

City of Philadelphia

Electric Vehicle Policy Task Force

Policy Recommendations

March 8, 2018

CITY OF PHILADELPHIA

otis

MANAGING DIRECTOR'S
OFFICE OF TRANSPORTATION
& INFRASTRUCTURE SYSTEMS



March 8, 2018

To the President and Members of the Council of the City of Philadelphia:

RE: Electric Vehicle Policy Task Force Final Report

Over the past eight months, the City's Electric Vehicle Policy Task Force has worked collaboratively to produce consensus policy recommendations to promote electric vehicle (EV) use in Philadelphia. This report is the first step in laying the groundwork for informed discussions and future actions to decrease the use of fossil fuels in the transportation sector by making it easier for Philadelphia's residents, workers, and visitors to use electric vehicles.

The ongoing shift from petroleum to electricity for transportation is expected to accelerate. Thus, the Task Force has focused on the challenge of meeting demand for charging this growing pool of vehicles. It has endeavored to think about the charging challenge, while distinguishing it separate from parking challenges, which face drivers of all types of vehicles, particularly in some areas of the City.

Through the Task Force's work, it has become abundantly clear that a successful transition to EVs requires a comprehensive approach. Our experience with the EV parking space program demonstrated no single City action will by itself significantly increase EV use in Philadelphia. National trends are propelling market maturation, and throughout the process the Task Force was shown that City policies are one important piece that must be coordinated with larger trends to be most effective. Success requires action not only by the City, but also by private sector partners, public utilities, regional entities, local organizations, and Philadelphians at large.

Since EV technologies are dynamic, robust standards and best practices are truly just emerging. As EV opportunities expand, the City must remain flexible when responding to these changes in order to effectively incorporate EVs into Philadelphia's broader transportation vision. The purpose of the recommendations issued in this report is to foster EV use in the City, not to prescribe it.

Recognizing the dynamic nature of EV technology creates challenges for formulating robust policy, the Office of Transportation & Infrastructure Systems (oTIS) is committed to reexamining the Report's findings and recommendations to ensure they match future conditions. Therefore, in two years, oTIS will reexamine the assumptions, findings, and recommendations of this report; and document the reevaluation in a technical memo. Additionally, oTIS will report periodically on the implementation status of the recommendations issued by the Task Force. All of this information will be made publicly available.

Parallel to the Task Force's work, several City led efforts are already underway to encourage greater EV use. These efforts include:

- Establishing alternative curbside charging opportunities;
- Engaging and partnering with private entities and PECO to attract EV infrastructure investments;
- Actively seeking funding through grant opportunities such as Volkswagen Settlement Appendix D and the Alternative Fuels Incentive Grant program;
- Continued enforcement of the City's EV Ready building code, and
- Participating in statewide efforts to plan and implement strategies to increase access to electric transportation, such as Drive Electric PA.

We look forward to working with Philadelphia City Council and the Mayor's Office in our ongoing effort to encourage EV use in Philadelphia as part of the City's wider transportation network.

Respectfully,

A handwritten signature in black ink, appearing to read 'Michael A. Carroll', with a long horizontal flourish extending to the right.

Michael A. Carroll, P.E., Deputy Managing Director

cc:

Mayor James Kenney
Michael DiBerardinis, Managing Director

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Executive Summary

The Electric Vehicle Policy Task Force (the Task Force) was formed to develop an approach to encourage electric vehicles (EVs) as part of the City's wider multi-modal strategy that encourages transit, walking, and bicycling. EVs are progressively becoming more common in Philadelphia, but increased EV use raises many complex questions. Drawing from a broad and diverse range of stakeholders including EV owners, community representatives, and industry experts, the Task Force worked to ensure that all perspectives were heard and that realistic, workable policies for EVs in Philadelphia were recommended. This report addresses the current state of EV usage in Philadelphia and recommends potential actions the City and partners can take to encourage and accommodate increased EV use.

Led by the City of Philadelphia's Office of Transportation and Infrastructure Systems (oTIS) and Philadelphia City Council, the Task Force consists of representatives from multiple City and regional agencies and offices, private citizen electric vehicle owners, and representatives from Registered Community Organizations. The Task Force conducted its work through a series meetings and workshops which focused on reviewing existing conditions, identifying challenges and opportunities associated with EVs, consulting industry experts, and ultimately formulating policy recommendations.

In reviewing the recommendations that follow, the reader is advised to bear in mind that this is a consensus report. Task Force members worked collaboratively and iteratively to find common ground that would support the Task Force's objectives of promoting or accommodating EVs as part of the City's wider multi-modal strategy. More details on the Task Force Process are in Appendix II.

Recommendations

Strategy 1: Addressing the Existing Electric Vehicle Parking Space (EVPS) Program

- 1.1. Close the existing electric vehicle parking space (EVPS) program to new applications
- 1.2. Transition from the EVPS Program

Strategy 2: Electric Vehicle charging Infrastructure

- 2.1. Create more publicly available charging stations
- 2.2. Encourage EV charging installation in new and existing off-street parking facilities
- 2.3. Explore public-private partnership for an EV charger provider/operator
- 2.4. Explore DC fast charging pilots
- 2.5. Reduce barriers to introducing DC fast charging in Philadelphia
- 2.6. Promote and encourage charging at the workplace
- 2.7. Offer technical assistance for installing chargers
- 2.8. Seek funding opportunities to support EV use and adoption in Philadelphia
- 2.9. Encourage EV charging infrastructure in areas with compatible land uses

Strategy 3: Transit & Fleets

- 3.1. Continue to promote low-carbon transportation
- 3.2. Encourage EV fleet adoption

Strategy 4: Smart Infrastructure & Technology

- 4.1. Encourage innovation and experimentation
- 4.2. Encourage use of EVs in shared mobility
- 4.3. Explore the potential impact of E-Bikes

Strategy 5: Education & Awareness

- 5.1. Continue to develop and promote EV planning and educational resources
- 5.2. Create greater awareness of EVs

Task Force Guiding Values

The recommendations were guided by the following five values:

1

Opportunity & Access: Ensuring an efficient, accessible, and reliable transportation system

2

Safety: Working towards the City's Vision of Zero initiative and reducing traffic-related deaths to zero by 2030

3

Sustainability: Fulfilling the City's obligation to limit carbon dioxide emissions, which are a cause of climate change

4

Equity: Identifying equitable solutions developed on behalf of all Philadelphians

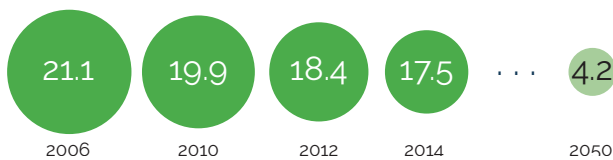
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Health: Making Philadelphia healthier by improving air quality and increasing active transportation

Introduction

Reducing Greenhouse Gas Emission 80 Percent by 2050

Citywide GHG Emissions (Millions of MTCO₂E)



Mayor Kenney has set a goal of reducing carbon emissions 80 percent by 2050. To meet this target, we must increase the pace of emissions reductions. Philadelphia is developing a [clean energy plan](#) to set interim goals and identify policies to meet this challenge.

PURPOSE AND FRAMEWORK

The City of Philadelphia has set a goal of reducing greenhouse gas (GHG) emissions 80 percent by 2050. Transportation is the second largest source of GHGs and air pollution in Philadelphia, and a major source of particulate pollutants. Automobiles are one of the most visible symbols of carbon dioxide emissions in America today, and while they are a secondary source of emissions in Philadelphia, the transportation sector still provides an opportunity to mitigate climate change locally. Shifting from

gasoline and diesel to low carbon transportation options, such as walking, bicycling, and public transit, in addition to lower-carbon transportation fuels like electricity, is key to achieving Philadelphia's climate action goals.

Philadelphia's overall approach to climate change is outlined in the City's sustainability plan, [Greenworks](#), and is supported by the City's comprehensive plan, [Philadelphia 2035](#). A key vision in both plans is the aim to ensure Philadelphians have access to safe, affordable, low-carbon transportation. This vision primarily promotes low carbon transportation such as walking, bicycling, and transit. EVs represent a component of mobility that supports the City's broader goals to reduce carbon emissions and ultimately improve air quality within the city and region.

The energy we use to charge our EVs matters as well. If EV users are recharging vehicles with electricity generated by burning coal or natural gas, the plants that provide that energy are still producing emissions outside of cities. In order to maximize the environmental benefits of EVs, they need to operate on clean electricity.

