2021

Prince George's County Government Operations: Electric Vehicle & Charging Infrastructure Action Plan

ICF

Metropolitan Washington Council of Governments

Acknowledgements

The Plan was created by MWCOG and ICF in partnership with the Prince George's County Office of Central Services leaders and input from interagency teams.

A special thanks to those who provided their time and expertise, particularly:

Office of Central Services

- Jonathan Butler, Director
- Erica Bannerman, Sustainable Energy Manager
- Rick Hilmer, Fleet Manager
- Michael Brown, Deputy Director

Metropolitan Washington Council of Governments (MWCOG)

- Jeffrey King
- Leah Boggs

ICF

- Carrie Giles
- Haley Erickson

Contents

Key Terms

The following acronyms are used in this report:	
ADA	Americans With Disabilities Act
BEV	Battery Electric Vehicle
CAFE	Corporate Average Fuel Economy Standards
CVF	Clean Vehicles and Fuels Workgroup of the Transportation Climate Initiative
DC	Direct Current
DGS	Maryland Department of General Services
EV	Electric Vehicle – Considered interchangeable with PEV
EVIP	Electric Vehicle Infrastructure Program
EVSE	Electric Vehicle Supply Equipment
FAST	Fixing America's Surface Transportation Act
FCEV	Fuel Cell Electric Vehicle
FHWA	Federal Highway Administration
GHG	Greenhouse Gas
HOV	High Occupancy Vehicle
ICE	Internal Combustion Engine
kWh	Kilowatt-Hour
MDE	Maryland Department of Environment
MDOT	Maryland Department of Transportation
MEA	Maryland Energy Administration
MOU	Memorandum of Understanding
MDOT MVA	MDOT Motor Vehicle Administration
PEV	Plug-In Electric Vehicle - term used collectively for BEVs and PHEVs
PHEV	Plug-In Hybrid Electric Vehicle
PSC	Public Service Commission
TCI	Transportation Climate Initiative
VMT	Vehicle Miles Travelled
ZEEVIC	Zero Emission Electric Vehicle Infrastructure Council
ZEV	Zero Emission Vehicle - Encompasses PEVs and FCEVs

Executive Summary

This plan is an operational government action plan for Prince George's County (County) to deploy electric vehicles (EVs) in the County fleet and install electric vehicle supply equipment (EVSE) at County facilities over the next 10-years. The County's Green Fleet Policy outlines a 25% reduction goal in greenhouse gas (GHG) emissions by 2025 and a 20% improvement in fuel economy by 2020, supported by a 50% goal of all applicable vehicle purchases to be zero emission vehicles (ZEVs) or partial zero emission vehicles (PZEVs) by 2025.

Specific recommendations to achieve the Green Fleet Policy goals are included in this plan. Prince George's County also has overarching goals that will help achieve these savings, namely:

- Inventory current EV and EVSE programs across departments, to create a unified approach, particularly between the fleet, transit, and facilities plans;
- To meet current County fleet electrification needs: 54 charging plugs should be installed over the next 5 years, across 27 locations; and,
- Revisit the Green Fleet Policy Resolution's requirement of 1 EVSE per 50 parking spaces to either add clarity to the current requirement or switch to a minimum of installing 2 EVSE per County facility.

Maryland is actively promoting EV deployment through utility programs, state-funded incentives, and education campaigns to meet the State goal of having 600,000 registered EVs by 2030, 20x the current number of registered EVs in the State. The County should continue to leverage existing funding programs for EVs and EVSE, particularly working with BGE, Pepco, and SMECO to install free public chargers, to build off statewide momentum. However, the County first needs to look holistically at coordinating EV and EVSE deployment. The focus of this plan is to help County operations relate to the fleet's light-duty vehicle needs and build a strong County-owned EVSE program which could potentially be opened to employees and the general public. This is not a community wide EV plan.

The Prince George's County fleet consists of over 3,000 vehicles, of which 17 are plug-in electric vehicles (PEVs) and 6 are powered by other alternative fuels. As a result of the Green Fleet Policy, the County has dramatically increased the number of ZEVs and PZEVs (hybrids and high miles-per-gallons) vehicles in the fleet, but needs to consider altering its purchasing policy to only buy EVs or PHEVs moving forward. This policy would include caveats to address vehicle model availability and fleet function.

To prepare for EV deployment, the County should have 2 Level 2 EVSE installed at every County facility and in fleet yards when available, so that EVs can be domiciled at those facilities and freely travel between County facilities without experiencing range anxiety. Level 2 charging stations can fully charge an EV in 4-8 hours; ideal for providing overnight charging. Direct current fast chargers (DCFC) should be considered for locations without a private fleet yard, providing a full charge in 20-30 minutes, less if a vehicle has charge remaining. Similarly, as the County's EV program grows, the County will want to consider a ratio of one EVSE per 10 EVs as a baseline. This ratio can be further customized via vehicle use patterns, charger level, charger accessibility to fleet or public, and increasing vehicle battery ranges.

Section 1. Introduction

Purpose and Scope of Plan

This document is a strategic and operational plan for electrification of vehicles owned and operated by Prince George's County, Maryland. The plan covers county fleets, electrification of fleet vehicles, real estate assets controlled by the County which will require Electric Vehicle Supply Equipment (EVSE), and opportunities and plans to deploy chargers on both government property and current and planned chargers on properties not owned by the County. The plan also addresses the myriad of other considerations for a transition to electrified fleets, including education, communication, protocols, signage, accommodating disabilities, charger networking, charger fees and collection, security, procurement, electric utilities, policies, incentives, and others.

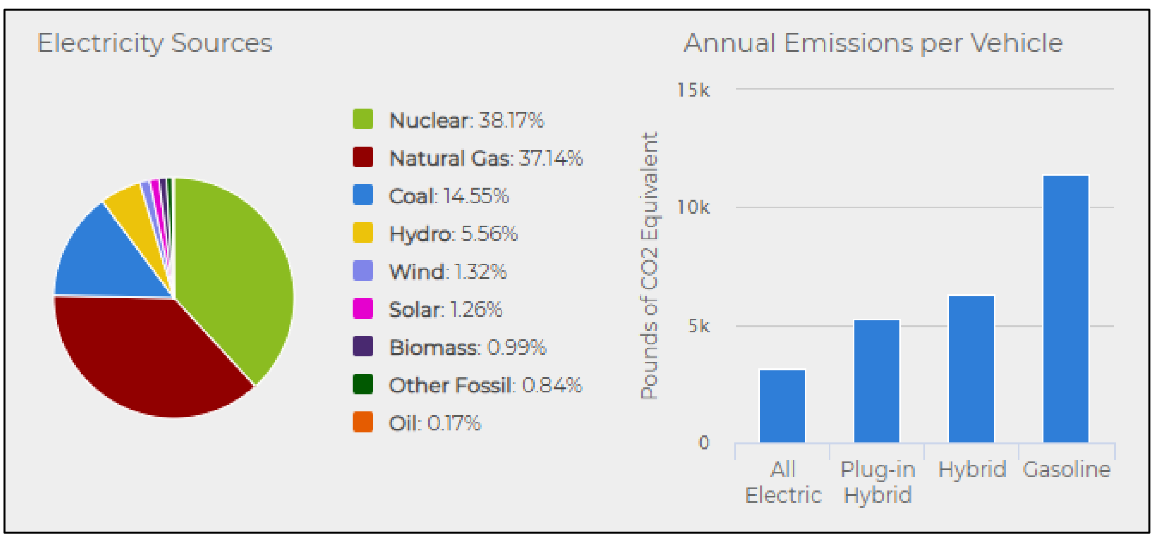
Each section includes background information, documentation of the existing County status, assessment of near-term needs and opportunities, and recommendations.

