as CNG trucks and buses, whereas programs that prioritize greenhouse gas emissions may choose to exclude CNG technologies due to marginal greenhouse gas reductions. California's HVIP has established an option for CNG trucks that use Low NOx engines that must exclusively use renewable natural gas, guaranteeing both greenhouse gas emissions reductions in addition to criteria air pollutant reductions. The technologies incorporated in each of these programs reflect the goals that each program is trying to achieve through clean vehicle deployments.

VIPs that include multiple vehicle technologies and classes generally have the greatest flexibility and allow the market to compete and meet clean vehicle opportunities.

VIPs that include multiple vehicle technologies and classes generally have the greatest flexibility and allow the market to compete and meet clean vehicle opportunities. Even if certain technologies have not

consistently met all duty cycles for each weight class (such as light-medium duty CNG delivery vans or heavy-duty all-electric drayage trucks), providing a voucher incentive for these vehicles will create an economic opportunity for manufacturers to develop technologies that meet all duty cycles. To promote market and technology growth and advancement, VIPs should allow for the addition of new clean vehicle technology options that are not yet identified or commercially available. The ability to add new technologies is especially important in long-term programs with renewable funding resources.

Design Voucher Programs and Process

Voucher programs can be designed as all-encompassing funds to include all available technologies that draw from a common pool, or programs can be subdivided by technologies or regions. The NYTVIP provides an interesting example of structuring a multi-technology voucher system by designing three separate vouchers within the larger umbrella program. Separate programs were established to manage different technologies, as New York did with its electric truck program and diesel emission control program. NYTVIP's design also established a single voucher that allows multiple technologies to participate, as is the case with alternative fuel voucher incentive that provides incentives for hybrid, all-electric, and natural gas trucks and buses. These programs also correspond to geographical restrictions, with the all-electric vehicle program providing funding for projects in 30 eligible counties across the state and the alternative fuel and diesel emission control programs restricted to projects located in New York City.

Critically, the process for qualifying for, applying for, and receiving vehicles and vouchers must be designed as simply and transparently as possible. The value of creating a simple design that manufacturers, vendors, and fleets can interact with can be expressed in many ways:

- **Transparency/Certainty:** A transparent program that defines the amount of funding available and allows for vouchers to be processed quickly creates clear economic opportunities for stakeholders to participate;
- **Simplicity/Fairness:** A simple program that is easy for participants that typically deal in vehicle operations to follow will create a sense of fairness – that all projects and participants are equally valued and that the program works to promote clean vehicle deployments rather in an honest manner; and
- **Cost-effectiveness:** The ease of participating in the program will reduce administration costs by reducing the amount of time and effort that administrators spend explaining the program and that a voucher processing center would spend in guiding participants through the voucher process.

Incorporate Funding Sources and Local Priorities

As established in Section 3, a voucher program can (and must) be tailored to fit the requirements of its funding source. A city, state, or region can incorporate specific funding requirements with the chosen technologies and processes to yield a complete VIP that will deliver clean vehicles in a precise, unique, and optimal manner. Depending upon the funding source, requirements may pertain to, but are not limited to:

- Permissible vehicle types (low GHG output from CA cap-and-trade funding);
- Scrapping existing vehicles (Volkswagen Settlement NOx Mitigation Trust);
- Meeting requirements of domestically sourced, assembled, or purchased materials or components (CMAQ); and

- Location of vehicle deployments (CMAQ and CA cap-and-trade funding).

Modifications and additions to the VIP design are not limited to funding requirements, but can stem from the particular concerns or interests of local policymakers and other stakeholders. To ensure that a VIP most effectively meets the clean transportation needs of fleets and residents within a particular jurisdiction, the program's designers should convene working groups or listening sessions to gather information. Examples of stakeholders that should inform the conversation may include:

- City and State air, energy, and transportation agencies;
- Vehicle and auto parts manufacturers;
- Fleets that have adopted clean vehicles, and fleets that have not yet adopted clean vehicles; and
- Community groups representing residents affected by transportation pollution.

An effectively organized design process that incorporates feedback from knowledgeable and invested stakeholders will produce a VIP that will meet the demands of its constituents and successfully deploy clean vehicles that meet the program's emissions goals.

Ongoing Collaboration with Industry and Policy Experts

Marrying continued efforts to improve the program with a thoughtful and targeted design is crucial to achieving a VIP's clean vehicle deployment goals. As technologies improve and populations shift, adjustments may be necessary to ensure that the program is working effectively. Outreach activities may include the following strategies:

- Promoting the program to interested fleets and manufacturers to ensure that all qualified and interest parties are aware of and have access to clean vehicle funding;
- Collaborating with the vehicle manufacturers to identify and certify new technologies that will be eligible under program guidelines;
- Tracking vehicle usage to ascertain the mileage, air quality impacts on neighborhoods, and types of duty cycles that the vehicles are meeting; and
- Developing a feedback loop with all stakeholders about the relative successes and shortcomings of the project to continue refining and improving the program.