Philadelphia took its first step towards encouraging EV use in 2007. With the goal of decreasing barriers to electric vehicle usage, the City launched the EVPS program. The EVPS program provided for the designation of on-street electric vehicle parking and charging spaces to residents with available curbside parking who also installed private curbside charging stations.

Although the program was innovative at the time and successful in supporting early adopters, a lack of public charging infrastructure in the City still presents a major barrier to growth in Philadelphia's EV market. Charging infrastructure in Philadelphia suffers from fragmentation, which continues to make using an EV in the City challenging. To better assess and address the charging needs of EV owners, the City paused the EVPS program in April 2017 for one year, to develop an appropriate approach to encouraging electric vehicle use in Philadelphia. That is the mandate of the Task Force.

CURRENT TECHNOLOGY & INFRASTRUCTURE

Electric Vehicles, or EVs, are still a relatively new concept and may be unfamiliar to some. The next few sections of this report serve as an introduction to electric vehicles and will help answer questions you may have about EV technology, EV infrastructure, and how EVs are impacting Philadelphia.

An EV is any car or truck that gets some or all of the power it needs to move from electrical energy. A Plug-in Electric Vehicle (PEV), which is the focus of this report, can be plugged-in and recharged from an outlet or an external power source.

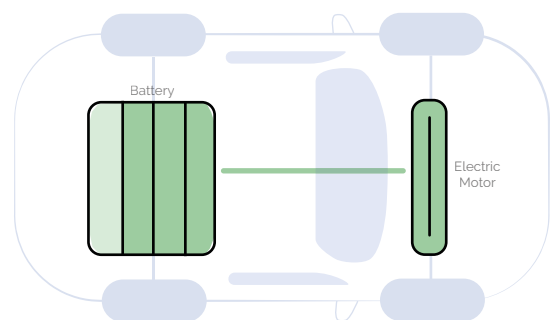
Electric Vehicle Technology

Various types of EVs are available to fit different driving requirements. There are two main types of PEVs: All Electric Vehicles, also known as Battery Electric Vehicles (BEVs), and Plug-in Hybrid Electric vehicles (PHEVs).

Different kinds of electric vehicles process power in different ways. BEVs are fully electric vehicles, meaning they are only powered by electricity and do not have a combustible engine, fuel tank, or exhaust pipe. PHEVs are powered by both gasoline and electricity. PHEVs can recharge the battery through both regenerative braking and 'plugging-in' to an external electrical charging outlet.

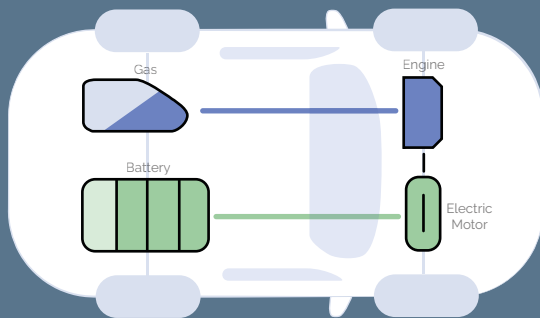
The car drivers choose often reflects the needs and preferences of the driver. BEVs are explained further below and PHEVs are explained further on page 7.

All Electric Vehicles or Battery Electric Vehicle (BEV)

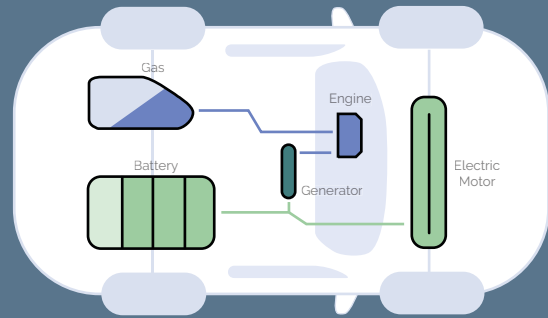


All-electric vehicles, also known as BEVs, rely solely on electric motors to make them go. Large batteries give them longer range. They need to be plugged into a power source to charge.

Plug-in Hybrid Electric Vehicle (PHEV)



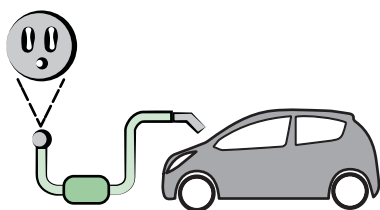
PHEVs can be powered by an internal combustion engine that can run on conventional or alternative fuel and an electric motor that uses energy stored in a battery. The vehicle can be plugged in to an electric power source to charge.



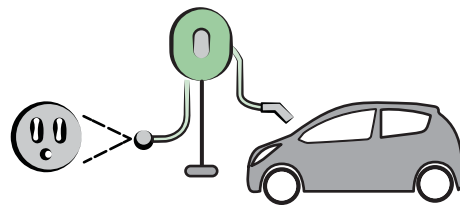
PHEVs can also be powered by an internal combustion engine (ICE) that runs on conventional or alternative fuel and an electric motor that uses energy stored in a battery. The battery is charged through regenerative braking and by the internal combustion engine. A plug can also be used to recharge the battery.

Electric Vehicle Charging Technology

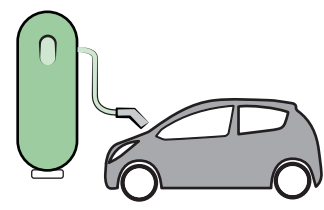
There are three standard types of charging: level 1, level 2, and DC Fast Charging. The available methods of EV charging come down to charging speed, which impacts the number of vehicles a particular charger can serve. Level 1 is the slowest form of charging and DC Fast Charging is the fastest. The different types of EV charging, including their charging times, are summarized below. For reference, gasoline adds about 250 miles of range per minute.

**Level 1 Charger**

- 120V / 1400W - plugs into the wall
- Full charge: 10 to 20 hours
- For home and workplace mostly

**Level 2 Charger**

- 240V / 7700W - like an electric stove with all burners and oven on
- Full charge: 4 to 8 hours
- For home, workplace, and public settings

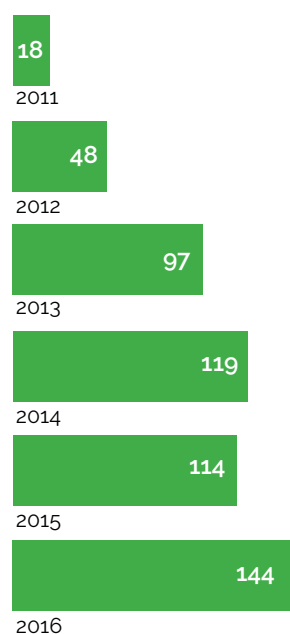
**DC Fast Charger**

- 480+V / 50,000 to 120,000W or more
- Full charge: 1/2 hour
- Not for home use, public charging only

Electric Vehicle Sales and Growth

The U.S. electric vehicle market has grown significantly in recent years. Twenty-nine electric vehicle models were offered in 2016 compared to only two models in 2011. Growth has been helped by a combination of federal and state consumer incentives and investments, zero-emission vehicle regulations, and a series of state and local city promotional activities. More than 2 million plug-in electric vehicles (PEVs) are on the road globally, more than 500,000 in the United States alone. Despite the rapid growth, penetration of the American automotive market remains slow and lags compared to other countries. EV sales represent just over 1.07% of all vehicle sales in the US. Although the market share has increased in recent years, the EV market is still evolving and not yet close to maturity.

U.S. Plug-in Electric Vehicle Sales by Year Thousand Vehicles



www.afdc.energy.gov/data/

To serve the early growth, much of the initial investment in charging infrastructure in the United States came from the American Recovery and Reinvestment Act of 2009, which provided federal funding through the EV Project and the U.S. Department of Transportation's Transportation Investment Generating Economic Recovery program, among many infrastructure projects in the United States from 2010 to 2013. By the end of 2014, there were about 18,000 public level 2 and DC fast electric chargers in the United States. Since then, charging infrastructure has been deployed with funding and authority from different federal, state, and local agencies and increased to more than 27,000 chargers through 2015. The supply increased to 36,000 chargers through 2016. Nearly all of these government-funded stations are operated by private networks.