Benefits of Electrification

Electrification of Prince George's County fleet vehicles aligns with existing state and County policies and programs designed to reduce GHG emissions from the transportation sector. Vehicle electrification also provides significant ancillary benefits, outlined in the following bullets:

- **Emissions Reduction:** Battery electric vehicles (BEVs) eliminate, and plug-in hybrid vehicles (PHEVs) reduce, mobile source criteria pollutants and GHG emissions. Similarly, without any grid modifications, lifecycle emissions from PEVs are already cleaner than ICE vehicle alternatives. The emissions profile of all plug-in electric vehicles (PEVs or simply EVs) will only improve as electricity sources in Maryland become cleaner. Figure 1 shows that light-duty BEVs reduce GHG emissions by over 72% compared to light-duty gasoline-powered ICE vehicles.[1]

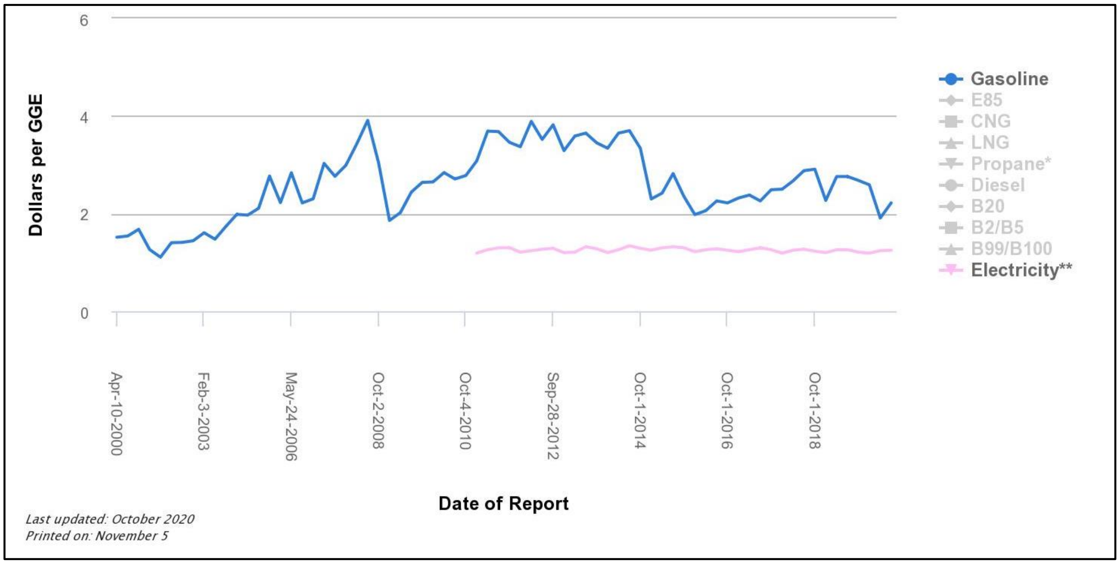
FIGURE 1. MARYLAND ELECTRICITY SOURCES AND AVERAGE ANNUAL EMISSIONS PER VEHICLE TECHNOLOGY



[1] U.S. Department of Energy Alternative Fuel Data Center, https://www.afdc.energy.gov/vehicles/electric_emissions.php

- **Hazardous Air Pollutant Reduction:** EVs can reduce hazardous air pollutant emissions, improving air quality and reduced local negative health impacts of pollution.[2]
- **Reduce Vehicle Maintenance:** BEVs do not have an ICE and, therefore, do not require routine maintenance as oil, filter, and timing belt changes, saving on labor and parts. Both BEVs and PHEVs utilize regenerative braking to recapture power, minimizing on brake wear and replacement.
- **Lower Fuel Costs and Price Volatility:** Gasoline and diesel experience fuel supply disruptions that can increase fuel prices beyond planned operating budgets. Electricity is a much less volatile energy purchase with steadier prices for budgeting operation costs.

FIGURE 2. AVERAGE RETAIL FUEL PRICES IN THE UNITED STATES FROM APRIL 2000 TO OCTOBER 2020[3]



- **Lower Noise Pollution:** Vehicles operate much more quietly on electricity versus gasoline or diesel, providing a benefit to employees, the community, and the surrounding environment.
- **Improved Resilience to Fuel Disruption:** PEVs can be a valuable resource during disaster relief efforts, in part because many EVs can export power from their batteries to power emergency response systems, such as communication equipment, traffic lights, or fuel pumps, and because the vehicles can be charged by distributed energy resources when fuel supplies are disrupted.[4]
- **Potential Reduced Cost of Electricity:** PEV charging can increase utility revenues while increasing effective utilization of the existing generation, transmission and distribution system. This has the potential to suppress future electricity price increases for all electricity customers.[5]

[2] U.S. Environmental Protection Agency, *Clean Air Act*, https://www.epa.gov/clean-air-act-overview/progress-cleaning-air-and-improving-peoples-health

[3] U.S. Department of Energy, *Alternative Fuels Data Center*, https://afdc.energy.gov/fuels/prices.html

[4] NASEO, *Initiative for Resiliency in Energy through Vehicles*, http://www.naseo.org/irev

[5] M.J. Bradley, *Analyzes State-Wide Costs and Benefits of Plug-in Vehicles*, http://www.mjbradley.com/reports/mjba-analyzes-state-wide-costs-and-benefits-plug-vehicles-five-northeast-and-mid-atlantic

Prince George's County Fleet Policy

Green Fleet Policy

Electrification of fleets in the County is guided by County Resolution 28-2014 (Green Fleet Policy) adopted by the County Council in May 2014.[6] The Green Fleet Policy outlines a fleet purchasing requirement and requires that the applicable portion of the fleet be replaced with smaller, more fuel-efficient vehicles, prioritizing California Air Resources Board (CARB) certified ZEV and PZEV vehicles. Purchasing goals are set as percentages of fiscal year vehicle acquisitions using 2015 as the baseline; 20% of all applicable purchases to be zero emission vehicles (ZEVs) or partial zero emission vehicles (PZEV) by 2020 and 50% by 2025. Police, fire, and other public safety fleets are exempt.

As of July 2020, the County has reported the following percentages of ZEVs and PZEVs purchased in each fiscal year:

- 26% in FY2016
- 29% in FY2017
- 45% in FY2018
- 31% in FY2019
- Projected 48% for FY2020[7]

The Green Fleet Policy also requires the County to reduce vehicle greenhouse gas (GHG) emissions while improving the fleet's fuel economy. This part of the Policy does not exempt police, fire and other public safety fleets as the purchasing requirement does, but they are still required to reduce their fleet's carbon footprint and increase fuel economy. This portion of the Green Fleet Policy outlines a 25% reduction in GHG emissions by 2025 and a 20% improvement in fuel economy by 2020, using 2015 as the baseline. As of July 2020, GHG emissions have improved by 11% and fuel economy has improved by11%.

The County, in conjunction with the Metropolitan Washington Council of Governments Environmental Planning Division, commissioned this study to develop a fleet electrification infrastructure master plan to enable the increase of the number of ZEV and PZEV vehicles in the County fleet. In FY2020 the County increased the number of electric vehicle supply equipment (EVSE) from 14 to 23 and have expanded availability of stations to the general public and employees.