To achieve ongoing collaborative goals, a funding agency may prefer to engage a trusted and knowledgeable contractor. An unbiased third-party group such as CALSTART could play a useful coordinating role in understanding the landscape and requirements, as well as tapping the knowledge of all interested parties. CALSTART's extensive experience with several programs would also be beneficial at the program's beginning phases, since the organization has effectively designed and implemented three separate incentive programs and has a solid understanding of the needs and priorities of industry and fleet decision-makers. CALSTART also works with federal agencies and other partners involved with complex federal and state funding. With a network of national offices, accumulated expertise on commercial vehicle technologies and strategies, and a demonstrated record of success in deploying clean vehicles, CALSTART embraces the opportunity to expand the adoption its voucher incentive program design and to work with new jurisdictions that deploy clean vehicles through the VIP model.

5.3 A Tool to Activate New Beachhead Markets for Clean Commercial Vehicles

Voucher programs at the state and city levels have proven highly successful in activating local or regional markets for advanced alternative fuel vehicle options. However, this market activation must expand beyond early adopter states to meet the various climate and sustainability goals around the country that blossomed following the U.S. decision to depart the Paris Climate Accords. The voucher incentive design can be replicated to create a larger national network of incentive programs that will collectively reduce greenhouse gas emissions and improve air quality for U.S. residents. Expanding to additional states and cities will benefit all clean vehicle industry stakeholders – fleets, manufacturers, suppliers, government and nonprofit groups focused on air quality and energy security – as well as states, cities, and their residents that benefit from the cleaner air enabled by clean vehicle deployments.

A broader network of incentives will increase the size and scope of the early market, leading directly to additional air quality and petroleum reduction benefits. It also leads to increase vehicle sales, creating and retaining jobs in this industry. Perhaps most importantly, a broader network of incentives will help boost volumes and drive down costs through economies of scale, creating a virtuous cycle that will increase deployment, further driving down costs. The effect of incentive programs as a market catalyst will grow as the reach of these incentives expands beyond just a few early adopter states and cities.

CALSTART's Global Commercial Vehicle Drive to Zero Program seeks to leverage early wins for alternative fuel vehicle adoption, such as those in areas with VIPs, for deeper market transformation while extending the reach of these markets by working with additional jurisdictions to seed new markets. In expanding beyond early adopter areas, Drive to Zero intends to support regional "beachhead" markets across the globe where the conditions are present for zero- and near-zero emission commercial vehicles to become viable across a wide range of applications. A regional network of VIPs or similar incentive programs can help grow a regional beachhead market with a burgeoning clean vehicle economy.

Beachheads markets can establish market conditions that develop local supply chains and make large-scale clean commercial vehicle adoption more affordable and manageable for fleets. The beneficial outcomes of committing to a clean medium- and heavy-duty vehicle economy may include:

- Manufacturers expand operations to new market to meet local demand;
- Regional supply chains improve, making component parts and replacements more affordable;
- Infrastructure is built to service and fuel new vehicle technologies;
- Fleets have greater number of technology and vehicle model options and can more easily adopt clean vehicles;
- Growth in a regional clean vehicle economy generates greater investment in new technology and manufacturing capacity; and
- Adoption of clean vehicles reduce greenhouse gas and criteria air pollutant emissions.

Establishing a VIP generates clear localized economic and environmental benefits, but a regional approach that can cultivate a beachhead market will attract additional support from industry partners; existing beachhead markets like California, China, and Northern Europe are seen as critical bellwethers and conduits for growing national and international clean commercial vehicle adoption. For instance,

CALSTART will work partners in beachhead markets to develop institutional and industry knowledge to help establish and grow clean commercial vehicle markets. By establishing a VIP in a beachhead market, jurisdictions can compound the benefits of a voucher program through impactful and extensive industry and non-profit collaboration.

5.4 Key Takeaways

Purchase vouchers are the preferred tool for clean commercial vehicle deployment. These simple, streamlined incentives can greatly improve the business case for new technologies, helping fleets purchase more efficient vehicles and helping manufacturers and suppliers increase sales to build the production volumes needed to comply with standards and to lower purchase price. Vouchers reduce uncertainty and administrative burden, can be utilized by tax-exempt fleets, and effectively lower capital costs at the point of purchase. The certainty, simplicity, and transparency inherent in the voucher process make this method of incentives the preferred option of manufacturers and fleets.