BARRIERS TO USE AND ADOPTION

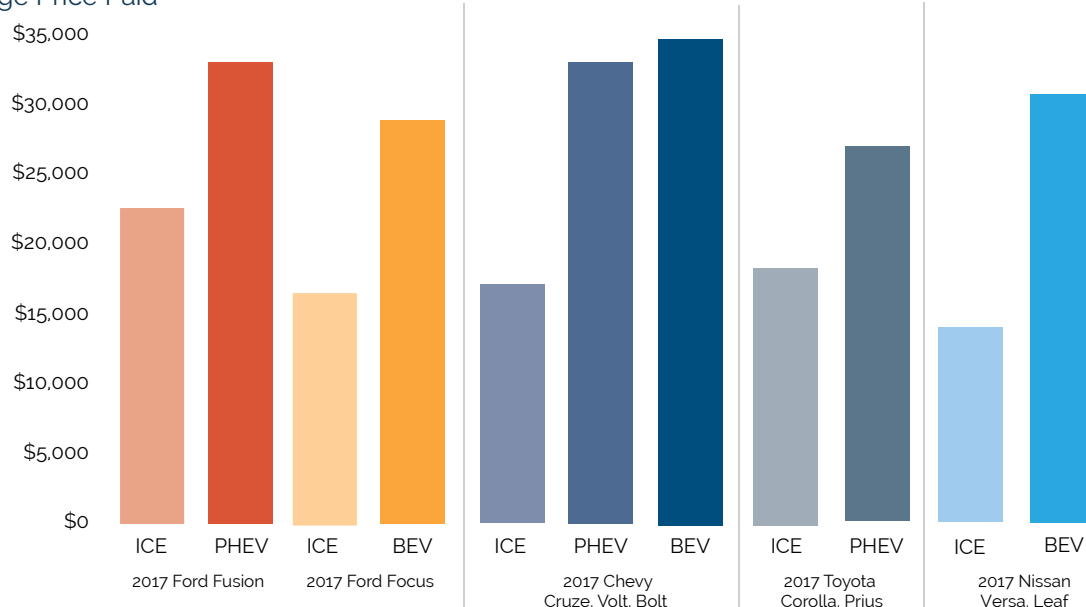
Despite growth in product development and sales, EVs are still at an early stage of development and barriers to widespread adoption persist. Research and findings gathered by the Task Force show that cost, convenience, and general consumer awareness related to EVs act as barriers to greater EV use. These barriers are explained in greater detail below.

Initial Cost

Affordability is a major barrier to EV adoption. Although EVs tend to have very low operating costs, the upfront cost of purchasing an EV is substantially higher than that of a non-electric vehicle. For instance, the MSRP of the Nissan Leaf is \$30,680, which is significantly higher than that of its conventional counterpart: the 2017 Nissan Sentra (\$16,990) and Altima (\$22,500). EVs also tend to be thought of as luxury cars such as the Tesla S (\$71,000) and the Tesla X (\$85,000).

Sample EVs Purchase Price in Comparison to Internal Combustion Engine (ICE) vehicles, Plug-in Hybrid Vehicles (PHEV), and Battery Electric Vehicles (BEV)

Average Price Paid*



*Price estimates based on U.S. News & World Report Vehicle Comparison (<https://cars.usnews.com/cars-trucks/compare>)

Additionally, a large portion of the costs associated with fueling EVs are upfront with the installation of charging infrastructure. This contributes to increased front end costs of buying an electric vehicle compared to a gas-powered vehicle. The initial cost can be reduced through EV tax credits. However, to claim the full \$7,500 federal credit, annual gross income needs to approach \$80,000. For comparison, most Philadelphians earn around \$36,000 annually. These upfront costs price out a vast majority of residents in Philadelphia, where the cost of an electric vehicle can often exceed an individual's or household's annual gross income.

With increased production volumes, emerging used vehicle markets, leasing opportunities, and battery cost reductions, EVs are projected to approach cost-competitiveness with conventional vehicles, which will make EV adoption more feasible for moderate and low-income families. In the short term, however, EVs are likely out of reach for most Philadelphians. Given Philadelphia's demographics, the affordability

of EVs makes widespread adoption challenging and raises questions as to whether EVs are the most equitable solution today to encouraging low-carbon transportation.

Convenience

Despite improvements to EVs entering the market, charging infrastructure for those who cannot charge at home suffers from fragmentation, inconsistent data on availability and location, and a lack of consistent standards for payment in most markets. Having reliable access to charging is a key factor in encouraging EV use. In many places, particularly dense cities, finding reliable EV charging infrastructure can be challenging.

One of the most pressing questions is how to address multi-unit dwellings and rowhouses in dense urban settings where residents frequently do not have dedicated parking spots and instead park on the street. Many residents cannot access a dedicated residential charger where charging is most convenient.



Perhaps one of the largest barriers to adoption is that most people simply do not consider EVs when they are buying a new vehicle.

Public charging equipment can also vary significantly. Open standards for vehicle-charger communication and payment may mitigate some of these issues by enabling interoperability between charging networks, increasing innovation and competition, and reducing costs to drivers. However, there are currently no interoperability standards in place.

Economics

There are also significant financial barriers to implementing cost-effective EV charging models in and around Philadelphia. The limitations of selling electricity from EV charging stations are clear: if electricity costs approach the costs of gasoline, EVs may become less financially attractive to use. The placement of high powered DC Fast chargers or clusters of level 2 chargers may also impose utility demand charges on the facility where they are located and may be a discouraging factor in the decision to install faster EV chargers.

Mindset and Awareness

Perhaps one of the largest barriers to adoption is that most people simply do not consider EVs when they are shopping for a new vehicle. EVs challenge cultural norms about how we travel using cars. Fueling is embedded in our built environment and the expectations that come with operating a non-electric vehicle are clear. EVs are still relatively uncommon and most people have never ridden in an EV, contributing to the fact that purchasing an EV is not even considered. As EVs become more prevalent, greater awareness and use will likely result in greater demand.

BEST PRACTICES IN OTHER CITIES

Since the introduction of modern EVs, many cities have begun promoting electric vehicle infrastructure to accommodate the charging needs of EV users. Some programs and strategies for EV charging found in other cities are described below.



Portland, OR

Portland has moved to encourage other modes of transit before providing incentives for any type of private automobile. Portland has a transportation hierarchy that informs all of its transportation planning decisions:

1. Walking
2. Biking
3. Transit
4. Shared vehicles
5. Electric vehicles, but only when private automobiles are absolutely necessary

While Portland does not promote EV curbside charging in front of private residences, they have thought about how to encourage EV purchases by those unwilling to forgo private automobiles. To do this, the City crafted the 2017 City of Portland

Electric Vehicle Strategy. The main component of the Portland's strategy is to build off their Electric Avenue charging hub model. Electric Avenue is a charging hub (or pod) owned and operated by the electric utility. Electric Avenue has two level 2 chargers and four DC fast chargers.

Portland is looking to expand this charging hub model. In general, they are not encouraging these hubs within a 3-mile radius of the City's core. More specifically, they mapped the following six criteria to determine the best places for these chargers:

1. Fewer existing charging stations
2. Less access to public transit and bike routes
3. Higher number of multifamily and garage free residences (with much more emphasis on multifamily)
4. Higher access for low-income residents and people of color
5. More large businesses with employees commuting long distances
6. Areas with more vehicle miles traveled (VMT)

Portland has shared this map with its local utilities and other partners interested in building charging hubs. The City is encouraging hubs to be located in areas with at least 4 of the 6 listed priority criteria. The City does not intend to purchase, own, or operate any of these hubs.



New York City

In September 2017, New York City announced they would develop fast charging hubs in every borough in 2018 as part of a new commitment and partnership with Con Edison to develop 50 fast charging hubs citywide by 2020. The broader objective is to help spur adoption of EVs by New Yorkers, with a goal of 20% of new car registrations to be EVs by 2025. The City will invest \$10 million to develop fast charging hubs with up to 20 chargers per site. These hubs would have the capacity to charge more than 12,000 EVs every week.