Plan 2035

The County's Approved General Plan for 2035: Policies and Strategies outlines the County's investment strategy over the next 15 years, including the promotion of alternative fuel vehicles, EVSE, and EV parking facilities.[8] Similarly, it calls for amending codes and standards and the implementation of policies, strategies, and partnerships with local energy providers to develop alternative fueling stations for compressed natural gas, liquefied propane, biofuels, and electric vehicles. Plan 2035 specifically calls for EVSE to be readily available on streets and in parking facilities and the development of priority parking for alternative fuel vehicles at County buildings, commuter parking lots, and other popular areas. Within Plan 2035, the County states the intent to lead by example with EV and EVSE adoption and actively participate in regional efforts to support the deployment of EVs and EVSE.

[6] Prince George's County, *Green Fleet Policy*, 2014, retrieved from https://princegeorgescountymd.legistar.com/View.ashx?M=F&ID=4034915&GUID=BBCE02B5-A0B3-4926-8FF6-9F21293E1105

[7] Currently, 11% of the applicable fleet vehicles are ZEVs or PZEVs.

[8] Prince George's County, *Plan 2035*, http://planpgc2035.org/

Sustainable Energy Objectives

The Office of Central Services, Sustainable Energy's objective is to provide reliable and environmentally sound energy solutions that enhance the quality of life of Prince George's County residents' while concomitantly maximizing energy savings. It coordinates the County's efforts to reduce energy cost, consumption, and carbon emissions.

Image: EV Charging and PHEVs at 9400 Peppercorn

In 2014, the county joined the Maryland Smart Energy Communities Program. The goal of the program is to help local governments commit to sustained energy savings and adopt policies related to energy efficiency, renewable energy and/or transportation efficiency. Sustainable Energy and the Fleet Division utilized a portion of the $649,000 of grant funds to purchase county government's first six plug-in hybrid electric vehicles (PHEV) and install 3 dual-head electric vehicle charging stations.

State Goals

The County is also guided by Maryland's state goal of reducing GHG emissions by 25% from 2006 levels by 2020 and increasing the number of ZEV acquisitions in light-duty fleets to 50% of annual fleet purchases by 2025. Maryland has an EV registration goal of 300,000 EVs by 2025 and 600,000 EVs by 2030. Along with state-level goals, the County is also guided by Maryland's involvement in the following initiatives, memorandum of understandings (MOUs), and partnerships:

- Maryland joined with several other east coast states to create the Regional Transportation Climate Initiative (TCI) to improve transportation, develop a clean energy economy, and reduce carbon emissions in the transportation sector through supporting the deployment of ZEVs and associated fueling infrastructure.
- Maryland joined the ZEV Deployment Support MOU to work with other member states on raising consumer awareness of EVs, building out reliable and convenient EVSE infrastructure, improving access to financial and non-financial incentives, expanding public and private sector fleet electrification, and supporting dealership efforts to increase ZEV sales.
- In 2020, Maryland signed the Medium- and Heavy-Duty ZEV MOU to support electrification of medium- and heavy-duty vehicles by considering actions such as limiting all new medium- and heavy-duty vehicles sales in the signatory states to ZEVs by 2050 and accelerating the deployment of medium- and heavy-duty ZEVs to benefit disadvantaged communities and explore opportunities to coordinate and partner with key stakeholders.
- Most recently, the Mid-Atlantic Electrification Partnership was created by governments, utilities, and businesses in Maryland, DC, and Virginia to expand EV and EVSE adoption in the region by bringing together industry, government, and non-profit stakeholders to develop alternative fueling corridors, charging hubs, and education and outreach programs.

Prince George's County Organization

This process is a multi-department endeavor that engages a number of County agencies via the Green Fleet Committee that will inform the process and provide input at the draft- and final-report level. The primary agencies involved, and their roles are as follows:

TABLE 1. COUNTY OFFICES AND DEPARTMENTS INVOLVED IN THE GREEN FLEET POLICY AND/OR EV PLAN

Office
Department of Public Works & Transportation (DPWT)
Office of Central Services (OCS) Fleet Management
Office of Central Services - Sustainable Energy
Department of Environmental Recourses
Office of Management and Budget

Please contact Erica Bannerman or Richard Hilmer with questions regarding this plan.

Erica Bannerman
Manager, Sustainable Energy
Office of Central Services
Prince George's County Government
Phone: 301.883.6466
Email: esbannerman@co.pg.md.us

Richard Hilmer
Division Chief, Fleet Management
Office of Central Services
Prince George's County Government
Phone: 301-808-1715
Email: RGHilmer@co.pg.md.us

Prince George's County Demographics, Geography, and Regional Activity Centers

Prince George's County is the sixth largest county in area in the State of Maryland, spanning 483 square miles with a population of 906,202 people. There are 27 municipalities within the County, the largest number of any county in the state. The oldest municipality in the County is Bladensburg, incorporated in 1854 and the newest is New Carrolton incorporated in 1853. County statistics are outlined in the following table:

TABLE 2. PRINCE GEORGE'S COUNTY STATISTICS

County Statistics	
Average Commute Time to Work (minutes)	37
Number of Businesses and Firms	77,204
Education Attainment (high school graduate or higher)	86.50%
Employer Establishments	15,042
Employment Rate	66.40%
Households	308,849
Housing Units	331,272
Homeownership Rate	62%
Median Household Income (per capita)	$81,969
Median Housing Value	$287,800
Regional Activity Centers	21

Section 2. Current Situation and Needs Assessment

Maryland EV Goals

Maryland has a goal of reaching 60,000 ZEVs registered in the state by 2020 and 300,000 ZEVs registered by 2025. While Maryland has a comprehensive approach to increasing ZEV registration, there is possibly a disconnect between realistic expectations of market growth and state action. Setting achievable ZEV goals calls into question EV adoption rate expectations, market conditions, consumer comfort and awareness, infrastructure availability, and legislative understanding. Growth rates must be realistic, around 30 percent annually, to enable buy in from legislators, fleets, and the public.

Maryland has strategically engaged with various stakeholders through the ZEEVIC since 2011 to develop a comprehensive and coordinated effort to remove barriers to ZEV adoption. ZEEVIC is working to coordinate efforts between state EV and EVSE incentives, utility EVSE programs, non-profit activities, education and outreach campaigns, coordinate alternative fuel corridors, and more to bring more ZEVs to Marylanders. Maryland also created several rebates and grants for EVs, FCEVs, and EVSE and passed regulations supporting and facilitating the use of ZEVs in the state. As of October 2020, Maryland had 25,055 ZEVs registered, needing to double EV registrations, adding 34,945 ZEVs to meet their 2020 goal. While Maryland has approached ZEV goals strategically, their goals were likely overly ambitious in the context of the EV market, model availability, and the rate of infrastructure deployment.