The VIP design is flexible to conform to funding source requirements, from state-specific revenues for clean energy to federal clean air programs or a unique settlement or appropriation, such as provided by the Volkswagen Mitigation Trust. Each jurisdiction can revise the program design to meet local needs, including environmental equity concerns and individual air quality and greenhouse gas goals. The successes of distinct and separate voucher programs demonstrate how capably a VIP can be adapted to meet funding requirements while facilitating clean bus and truck deployments.

Cities and states across the United States are searching for the best methods to meet their climate goals and reduce harmful criteria air pollutants that damage the health and wellbeing of residents. Voucher incentive programs are a proven, effective tool to replace polluting commercial vehicles with clean, reliable alternatives.

6. Get Involved

Contact

CALSTART can serve as a resource for any questions about the VIP design and implementation process. Please reach out to the following offices with any questions or information requests:

Southern California (Headquarters & HVIP)

48 S Chester Avenue

Pasadena, CA 91106

626-744-5600

calstart@calstart.org

info@californiahvip.org

Northeast Regional Office (NYTVIP)

Benjamin Mandel, Northeast Regional Director

67 35th St, 3rd Floor, Suite C356

Brooklyn, NY 11232

929-295-6540

bmandel@calstart.org

To be involved in the national effort on vouchers, contact Tom Brotherton, Director of Market Acceleration, at tbrotherton@calstart.org.

Additional Resources

The following websites, reports, and regulations found in the Additional Resources box may provide valuable information resources for the topics and programs discussed in this brief.

Additional Resources**VIP Websites**

California's Hybrid and Zero-Emission Truck and Bus Voucher Incentive Project and Low NOx Engine Incentives (HVIP): <https://www.californiahvip.org>

New York's Truck Voucher Incentive Program (NYT-VIP): Final program will be listed on New York State Energy Research and Development Authority's clean transportation website:

<https://www.nyserda.ny.gov/All-Programs/Programs/Clean-Transportation-Program>

Drive Clean Chicago (DCC): <http://www.drivecleanchicago.com>

Additional Information

Global Commercial Vehicle Drive to Zero Program (CALSTART): <http://globaldrivetozero.org/>

Publication of Final Guidance on the Congestion Mitigation and Air Quality Improvement (CMAQ) Program (Federal Highway Administration): <https://www.govinfo.gov/content/pkg/FR-2008-10-20/pdf/E8-24704.pdf>

Congestion Mitigation and Air Quality Program Laws and Regulations (Federal Highway Administration): https://www.fhwa.dot.gov/environment/air_quality/cmaq/laws_and_regs/

Fixing America's Surface Transportation Act (Federal Highway Administration): <https://www.fhwa.dot.gov/fastact/>

Volkswagen Clean Air Act Civil Settlement (U.S. Environmental Protection Agency): <https://www.epa.gov/enforcement/volkswagen-clean-air-act-civil-settlement>

Amended Partial Consent Decree (U.S. Environmental Protection Agency): <https://www.epa.gov/sites/production/files/2016-10/documents/amended201partial-cd.pdf>

Volkswagen Settlement Beneficiary Mitigation Plan Toolkit (National Association of State Energy Officials): <https://www.naseo.org/Data/Sites/1/naseo-vw-beneficiary-mitigation-plan-toolkit-final.pdf>

California Climate Investments (California Air Resources Board): <https://ww2.arb.ca.gov/resources/documents/cci-investment-plan>

Alternative Fuels Data Center: Fleet Applications for Vehicles (U.S. Department of Energy): <https://afdc.energy.gov/vehicle-applications/>

Transitioning to Electrification: Funding Resources (Center for Climate and Energy Solutions): <https://www.c2es.org/document/transitioning-to-electrification-funding-resources/>

About CALSTART

CALSTART is a nonprofit organization working nationally and internationally with businesses and governments to develop clean, efficient transportation solutions. CALSTART is a network that connects companies and government agencies and helps them do their jobs better. From technology firms to transit operators and from vehicle manufacturers to research institutions, we connect every element of the clean energy sector, offering customized services, information and programming.

Drawing on more than 25 years of experience and expertise, CALSTART provides services and consulting to spur advanced transportation technologies, fuels, systems and the companies that make them. Our clients range from companies working on emerging technologies to transit agencies piloting potential clean-energy solutions. See our staff directory to find the expert you need.

CALSTART's 200+ member firms and agencies include manufacturers, suppliers, fleets, technology firms, academic institutions, government agencies, NGOs, power companies, fuel providers, banks and other businesses interested in the future of transportation.