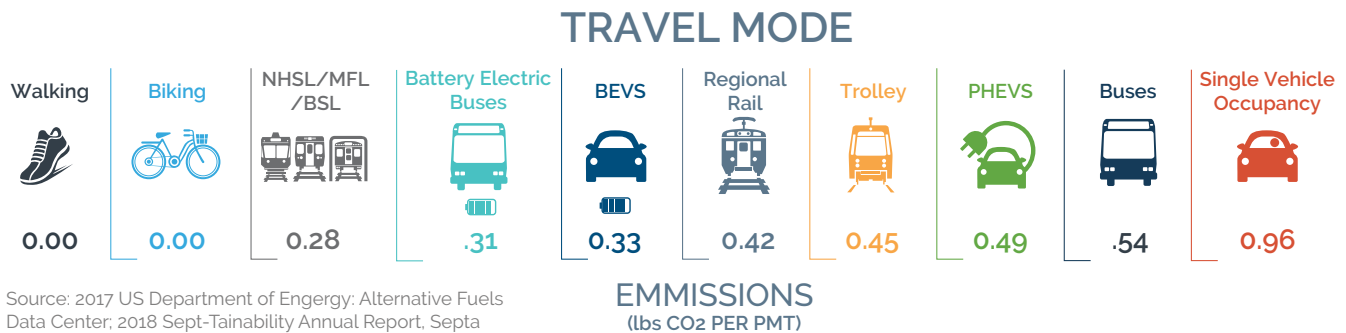


Amsterdam Electric Vehicle Charging Model

The City of Amsterdam has rolled out a public charging network that is available through a uniform payment system. Their network has over 2,000 level 2 chargers, nearly 10,000 individual users, and approximately 30,000 charging sessions each month. Parking at the public charging stations in Amsterdam is exclusively for EVs. EVs parked at a charging station must be connected to the charger. Cars that are not connected can be towed away or fined. This applies to both permit holders and those without permits.

The City also works with Amsterdam University to facilitate a more efficient and effective deployment of EV charging infrastructure. The municipality has invested in the construction of this public charging network with the idea that investment will be paid back over time. A charger operator can generate revenue with the sale of the power to the EV driver. However, the costs of the charger point, including installation, connection, and operation, are still too high in relation to the revenues from electricity sales. Using data analysis, Amsterdam, in collaboration with the university, is investigating the optimal conditions for a better business model.

Emissions per Passenger Mile by Mode



CURRENT STATE OF EVS AND EV INFRASTRUCTURE IN PHILADELPHIA

Public Transit

Encouraging EV use is essential to helping the City shift from gasoline and diesel to low carbon transportation. However, focusing exclusively on EVs ignores a key element when considering approaches to reducing carbon emissions - existing electric public transit infrastructure that already helps reduce the carbon footprint of transportation users. Although EVs will play an increasingly important role in helping the City shift from gasoline and diesel to low carbon transportation, Philadelphia is already well-positioned to mitigate climate change through its existing transit system, much of which is powered by electricity. The City and the surrounding region feature a robust electric transit network and promoting greater use of the larger transit system is key to reducing carbon emissions.

Public transit helps limit carbon emissions primarily through shifting from cars to transit and providing congestion relief, in addition to efficient land use & development. By reducing the number of single-occupancy vehicles on the road and shifting away from single-occupancy vehicular trips, public transit eliminates incremental emissions that would otherwise be produced. By reducing the number of cars on the streets, public transit also significantly reduces traffic congestion. As high-congestion conditions typically increase idling and decrease cars' fuel efficiency, public transit helps to reduce carbon emissions by decreasing traffic. Moreover, transit supports more efficient land use patterns and reduces individual carbon footprints while preserving and enhancing mobility.

Public transit in Philadelphia already reduces energy consumption and carbon emissions. Therefore, it is essential that we encourage EV use within the larger context of the City's multi-modal transportation network. While light-duty vehicles -- whether privately owned, shared, or autonomous -- will remain an important component of Philadelphia's transportation system, public transit will play a vital role in making Philadelphia more sustainable.

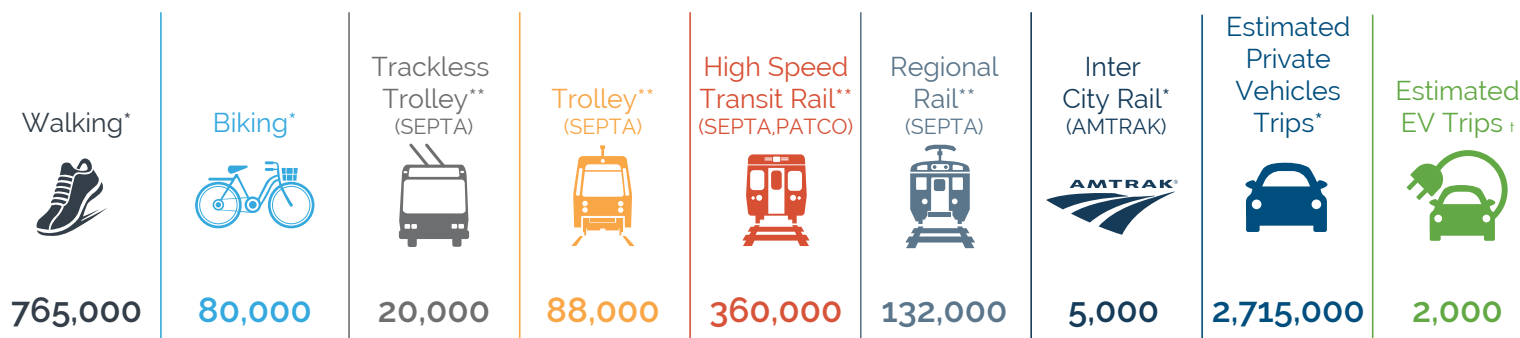


SEPTA has taken substantial steps to reduce its carbon footprint through its purchase of electricity and use of fuel, in addition to expanding its hybrid bus fleet and adding electric buses. Over the next five years, 525 hybrids will be added to SEPTA's existing hybrid fleet of over 700. By 2020, hybrids will represent 95% of SEPTA's bus fleet. In 2018, SEPTA will also pilot 25 battery electric buses running on two routes in South Philadelphia.

Electric Transportation in Philadelphia

- The region is served by twenty-eight transit routes that depend on electric propulsion. These routes include trolleys, high speed rail, regional rail, and intercity rail and are operated by SEPTA, PATCO, and Amtrak.
- Combined, electric public transit generates an estimated average of approximately 600,00 trips every weekday in the region.
- EVs are estimated to account for an average of 2,000 trips on weekdays in the Philadelphia.

TRAVEL MODE



ESTIMATED AVERAGE WEEKDAY TRIPS

Sources:

* 2012 DVRPC Household Travel Survey - Trips starting or ending in Philadelphia made by Philadelphia residents

** 2017 SEPTA Annual Ridership Report

† EV Trips inferred based on Total registered EVs multiplied by average person trip rates (DVRPC HH Travel Survey)

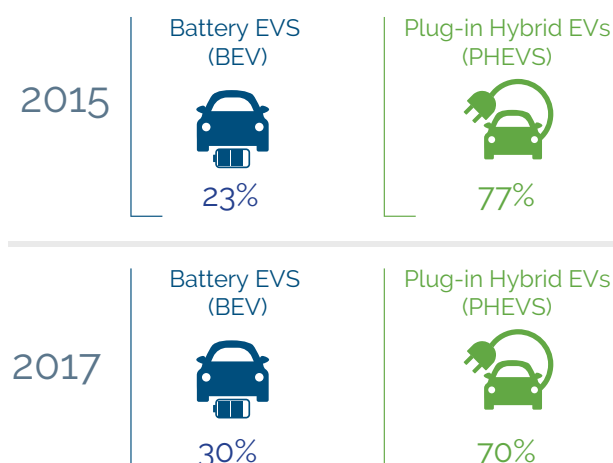
EV Trends in Philadelphia

As of November 2017, there were approximately 750,000 vehicles registered in Philadelphia and 2.9 million vehicles registered in Southeastern Pennsylvania, including Philadelphia. PEVs account for .10% of all registered vehicles in Philadelphia. For the entire Southeastern Pennsylvania region, including Philadelphia, PEVs account for .27% of all registered vehicles. Trends indicate BEVs are increasing in popularity compared to PHEVs. In 2015, 23% of all EVs in Philadelphia were BEVs. Now, almost one third of all EVs are BEVs.