TABLE 3. COUNTY FLEET COMPOSITION FOR FISCAL YEAR 2020

Vehicle Class	Fuel Type	Total in Fleet
Light Duty Classes 1 and 2 GVW; up to 10,000 pounds (lbs.)	Propane	6
	CNG	0
	Electric	2
	HEV	75
	PHEV	15
	Gasoline	2,958
	Diesel	13
	Other/Bi-Fuel	3
	TOTAL	**3,072**
Medium Duty Classes 3, 4, and 5 GVW; >10,000 to 19,500 lbs.	Propane	21
	CNG	0
	Electric	0
	HEV	13
	PHEV	0
	Gasoline	8
	Diesel	58
	Other/Bi-Fuel	6
	TOTAL	**106**
Heavy Duty Classes 6, 7, and 8; >19,500 lbs.	Propane	0
	CNG	0
	Electric	0
	HEV	0
	PHEV	0
	Gasoline	0
	Diesel	3
	Other/Bi-Fuel	10
	TOTAL	**13**
Total Fleet Vehicles	**3,191**	

Existing County Fleet Vehicles

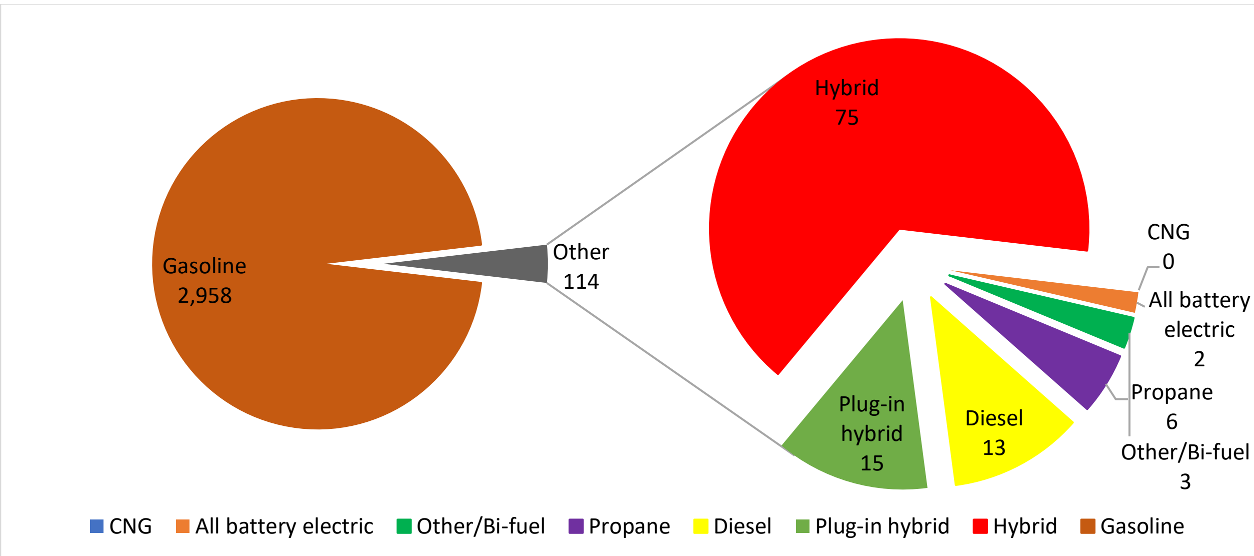
The County fleet consists of 3,191 County fleet vehicles that serve 34 county government agencies and 6,116 county employees. Vehicles are used for a range of government functions. The County fleet predominately consists of light-duty vehicles, but contains a variety of vehicle technology types, including propane, all-electric, hybrid-electric, plug-in hybrid electric, gasoline, diesel, and bi-fuel vehicles. There are a total of 24 alternative fuel vehicles (AFVs) in the fleet, with additional purchases planned. Table 3 details current fleet composition.[9]

[9] From 2020 Green Fleet Report.

County Government Light-Duty Fleet

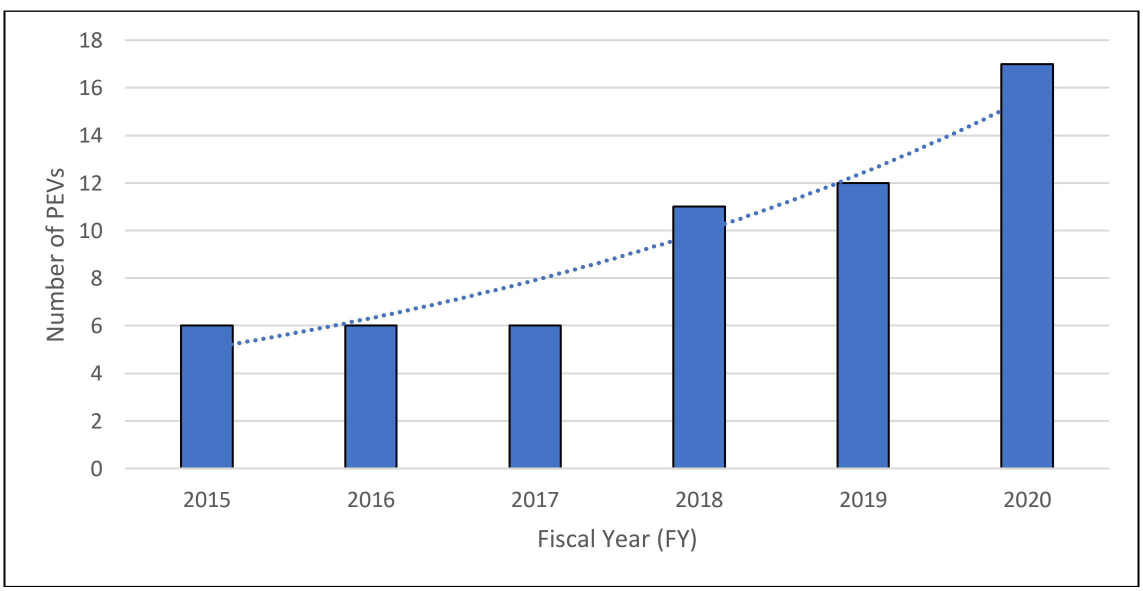
The County's light-duty fleet consists predominantly of internal combustion engine gasoline-powered vehicles. This vehicle class and fuel type combination makes up approximately 93% of the fleet. Figure 3 details shows the breakdown of the County's light-duty vehicles by fuel type.

FIGURE 3. COUNTY LIGHT-DUTY FLEET VEHICLES BY FUEL TYPE



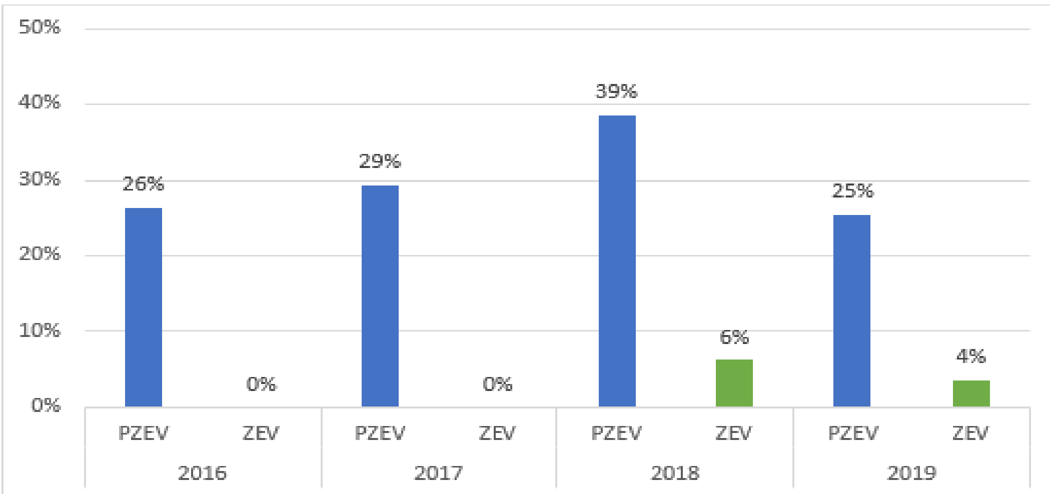
The County government fleet has 17 PEVs, making up approximately 0.6% of the fleet. Since 2018, the number of PEVs in the fleet steadily increased from 6 to 17 vehicles, as outlined in Figure 4 below.

FIGURE 4. PEVS IN COUNTY FLEET FROM FISCAL YEARS 2016 – 2020



While Figure 4 shows an increase in the number of PEVs in the County fleet over the last 3 years, Figure 5 shows that the proportion of ZEVs purchased for the fleet has not yet passed 6% of all new vehicle purchases in a year. In 2019, PZEV purchases include hybrid electric vehicles and liquefied petroleum vehicles and the ZEVs include a neighborhood electric truck and PHEVs.

FIGURE 5. PERCENTAGE OF PZEVS AND ZEVS PURCHASED OF TOTAL FLEET VEHICLE PURCHASES FROM 2016-2019



Planning for purchasing of vehicles for fiscal year 2020 is temporarily on hold until vehicle manufacturers unveil 2021 models as the availability of new ZEV and PZEV models will likely influence County purchasing strategy. Regardless, the established purchasing policy will be followed.

> ***Recommendation:*** The County needs to increase the proportion of ZEVs purchased each year. While the County is meeting the combined PZEV and ZEV acquisition goal of 20% of applicable purchases being either fuel type, to realize full GHG emissions reduction potential the County should prioritize the purchase of ZEVs over PZEVs and ICE vehicles. While first responder vehicles are exempt from Green Fleet goals, these fleets should still be encouraged to adopt PHEVs such as the Ford Interceptor PHEV and the Ford Fusion PHEV, which can meet the same needs as existing first responder light-duty vehicles.

Current projections anticipate light-duty sedans having comparable capital costs between ICE vehicles and PEVs by 2025, followed by a selection of light-duty trucks and SUVs by 2030. Already, total cost of ownership for light-duty sedans is cheaper than ICE sedans, when looking at the lifetime savings in fuel and maintenance costs.

Vehicle and Fuel Use Patterns

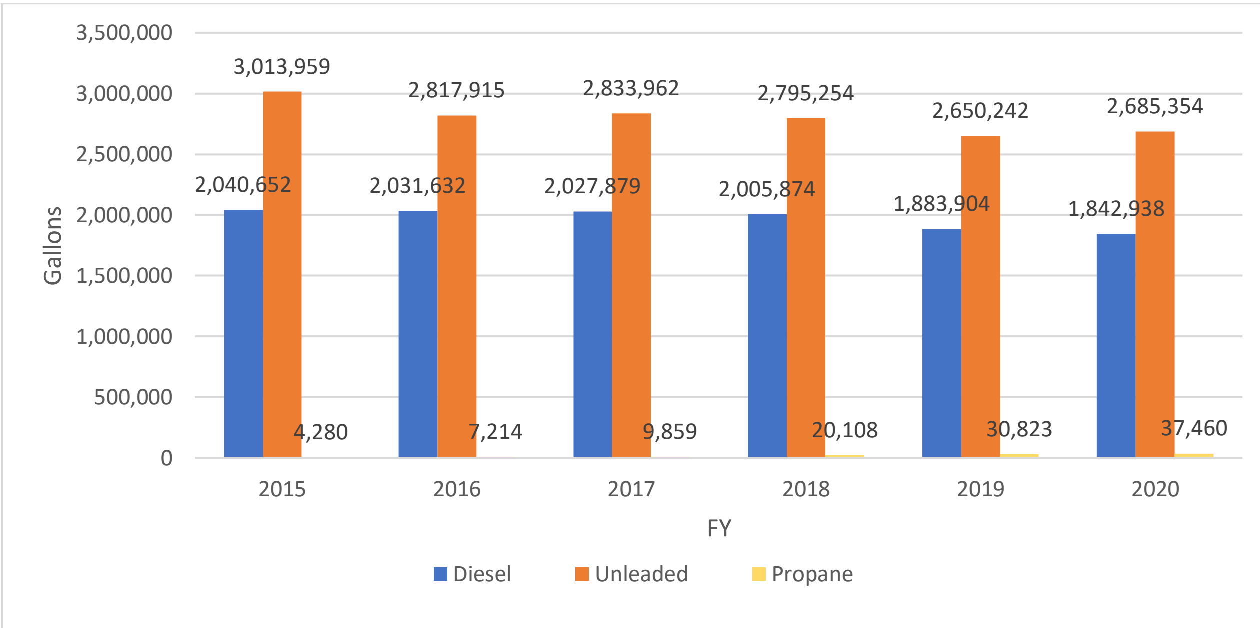
In fiscal year 2020, County fleet vehicles traveled a total of 42,799,794 miles, decreasing annual vehicle miles traveled (VMT) by 2,738,860 miles from 2019. Of the total VMT in 2019, PEVs traveled 120,699 miles or 0.26% of total fleet VMT.[10]

> ***Recommendation:*** As the County increases the share of PEVs in the fleet, the County also needs to increase the share of total VMT by PEVs versus ICE vehicles. This will ensure the County is realizing fuel efficiency and emission reduction benefits of PEVs.

[10] Total calculated VMT by PEVs in 2019 is an approximation based on 2019 Green Fleet Report data.

The County has steadily decreased its total fuel gaseous consumption by 10% from 2015 to 2020, after implementing their Petroleum Reduction Consumption Plan.[11] Comparatively, diesel and gasoline consumption decreased by 10% and 11% respectively, but propane consumption increased by 775% from 2015 and 2020. Figure 6 details annual fuel consumption for diesel, unleaded gasoline, and propane light-duty vehicles from the 2015 to 2020.

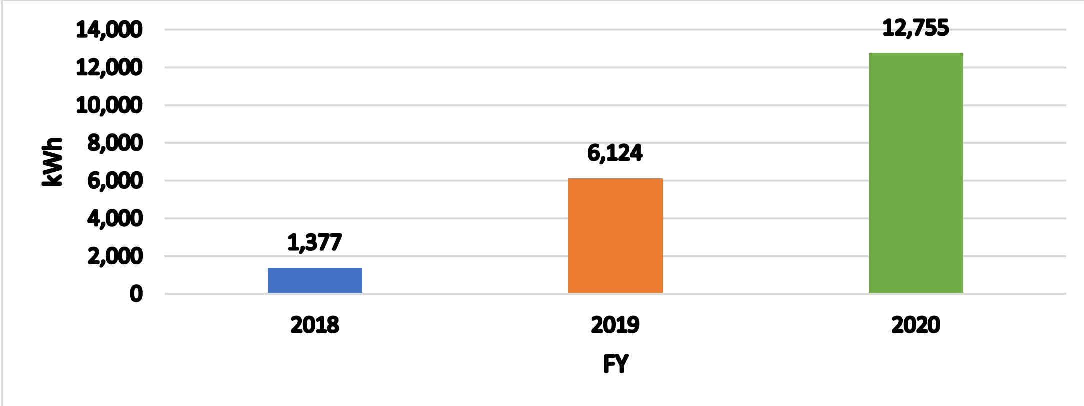
FIGURE 6. ANNUAL FUEL CONSUMPTION BY FUEL TYPE



In terms of PEV electricity consumption, in 2020 fleet PEVs consumed 12,755.19 kilo-watt hours (kWh) of electricity. Since 2018, electricity consumption from PEVs increased by over 11,000 kWh. Figure 7 shows the annual increase in kWh consumption by PEVs over the last three years.