Total Registered Plug-in Electric Vehicles by Year

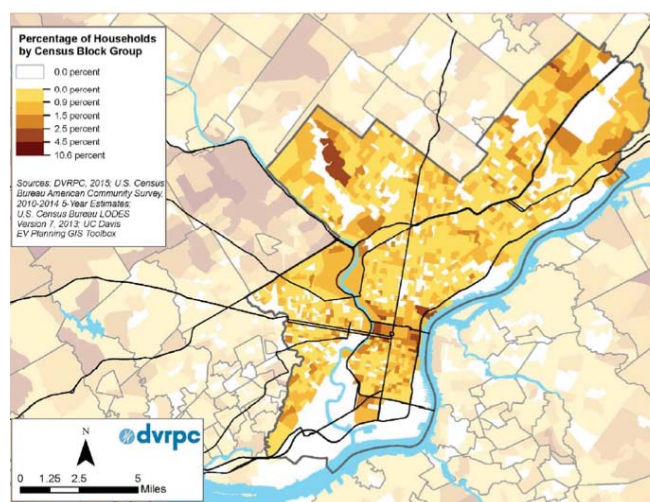
	2012	2015	2017
Total PEVs in Philadelphia	7	314	733
BEVs	0	73	220
PHEVs	7	241	513
Total PEVs in Southeastern PA	146	2,236	7,923
BEVs	26	790	3,059
PHEVs	120	1,446	4,864
Philadelphia Share of Total EVs	5%	12%	8%

Breakdown of EV Type in Philadelphia



Source: DVRPC; Pennsylvania Department of Motor Vehicles (preliminary). Estimates are based on known 2015 electric vehicle model types. This data may omit new or unknown electric vehicle model types.

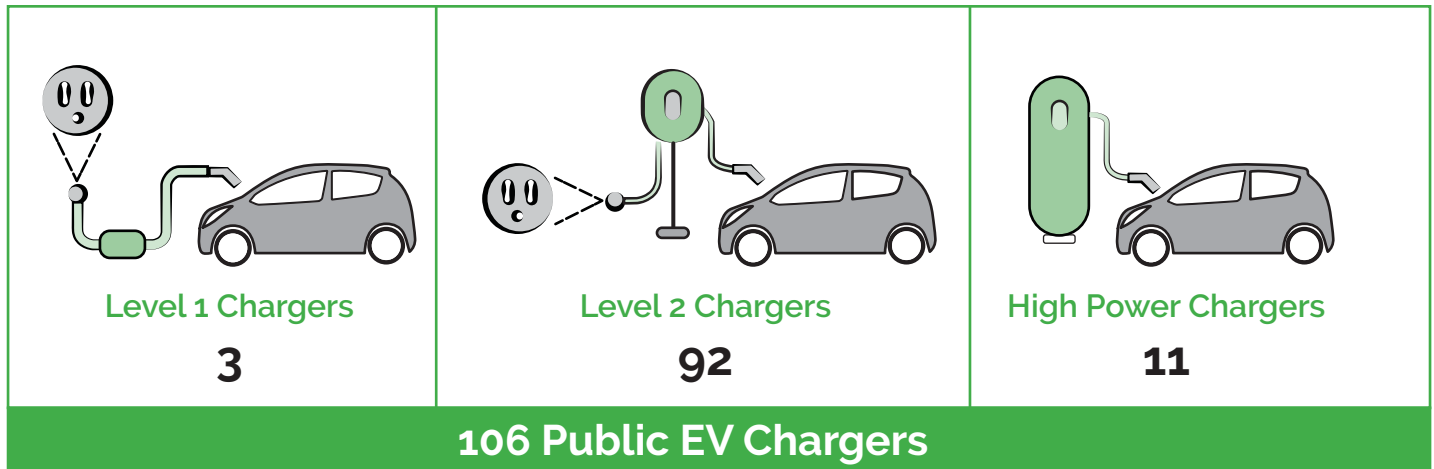
Although there is uncertainty on how EV use will vary across the City, the Delaware Valley Regional Planning Commission (DVRPC) identified areas in Philadelphia with the highest potential for EV ownership (see map below). Income, hybrid vehicle ownership, homeownership, dwelling type, and education were identified as key characteristics to determine potential EV demand.



Existing EV Charging Infrastructure in Philadelphia

Charging for EVs in Philadelphia primarily occurs at private residences and private parking facilities. According to the US Department of Energy's Alternative Fueling Station Locator, over 100 public EV charging stations are located in Philadelphia. The majority of EV charging stations are level 2 stations and are located in Center City.

Public EV Chargers in Philadelphia

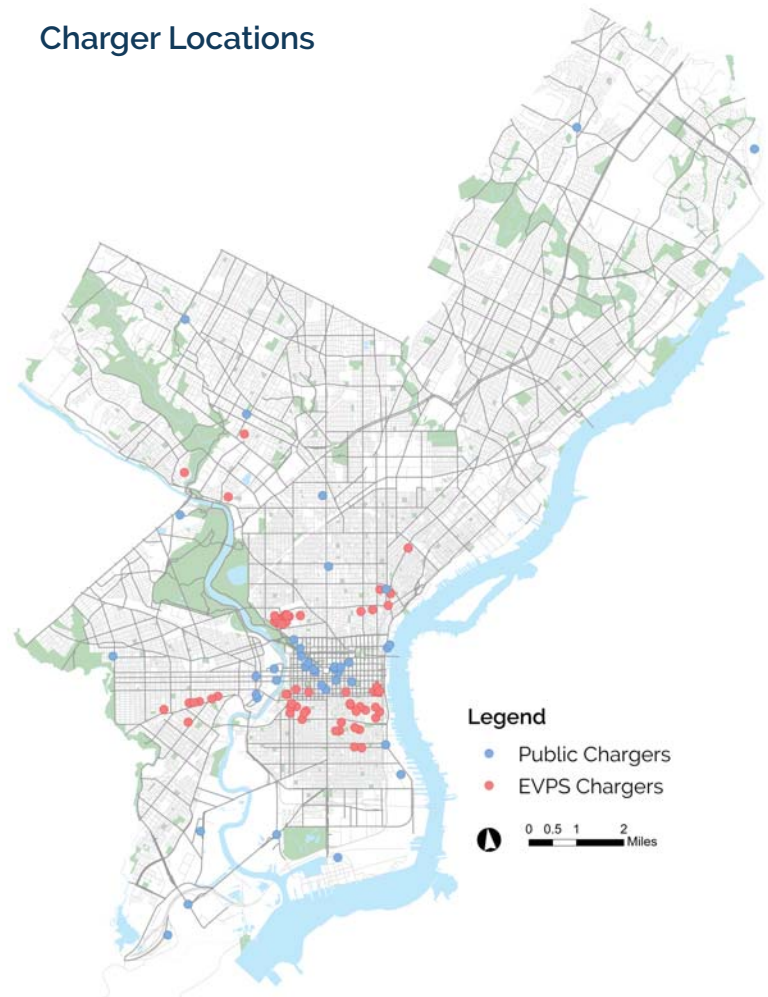


Source: 2017 US Department of Energy: Alternative Fuels Data Center

Charging for EVs in Philadelphia also frequently occurs on the street through the Electric Vehicle Parking Space program (EVPS). Established in 2007, the EVPS program sought to reduce barriers to using EVs in Philadelphia. The program originally provided on-street parking that was exclusively available to EVs. To obtain an EVPS permit, residents submitted an application to Philadelphia Parking Authority (PPA). Following approval by PPA, applicants were required to apply electrical permitting and pay a one-time installation fee and yearly renewal fee. The annual fees cover program administrative costs.

The program was successful in encouraging EV use in the City and was convenient for EVPS permit holders. It also proved to be effective in encouraging early adoption, reducing range anxiety, and creating greater awareness of EVs. Currently, 68 EVPS stations are serving EV users across the City. Most stations are located in the City's densest neighborhoods such as Society Hill, Bella Vista, Queen Village, and Fairmount.

Charger Locations



Source: 2017 US Department of Energy: Alternative Fuels Data Center; 2018 Philadelphia Parking Authority

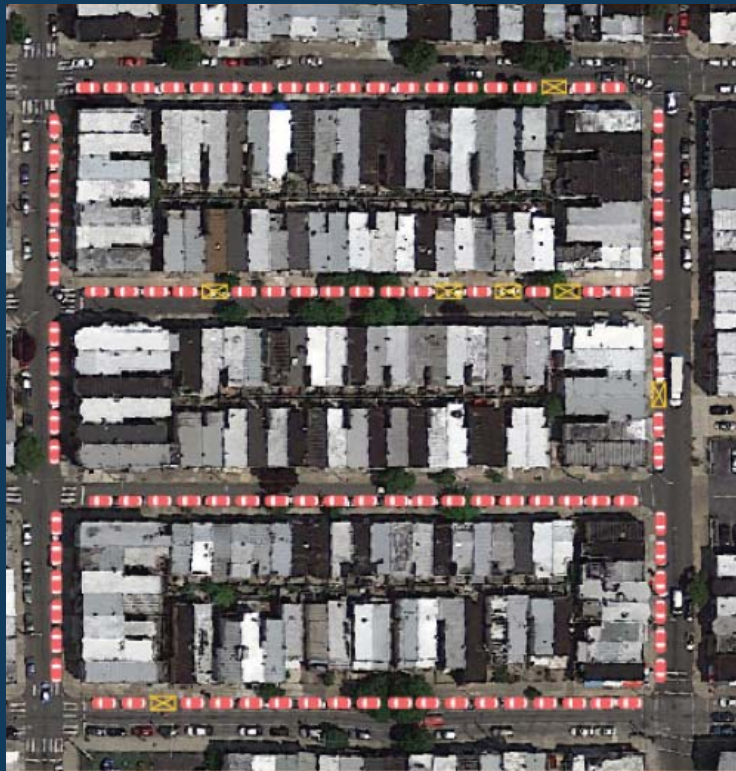
Despite the program's innovative approach and initial success, evolving technology and changing needs have created new challenges and opportunities. While the program remains useful to a number of residents, the EVPS does not effectively accommodate the growing EV charging needs of the City, and it has faced numerous challenges, including:

Limited effectiveness

The EVPS program has generated greater awareness of EVs and addressed the individual charging needs of a number of residents. However, overall EV readiness in Philadelphia still lags behind other cities. There are currently 360 EVs registered in Philadelphia and around 100 publicly accessible charging stations, compared to other cities such as Seattle (401 chargers), Los Angeles (1,456 chargers), and San Francisco (605 chargers). To encourage greater EV use, Philadelphia must develop a more effective approach to meeting the charging needs of EV users.

Public accessibility

Although EVPS parking spaces are publicly accessible to all EVs, charging stations are primarily built for personal use and are rarely accessible to the public. EVPS permit holders are responsible for purchasing and installing charging stations, and charging equipment can vary significantly. The permit holder also controls the electricity for their charging station. Charging stations are primarily available to the EVPS permit holder due to low vehicle turnover, limited interoperability, and uncertainty regarding electrical use and access.



Typical Block, East Passyunk

Homes

147

Businesses

4

Car ownership rate

62%

Cars per household

0.795

of cars

116

of spots

110

of spots without
impediments

103

Parking spots with impediments include fire hydrants, disabled parking, driveways, etc.

This block has 13 more cars
than parking spots

Scalability and long-term sustainability

The EVPS program is not scalable or sustainable in the long-term. Many of Philadelphia's neighborhoods face significant parking constraints where demand for parking exceeds the supply of on-street parking. The existing program allows no more than two EVPS permits on the largest City blocks. On smaller blocks, only one EVPS permit is allowed. As EV use grows, offering exclusive access to EV parking spaces and charging stations under the current model will become increasingly difficult. Even if the City increased the number of EVPS permits allowed per block, ensuring charging stations are reliably available to the public would be challenging, especially given the limited public accessibility of most EVPS charging stations. A visual snapshot demonstrating the challenges regarding scalability and long-term sustainability is provided to the side..

Access to curbside street parking

The EVPS program is primarily oriented to homeowners with curbside street parking in front of their residences. Encroachment on the frontage of any neighboring property requires written consent from all properties. This applies to parking spaces that encroach on neighboring properties or to residents without curbside parking in front of their residence. If a resident cannot gain consent from neighboring properties, they will not be able to install a charging station.

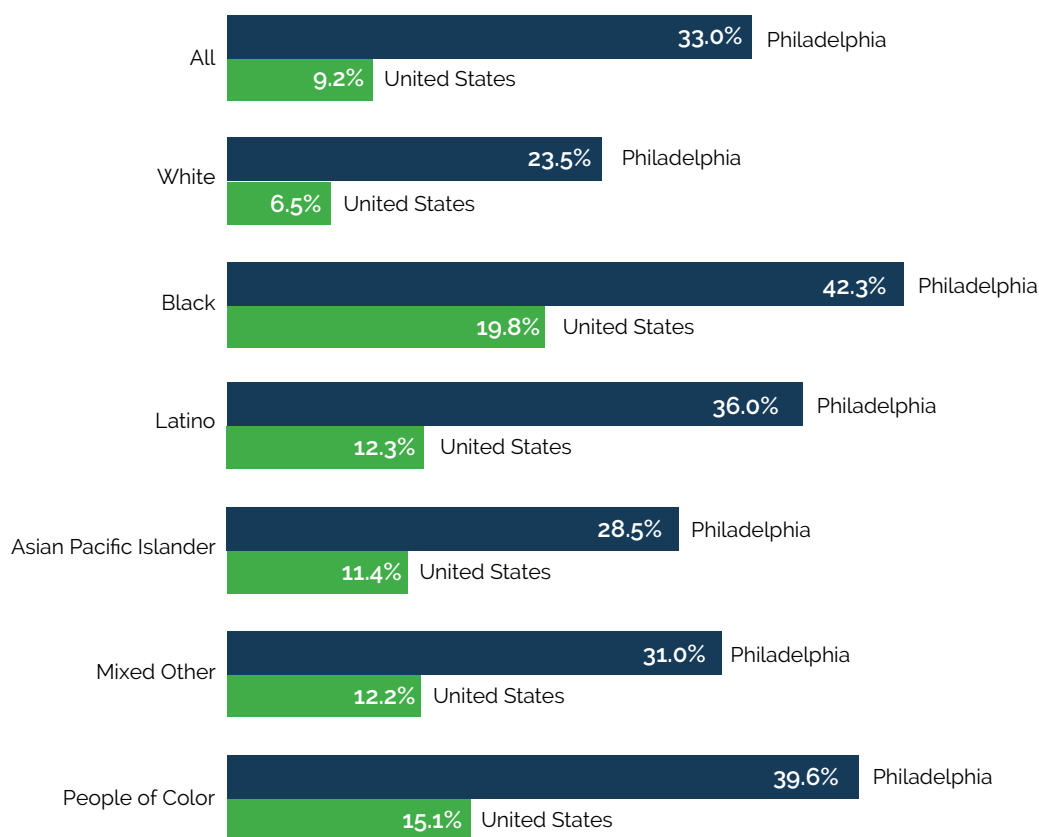
While the EVPS program provides utility to a number of EV users in the City and has benefited early adopters, this model is not an adequate long-term solution to addressing charging needs and encouraging EV growth in Philadelphia while also balancing the needs of non-electric vehicle owners.

SOCIAL EQUITY IMPACTS

The City is committed to creating and supporting mobility solutions that are equitable and empowering to all Philadelphians. In Philadelphia - low-income residents, particularly low-income residents of color - live in neighborhoods with poor air quality, have longer commutes, spend a higher proportion of their income on transportation costs, and are much more likely to rely on public transportation. Although EVs provide environmental benefits such as improved air quality and greater vehicle efficiency, they do not currently offer practical mobility solutions to Philadelphia's low-income residents. For the one out of four residents who live in poverty, EVs are simply out of reach.













And while the cost of purchasing an EV is expected to decrease in the near future, even purchasing a conventional vehicle is not economically viable for many Philadelphians. Over 33% of all households in Philadelphia do not own a car.