FIGURE 7. COUNTY FLEET PEV ELECTRICITY CONSUMPTION

[11] https://www.princegeorgescountymd.gov/DocumentCenter/View/3912/Smart-Energy-Communities-Policy-and-Petroleum-Reduction-and-Renewable-Energy-Action-Plan-PDF?bidId=#:~:text=Based%20on%20the%20select%20fleet,and%20alternatively%20fueled%20fleet%20vehicles



Electricity consumption has increased due to growing number of PEVs in the fleet and frequency of use. As vehicles increase, EVSE capacity needs to increase. Use will be more frequent and VMT will increase, naturally increasing electricity demand.

County Medium/Heavy Duty Fleet

For this plan, only initial information for County Transit Bus electrification is included, and detailed in Attachment D. Future plan updates will include more information on Transit bus electrification, as well as medium/heavy duty fleets.

Prince George's County *The Bus* is actively working to electrify the transit fleet, with four new Proterra electric buses arriving in Summer 2021. The County is working to future proof for a larger electric bus fleet however, with plans to install four charging stations, capable of supporting 12 electric buses. The County has also applied for U.S. Department of Transportation Low or No Emission Vehicle Grants for additional electric buses in northern and southern County locations, which would include proprietary Proterra overhead charging.

Recommendations:

- When upgrading electrical capacity to install bus charging, particularly along D'Arcy Road, add conduit and capacity for fleet and/or public charging as well.
- Proprietary overhead charging will lock the County into one bus manufacturer along those routes for several years. As long as proprietary charging is used along routes and not in the fleet yards, then this solution works. Keep fleet yard charging accessible to all bus manufacturers.
- Use marketing around the electric bus deployment as a low-cost way to market all the County electrification efforts.

Bus and EVSE Manufacturers

Equipment providers can provide transit agencies with technical information on the charging compatibility, capabilities, and limitations of the vehicles and chargers. Bus manufacturers can also provide recommendations for charging in a manner that preserves the health of the vehicle's battery.

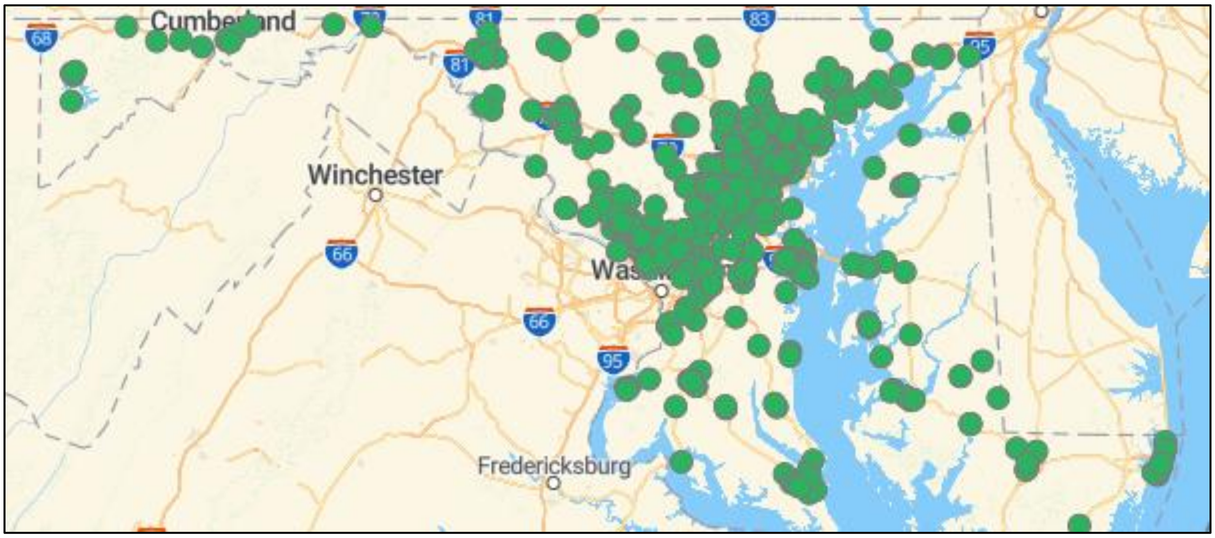
Recommendation: Acquire technical information for all vehicles and EVSE and ensure the specifications are compatible.

Overview of Charging Technology

Maryland currently has 778 EVSE with 2,466 charging outlets[12]. Of those outlets, 21 are Level 1, 1,989 are Level 2, and 456 are DC fast EVSE. Figure 8 shows the distribution of EVSE across Maryland and Table 16 in Appendix F shows a breakdown of EVSE by zip code.

[12] Department of Energy, *Alternative Fuels Data Center Station Locator*, afdc.energy.gov/stations, Accessed December 14, 2020.

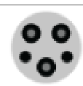
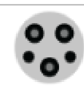
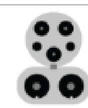
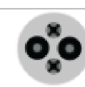
FIGURE 8. EVSE DISTRIBUTION IN MARYLAND



PEV charging infrastructure is typically differentiated by the maximum amount of power that can be delivered to the vehicle's battery. Over 60 charging equipment manufacturers are available domestically, although they vary by offering and connectivity. A searchable reference is available at GoElectricDrive.org.[13] Table 4 below provides a summary of the three types of charging infrastructure types – Level 1, Level 2, and direct current (DC) fast chargers. The charging equipment is referred to as electric vehicle supply equipment (EVSE), and each EVSE has at least one (but often more than one) charge port or plug.

TABLE 4. ELECTRIC VEHICLE CHARGING TYPES

[13] Maryland charging equipment manufacturer SemaConnect is included in the listings.

	Level 1 Alternating Current	Level 2 Alternating Current	DC Fast Charging
Description	Uses a standard plug - 120 volt (V), single phase service with a three-prong electrical outlet at 15-20 amperage (A)	Used for both battery electric (BEV) and plug-in hybrid electric vehicle (PHEV) charging 208/240 V AC split phase service that is less than or equal to 80 A.	Used specifically for battery electric vehicle charging Typically requires a dedicated circuit of 20-100 A, with a 480 V service connection.
Connector type(s)	 J1772 charge port	 J1772 charge port	 J1772 combo  CHAdeMO  Tesla combo
Use	Residential or workplace charging	Residential, workplace, or public charging	Rapid charging for transportation depots, vehicle fleets, public corridors
Limitations	Low power delivery lengthens charging time	Requires additional infrastructure and wiring	Can only be used by BEVs currently. Higher upfront and operational costs
Time to charge	2 to 5-mi range/1-hr charging Depending on the vehicle battery size, PHEVs can be fully charged in 2-7 hours and BEVs in 14-20+ hours	10 to 25-miles range/1-hr charging Depending on the vehicle battery size, PHEVs can be fully charged in 1-3 hours and BEVs in 4-8 hours	50 to 70-mi range/20-min charging Depending on the vehicle battery size, BEVs can be fully charged in 30-60 minutes.

EV charging can occur at various locations and use is based on driver needs. For publicly accessible Level 2 charging, which is the major focus of local government funded deployments, typical charging times range from 1-2 hours. DC fast charging units require significantly less dwell time and are typically sited along interstate highways. While most public stations have both CHAdeMO and J1772 combo standard plugs available to charge any vehicle make, Tesla charging equipment is proprietary only to Tesla vehicles. Tesla vehicles come with an adapter plug to be able to use any standard plug. Level 1 equipment may be a good option for some workplace and fleet charging needs, as they are easy and cost-efficient to install, but vehicles need to be parked several hours to get a significant charge. Level 1 equipment is best suited for many employee-owned vehicles that remain in the same parking spot during an eight-hour shift, or fleet vehicles that are parked overnight.

County EVSE – Current Situation and Needs Assessment

There are over 6,200 parking spaces across 35 buildings to install new or additional EV charging stations. Table 5 shows County buildings and libraries with existing number of employees, parking spaces, available Level 2 charging, and domiciled PEVs. Currently there are 29 existing EVSE connectors on County government property: 18 fleet-only EVSE and 11 EVSE available for public use.

TABLE 5. EXISTING PARKING AND EVSE INFRASTRUCTURE

Number of Parking Spaces and Employees per Building						
Building Number	**Building Name**	**# of Employees**	**# of Parking Spaces**	**Existing EVSE**	**Domiciled EVs**	**Solar Potential**
L60058	Animal Services Facility	79	118	-	-	-
L30097B	Homeland Security Complex	40	106	(4) Non-networked Level 2	-	-
L30063	Cheverly Health Center	140	162	-	-	-
L30074	Consolidated Warehouse	34	46	-	-	-
L30072	Central Fleet	35	70	(1) Non-networked Level 1	-	-
L60037	Facility Operations and Management	13	67	(4) Planned	1	-
L60259	Harriett Hunter Senior Center*	75	247	-	-	-
L30073	Health Department Admin	80	150	-	-	-
L30094	Inglewood #1	394	474		1	-
L30085	Inglewood #2	300	476	(2) SemaConnect Level 2	1	-
L30061	Inglewood #3	350	509	(6) SemaConnect Level 2	6	-
L30019	Largo Government Center (LGC)	272	312	-	1	-
L60080	Marburger Building	44	94			-
L30097	911 Center	55	155	(2) Non-networked Level 2	-	-
L60038	DPWT Transit Ops and Maintenance Building	200	320	-	-	-
L30059	DPWT Trip Center	16	88	-	-	-
L30068	RMS Building	250	195	(4) Planned	-	-
L30102	Wayne K. Curry Building		1032	(8) SemaConnect Level 2	5	Yes
L60284	Public Library - Accokeek**	8	536	**-**	-	-
L60285	Public Library - Beltsville	15	66	-	-	-

L60286	Public Library - Bladensburg	12		(3) Planned	-	Yes
L60287	Public Library - Fairmont Heights	8	13	-	-	-
L60288	Public Library - Glenarden	8	32	-	-	-
L60283	Public Library - Greenbelt	15	88	-	-	-
L60289	Public Library - Hillcrest Heights	10	8	-	-	-
L60290	Public Library - Hyattsville	21	120	(3) Planned	-	Yes
L60291	Public Library - Largo-Kettering	8	115	-	-	-
L60292	Public Library - Laurel	20	140	(4) ChargePoint Level 2	-	-
L60293	Public Library - New Carrollton	40	134	(2) ChargePoint Level 2	-	-
L60294	Public Library - Oxon Hill	21	167	-	-	-
L60295	Public Library - Spauldings Branch	17	79	-	-	-
L60296	Public Library - Surratts - Clinton	18	130	-	**-**	Yes
L60297	Public Library - Upper Marlboro	7	15	-	-	-
TOTAL		**2605**	**6264**	**10**	**15**	

***On County's list for potential Pepco site.**

****On County's list for potential SMECO site.**

Fleet PEVs are spread over a variety of building locations, but the majority fall under the purview of the Department of Fleet Management, which houses 14 of the 17 domiciled PEVs. The County currently has charging infrastructure available at all locations with domiciled PEVs except for the Facility Operations and Management, Inglewood #1, and Largo Government Center locations.

Recommendations:

- The County should take inventory of current EV and EVSE programs and initiatives across departments and to create a unified front and establish a joint effort to uniformly and efficiently increase EV and EVSE adoption. The County should work with department points of contact to jointly identify locations are expected to have high demand for EVSE.
- The County needs to establish an EVSE planning lead position that will serve as the primary point of contact for County officials, fleet managers, drivers, and other stakeholders. Having a single coordinator will ensure communication is uniform and creates a single location where all EVSE-related issues can be brought and discussed.
- The County should construct EVSE at the three locations that have domiciled PEVs and expand infrastructure out to all County buildings, starting with locations that will acquire PEVs in the near future and have an existing fleet parking area.
- The County should install a bank of 3 Level 2 chargers at the new Health and Human Services building, and future-proof the site by running electrical capacity for a DCFC as well, pending an utility installation application.

Electrical Needs Survey
In 2020, electrical audit surveys were completed on County facilities and libraries to determine the load capacity for charging, and to help prioritize future charging locations. Results of these surveys are found in Attachment I.

Utility Proposed EVSE Types and Locations

In 2019 the Maryland Public Service Commission approved an EVSE charging infrastructure pilot program, allowing for the deployment of more than 5,000 public access Level 2 and DC fast chargers in utility service areas. The approved utilities will pay for the station installation and management, on public government property. This pilot program offers a significant opportunity for the County to quickly and affordably expand EVSE infrastructure.

Table 6 details 32 proposed EVSE placement sites and County-selected priority locations. The County has proposed 30 public charging sites to BGE, Pepco, and SMECO, and has had 5 sites approved to receive a free, public EVSE.

TABLE 6. UTILITY PROPOSED EVSE SITES

Name of Location	Type of Property	Owner/Agency
New Carrollton Parking Garage*	Parking Lot	County
Hyattsville Justice Center*	Office Building	County
New Carrollton East Lot*	Parking Lot	WMATA
West Lot*	Parking Lot	Parks & Planning
Department of Corrections*	Office Building	County/Government
Clinton Lot**	**Parking Lot**	**County/Government**
Fort Washington Lot*	Parking Lot	County/Government
Oxon Hill Lot**	**Parking Lot**	**County/Government**
Revenue Authority of County HQ*	Office Building	Private
LGC or 9200 Basil Court	Office Building	County/OCS
New HHS Building - Hampton Park Project	Office Building	County/OCS
Harriet Hunter Building	Office Building	County/OCS
Prince George's Plaza Metrorail Station	Parking Lot	WMATA
Largo Town Center Metrorail Station	Parking Lot	WMATA
Prince George's Equestrian Center **	**Parking Lot**	**County/Parks and Recreation**
Prince George's Sports & Learning Complex	Recreation Center	County/Parks and Recreation
Beltsville Community Center	Recreation Center	County/Parks and Recreation
Bladensburg Community Center	Recreation Center	County/Parks and Recreation

College Park Community Center	Recreation Center	County/Parks and Recreation
Langley Park Community Center	Recreation Center	County/Parks and Recreation
Bowie Lot*	Parking Lot	County/Government
Bowie HS	School	County/PGCPS
Bowie Community Center**	**Recreation Center**	**County/MNCPPC**
Prince George's County Southern Area Aquatic and Recreation Complex	Recreation Center	County/Parks and Recreation
Gwyn Park High School	School	County/PGCPS
Accokeek Academy	School	County/PGCPS
Wagner Community Center	Recreation Center	County/Parks and Recreation
Accokeek Branch Library**	**Library**	**County/Library**
Baden Branch Library	Library	County/Library
William Schmidt Environmental Center	Recreation Center	County/Parks and Recreation

*Proposed locations submitted by the Revenue Authority
**Approved utility sites

In total, the utility EVSE pilot program has the potential to add 31 new public access EVSE within the County.