Percent of households without a vehicle: United States vs Philadelphia, 2014



National Equity Atlas, www.nationalequityatlas.org

Characteristics of Vehicle Owners Compared to Philadelphia Residents

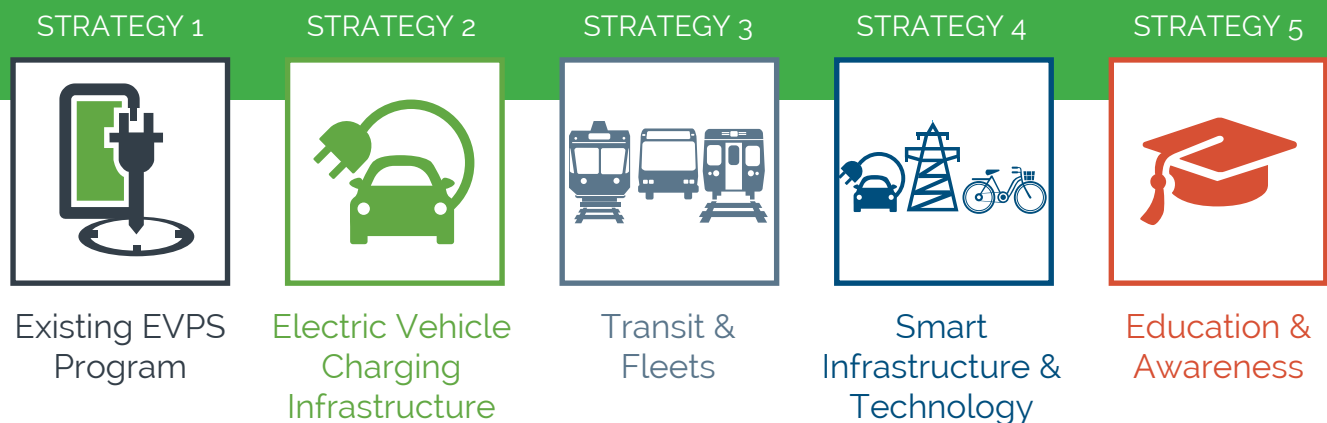
NATIONWIDE			PHILADELPHIA
<p>BEV Buyer</p> <p> 77%</p> <p>male</p> <p> 81%</p> <p>married</p> <p> 86%</p> <p>college graduate</p> <p>\$148,158</p> <p>household income</p> <p>48</p> <p>median age</p> <p>3,556</p> <p># of respondents</p>	<p>PHEV Buyer</p> <p> 70%</p> <p>male</p> <p> 78%</p> <p>married</p> <p> 77%</p> <p>college graduate</p> <p>\$127,696</p> <p>household income</p> <p>52</p> <p>median age</p> <p>1,000</p> <p># of respondents</p>	<p>ICE - Vehicle Buyer</p> <p> 60%</p> <p>male</p> <p> 66%</p> <p>married</p> <p> 59%</p> <p>college graduate</p> <p>\$83,166</p> <p>household income</p> <p>52</p> <p>median age</p> <p>186,662</p> <p># of respondents</p>	<p>Residents</p> <p> 47%</p> <p>male</p> <p> 30%</p> <p>married</p> <p> 26%</p> <p>college graduate</p> <p>\$39,770</p> <p>household income</p> <p>34</p> <p>median age</p>

Note: BEV, battery electric vehicle; ICE, internal combustion engine or non electric vehicle; PHEV, plug-in hybrid electric vehicle
Data on race was not available.

Source: 2016 ACS; Strategic Vision New Vehicle Experience Study of Vehicle Registrants, October 2013-June 2014

Future policies should ensure opportunities for EV use exist across Philadelphia's diverse population. More must be done to encourage EV use across all of Philadelphia while recognizing barriers that inherently inhibit EV use such as cost. Investing in electric vehicle infrastructure is important to improving air quality and helping the City shift away from gasoline and diesel fuel. However, the City must not lose sight of supporting affordable low carbon transportation options, such as walking, biking, and public transit.

Recommendations

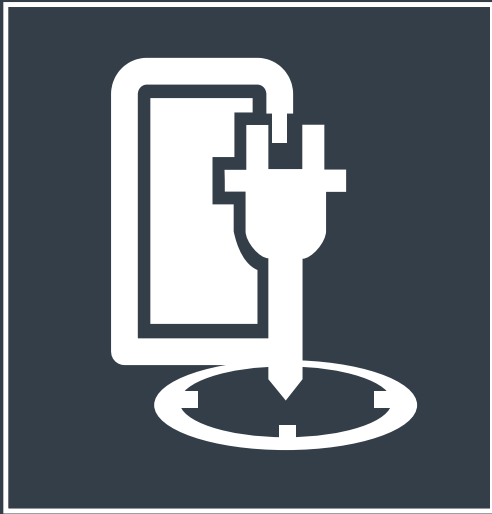


Philadelphia must adopt several policies working in tandem if it is to significantly increase EV adoption rates. Cities that have succeeded in doing so have deployed a multifaceted approach that address the barriers of cost, convenience, and awareness. Recommended policies and actions are explored in the following sections.

Public Participation

The Electric Vehicle Policy Task Force held a public meeting on January 26, 2018 at the Municipal Services Building to present ideas, propose recommendations, and receive feedback from the community. Digital outreach was also offered to the community through an online survey.

The public meeting was open to all interested community members and attracted over 30 people. The online survey was open from January 17, 2018 to February 16, 2018 and received over 50 responses. Thirty-nine comments were provided through the survey. Respondents included residents, EV owners, private industry organizations, public entities, and non-profit organizations. A summary with of public feedback and all comments can be viewed [here](#).



Strategy 1: Existing EVPS Program

1.1. Close the existing Electric Vehicle Parking Space (EVPS) program to new applications

The City should close the existing EVPS program to new applicants. While the EVPS program provides utility to a number of EV users in the City and has benefited early adopters, this model is not an adequate long-term solution to addressing charging needs and encouraging EV growth in Philadelphia while also balancing the needs of non-electric vehicle owners. The EVPS program is not reliably accessible to the public, it is not scalable, it does not meet the needs of EV owners without access to curbside parking, and it has had limited effectiveness in encouraging more EV use.

1.2. Transition from the EVPS Program

The City should transition from the existing EVPS program and affiliated preferential parking through property turnover and a fifteen-year sunset provision. If the EVPS permit holder ceases to reside at the address for which the EVPS was established, the EVPS permit will be discontinued and the owner of the EV charger will be responsible for removing the EVC from the public right-of-way. After fifteen years (2033), no EVPS permits will be renewed and any remaining EVPS signage will be removed. To accommodate EV users, the City is currently writing rules to implement the existing law allowing curbside charging in the public right of way.

Transition from the existing EVPS program
by providing alternative curbside charging
opportunities



Strategy 2: Electric Vehicle Charging Infrastructure

2.1. Create more publicly available charging stations

Future efforts should explore programs and policies that address the charging needs of EV users in the City. Without the EVPS program, residents who currently park on the street cannot reliably recharge their car. To fill this gap, the City should proactively seek solutions that address the charging needs of residents who lack access to residential charging.

2.2. Encourage EV charging installation in new and existing off-street parking facilities

The City should partner with community and private industry stakeholders to develop stronger EV-ready codes and strategies for retrofitting existing buildings and facilities with EV chargers. The City should also continue enforcing the existing EV-ready construction requirement for new buildings that contain residential parking.

2.3. Explore public-private partnerships for an EV charger provider/operator

The City should consider the financial feasibility of, and explore opportunities for a concession agreement to allow an EV charging solution company or companies to develop and build out a public charging network throughout the City.

The concessionaire would be responsible for installing, operating, and maintaining charging infrastructure. Installation would be demand-driven with parameters that conform to the City's broader transportation goals. The City would guide/oversee site selection and access to charging would be available through payment. This should start as a pilot program.

2.4. Explore DC fast charging pilots

The City should explore the potential for installing DC fast charging stations as part of a pilot project and promote financial partnerships with site hosts. One potential model is Electric Avenue (Portland), where a charging hub is owned and operated by a private partner and offers curbside charging stations to EV users.

2.5. Reduce barriers to introducing DC fast charging in Philadelphia

DC fast charging can significantly reduce charging times and improve convenience. However, DC fast charging requires substantial investment to interconnect stations to the utility distribution grid. Additionally, DC fast charging will likely have low utilization factors in the early years after installation and high peak demand

profiles, creating challenging economics. The City should collaborate with private industry partners and explore opportunities to reduce these barriers.

2.6. Promote and encourage charging at the workplace

Explore and promote programs and incentives that encourage charging while at work without discouraging the use of transit, walking, and cycling. Workplace charging can serve as the primary charging opportunity for drivers without a dedicated home charging station, allowing increased flexibility for drivers who commute with their EVs. An electric vehicle owner who lives in housing without an overnight charging option could be especially interested in workplace charging. Efforts to expand workplace charging capacity should focus on retrofitting existing parking supply, rather than net new supply, to avoid inducing additional vehicle miles traveled and roadway congestion, particularly in the downtown core.

2.7. Offer technical assistance for installing chargers

The City should work to develop EV charging outreach, educational materials, and programs targeted to workplaces, builders, and architects to encourage EV charging infrastructure, installations, and investment.

2.8. Seek funding opportunities to support EV use and adoption in Philadelphia

More specifically, the City should pursue and advocate for funding made available through the VW Settlement from both the State Environmental Mitigation Trust and the Zero Emission Vehicle (ZEV) commitment in addition to partnering with private EV technology companies.

2.9. Encourage EV infrastructure in areas with compatible land uses

To ensure convenience for EV users and to support Philadelphia's distinct urban character, EV charging stations should be located in areas that are conducive to vehicular traffic and compatible with the City's comprehensive plan.

The City should Explore public-private
partnerships with EV infrastructure
providers/operators



Strategy 3: Transit & Fleets

3.1 Continue to promote low-carbon transportation

The City should encourage greater use of Philadelphia's robust network of existing low-carbon transportation options. Philadelphia is already served by a wide array of high-capacity/low-emissions transportation options (SEPTA, PATCO, NJ Transit, Amtrak, Indego) in addition to strong pedestrian and bicycle networks. These modes also feature other benefits such as greater safety and affordability, reduced congestion, and increased physical activity.

3.2 Encourage EV fleet adoption

The City should explore "electric first" guidelines directing City departments to purchase EVs when their usage is compatible with available electric light-duty vehicles and the long-term benefits of purchasing EVs justify the initial costs. The City should also encourage private and public entities within Philadelphia to purchase EVs.

The City should continue to promote
low-carbon transportation options



Strategy 4: **Smart Infrastructure & Technology**

4.1 Encourage innovation and experimentation

The City should develop a flexible policy framework that encourages innovation and experimentation. EVs and charging infrastructure are changing quickly, resulting in challenges that go beyond responding to the growth in charging needs. Policies adopted by the City should reflect the continuous change that is inherent to EV technology. Meeting the needs of EVs will be an ongoing process.

4.2 Encourage integration of EV technology in shared mobility

The City should pursue policies that encourage taxi, car-share, and for-hire car services to use EVs.

4.3 Explore the potential impact of E-Bikes

The City should explore best practices and trends in electric bikes (e-bikes) and evaluate the impact of e-bike use in the City.

The City should develop a flexible
policy framework that encourages
innovation & experimentation



Strategy 5: **Education & Awareness**

5.1 Continue to develop and promote EV planning and educational resources

Numerous plans and resources have already been developed by partner organizations, including DVRPC's 2012 report, [*Ready to Roll – Southeastern PA's Regional EV Action Plan*](#). The City should build upon this foundation and develop resources to provide to residents and businesses to promote electric transportation.

5.2 Create greater awareness of EVs

The City should participate in EV Showcase and Ride & Drive events and activities while also promoting other low-carbon transportation options to create greater awareness of EVs.

The City should participate in EV Showcase and Ride & Drive events and activities to create more awareness

Implementation

This report makes eighteen recommendations that represent near-term, mid-term, and long-term opportunities to expand EV use in Philadelphia. Implementation of these recommendations primarily falls into three areas – coordination, funding, and monitoring & evaluation.

Coordination

Encouraging greater EV use in Philadelphia will require a coordinated approach among Philadelphia City Council, City departments, local agencies, utilities, community members, and EV industry partners. The City will need to continue to engage with EV owners and community organizations to ensure their needs are being met. The City should work with regional entities and organizations to better coordinate electric vehicle actions as well. It is also important that the City and the private sector coordinate their deployment activities to ensure that convenient, affordable, and reliable public charging infrastructure is available to electric vehicle drivers. As recommendations and specific policies are adopted by Philadelphia City Council, lead entities will be identified to implement specific actions. Key entities and groups for future coordination should include:

Local Organizations

- Philadelphia City Council
- The Mayor's Office
- Office of Transportation & Infrastructure Systems
- Philadelphia City Planning Commission
- Office of Sustainability
- Department of Licenses & Inspections
- Office of Fleet Management
- Philadelphia Parking Authority
- Electric Vehicle Owners
- Registered Community Organizations

Regional Organizations

- PECO
- SEPTA
- Delaware Valley Region Planning Commission
- PennDOT
- PA Department of Environmental Protection
- Drive Electric PA
- Eastern Pennsylvania Alliance for Clean Transportation (EP-ACT)

Funding

Many of the recommended actions, particularly actions associated with EV charging infrastructure, require funding. Potential funding sources include:

- **Local City funding**
- **Volkswagen Environmental Mitigation Trust Funds:** The state of Pennsylvania has been allocated approximately \$118 million as part of the Volkswagen settlement. The funding will be distributed and used to support programs and actions that reduce NOx emissions.
- **Volkswagen ZEV Investment Commitment (Electrify America):** Volkswagen will invest \$1.2 billion across the US to support programs and actions that increase the use of zero-emission vehicle (ZEV) technology. Greater Philadelphia is targeted to receive some of this investment.
- **Alternative Fuels Incentive Program (AFIG):** Administered through PA DEP, the AFIG program funds alternative fuel transportation projects that work to improve air quality, provide economic development for new transportation technologies, and help switch fleets to cleaner fuels. Approximately \$5 million is available annually.
- **Public-Private Partnerships:** Work with EV technology companies and leverage their needs to expand their business to bring more EV infrastructure to Philadelphia.

Monitoring and Evaluation

The City should monitor progress around implementation of adopted recommendations and evaluate their effectiveness. EV technology is still new and changing quickly. Charging solutions are still being tested and some are not yet proven. Improving data collection will be key to monitoring and evaluating adopted recommendations. By doing so, Philadelphia can strive toward the leading benchmarks of comparable cities by collecting and organizing data in a systematic approach that reflects best practices used in more advanced EV cities. Key metrics include:

- Annual EV registrations in Philadelphia
- Vehicle miles traveled and electric vehicle miles traveled
- Publicly accessible charging stations by type
- Energy use at public charging stations
- Number of charging sessions at public charging stations
- GHG emissions savings from EV use – Carbon Dioxide Equivalent (CO₂e)
- Charger/vehicle ratio - offers data to help approximate the number of charging stations for a given electric vehicle market
- Chargers per 1 million residents – offers a comparison to different cities
- Inclusion of regional data to better reflect the percentage of electric commuter vehicles Philadelphia might expect to see

Appendices

Appendix I: Task Force Members & Contributors

Task Force Members

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Appendix II: Details Of The Task Force Process

The Electric Vehicle Policy Task Force was formed to develop potential solutions and make policy recommendations to encourage electric vehicles. It is part of the City's wider multi-modal transportation strategy that encourages transit, walking, and bicycling. Led by the City of Philadelphia's Office of Transportation and Infrastructure (oTIS) and Philadelphia City Council, the EV Policy Task force consists of representatives from various city and regional agencies and offices, in addition to private citizen electric vehicle owners and representatives from local community organizations.

Structure and Governance

The Task Force worked by consensus in making the policy recommendations included in this report. Task Force members worked collaboratively and iteratively to find common ground that would support the Task Force's objectives of promoting the EVs as part of the City's wider multi-modal strategy.

Task Force Timeline and Process

The Task Force met monthly over a period of seven months, beginning with an introductory meeting on July 18, 2017. The initial meetings primarily focused on establishing goals and objectives in addition to learning more about EVs from policy, research, and private industry experts. The Task Force also worked to identify opportunities and challenges tied existing EV infrastructure in Philadelphia.

In August, the Task Force published a Request for Information (RFI) to learn more about best practices and trends related to EVs and EV charging infrastructure. The City received fifteen responses and selected five EV Industry Partner organizations to present to the Task Force. Organizations included, ChargePoint, Con Edison Solutions, Envision Solar, Greenlots, and PECO. In September and October, the Task Force explored

potential strategies for encouraging greater EV use in Philadelphia in collaboration with EV Industry Partners and Registered Community Organizations (RCO) representatives. These discussions generated valuable input on potential EV policy recommendations and helped inform future Task Force policy discussions. In November and December, the Task Force engaged in discussions based on information that was gathered in previous meetings and reached consensus on a of policy recommendations.

Public Engagement

Opportunities for public comment were made available at a public open house on January 25, 2018. Additional opportunities for public comment were also made available online from January 17th to February 16th. For a full overview of public comments, visit the [public feedback summary](#).

Appendix III: References

- http://theicct.org/sites/default/files/publications/EV-charging-best-practices_ICCT-white-paper_04102017_vF.pdf
- www.nrel.gov/docs/fy17osti/69031.pdf
- www.septa.org/sustain/pdf/Sustainability2020_report.pdf
- https://beta.phila.gov/media/20161101174249/2016-Greenworks-Vision_Office-of-Sustainability.pdf
- www.dvrpc.org/Reports/12055A.pdf
- <https://beta.phila.gov/media/20160429144916/2015-citywide-greenhouse-gas-emissions-inventory-for-2012.pdf>
- www.nap.edu/catalog/21725/overcoming-barriers-to-deployment-of-plug-in-electric-vehicles
- Consumer Views on Plug-in Electric Vehicles – National Benchmark Report (Second Edition)
- Advanced Plug-in Electric Vehicle Travel and Charging Behavior Interim Report
- Plug-in Electric Vehicle Sales Forecast Through 2025 and the Charging Infrastructure Required
- DVRPC Memo- Electric Vehicle Charging in other US Cities