Recommendation: The County should work closely with utilities to identify priority locations and streamline the permitting and construction process. The County should identify priority locations within each utility jurisdiction to maximize the efficacy of this pilot program.

Section 3. EVSE Plans

Government strategies to support EVSE deployment are an integral component of accelerating EVSE installation and PEV deployment. The County can leverage policies, programs, and incentives at various government levels. These strategies have applications and implications for the entire PEV and EVSE ecosystem, not just County operations. This section of the Plan addresses the EVSE that will be needed to serve existing and future county light-duty electric fleet vehicles outlined in the previous section. To estimate the total EVSE that will be needed to adequately serve the needs of County LDV operations, this Plan considers both County-owned and publicly available EVSE below.

EVSE Planning Considerations

There are a number of considerations for assessing the need for additional EVSE to serve existing and future fleet needs, including number of vehicles that will need EVSE, locations available for EVSE installation, number of existing parking spaces at various locations, VMT and use patterns, availability of public charging, EVSE capacity, electrical panel distribution voltage and capacity evaluations, and more. There is currently no primary EVSE deployment planning point of contact. The County is panning to begin EVSE installation in 2021 based on Table 7 below.

OVER THE NEXT 5 YEARS: INSTALL 54 CHARGING PLUGS ACROSS 27 COUNTY LOCATIONS

Recommendations:

- Based on the considerations and analysis below, this Plan estimates that an additional 54 charging plugs will be needed over the next 5 years, across 27 locations to adequately serve County fleet electrification. Begin with installing Level 2 at each facility. See Table 7 on the following page for priority recommendations.
- Prince George's County currently has a total of 2,365 EVs registered in the County, 1,359 BEVs and 1,006 PHEVs[14]. Assuming the County would want to quadruple the amount of registered EVs in the County, EV-Pro Lite[15] recommends having 201 workplace charging plugs, 157 public Level 2 charging plugs, and 29 public DCFC charging plugs.
- The County should leverage State-level incentives that encourage adoption of PEVs and EVSE in residences, multifamily dwellings, commercial fleets, utility fleets, and non-profit organizations. A full list of current State-level policies and incentives is available in Attachment B.

TO QUADRUPLE PUBLIC EV REGISTRATIONS, PRINCE GEORGE'S COUNTY NEEDS 201 WORKPLACE, 157 PUBLIC LEVEL 2, AND 29 PUBLIC DC FAST CHARGING PLUGS

[14] MDOT MVA data as of November 30, 2020 from https://opendata.maryland.gov/browse?q=EV%20registration%20data&sortBy=relevance

[15] DOE, *Electric Vehicle Infrastructure Projection Tool,* https://afdc.energy.gov/evi-pro-lite

TABLE 7: EVSE INSTALLATION PRIORITIES

Building Name		EVSE Installation Priorities	Domiciled EVs
New HHS Building - Hampton Park Project		High Priority – Install stations and prewiring during construction	
DPWT Transit Ops and Maintenance Building		High priority to coordinate with bus charging installation	-
Facility Operations and Management		High Priority, station planning in progress	1
Inglewood #1		High Priority	1
Largo Government Center (LGC)		High Priority	1
Marburger Building and DPWT Trip Center		High priority for chargers which can service both	
Central Fleet		High upgrade priority from Level 1	-
RMS Building		Medium Priority, station planning in progress	-
Animal Services Facility		Low Priority	-
Cheverly Health Center		Low Priority	-
Health Department Admin		Low Priority	-
Consolidated Warehouse		Low Priority	-
Harriett Hunter Senior Center		High priority for pursuing utility-owned public charging. Low priority for fleet charging	-
Libraries:	Fairmont Heights, Glenarden, Greenbelt, Hillcrest Heights, Largo-Kettering, Oxon Hill, Spauldings Branch, Surratts-Clinton, Upper Marlboro, Bowie, South Bowie	High priority for pursuing utility-owned public charging. Low priority for fleet charging	-
	Accokeek, Bladensburg, Hyattsville	Existing planned EVSE Installations	
	Laurel and New Carrollton	Level 2 Charging Available	
Homeland Security Complex		Low priority for upgrade to networked chargers	-
911 Center		Low priority for upgrade to networked chargers	-
Inglewood #2		2 Level 2 EVSE Installed	1
Inglewood #3		6 Level 2 EVSE Installed	6
Wayne K. Curry Building		8 Level 2 EVSE Installed	5

EVSE Siting Design Criteria

Siting and deployment of EV charging infrastructure to support transportation electrification is a complex, time-intensive process. However, early coordination with key stakeholders can ultimately reduce deployment timelines and costs to installing EVSE that meets transit agencies' core needs.

Signage

The County has no signage requirements for EVSE. EVSE signage is used to signal where EVSE can be found along highways, how to use EVSE, parking regulations, and penalties. Adding signage requirements to County Code ensures that EVs have unobstructed access to EV charging and to make sure that local governments can recoup the costs of publicly-available charging in the event that the local jurisdiction owns and operates the equipment. The Federal Highway Administration (FHWA) defines minimum stands for signage that the County should follow.

***Recommendations*:**

- The County should add EVSE station signage requirements to the County code. New code should include wayfinding signage, parking restrictions that prevent ICE vehicles from using PEV-dedicated parking spaces, guidance on EVSE use, and penalties for regulation violations. All signs must follow minimum requirements set out by the FHWA's Manual on Uniform Traffic Control Devices (MUTCD).[16] Any additional modifications or requirements established by the County should be uniform across all EVSE locations. The FHWA suggests the following two designs,[17] a symbol and a written description, for EV charging station signs:

- The County should restrict the use of EV charging stations to vehicles that are currently charging to ensure that the equipment is available for drivers that need them. Restrictions are typically time-based, limiting charger use to a few hours. Time-based restrictions may differ based on EVSE type with DC fast chargers needing less time than Level 2 chargers.

EVSE Use Requirements

After establishing policies and strategies to encourage the deployment of EV charging infrastructure, a next step for local governments is to amend parking ordinances to specify the regulations that apply to parking spaces designated for EVs. The goal of these amendments is to ensure that EVs have unobstructed access to EV charging and to make sure that local governments can recoup the costs of publicly-available charging in the event that the local jurisdiction owns and operates the equipment.

Recommendation: When designating EV parking, the County should consider applicable definitions, restrictions, enforcement policies, time limits, and fees. In general, it is a best practice to restrict use of EV charging stations to vehicles that are currently charging to ensure that the equipment is available for drivers who need them. To be enforceable, signs need to be supported by County ordinances and specify time limits, fees, definitions, and rules of use.

[16] U.S. Department of Energy Alternative Fuels Data Center, *Signage for Plug-In Electric Vehicle Charging Stations*, retrieved from https://afdc.energy.gov/fuels/electricity_charging_station_signage.html

[17] Additional examples are available in Appendix D.

EVSE Parking Space Design

Currently, the County does not have any EVSE station dimension or design requirements. A lack of standardization may lead to different structure designs across the County, increasing difficulty of use. Current County parking space ordinances require that parking spaces meet the following dimension requirements:

TABLE 8. CURRENT COUNTY PARKING SPACE ORDINANCE REQUIREMENTS[18]

Type of Space	Minimum Size (feet)
Standard car spaces:	
Parallel	22 by 8
Nonparallel	19 by 9.5
Compact car spaces:	
Parallel	19 by 7
Nonparallel	16.5 by 8

***Recommendation*: The County should establish minimum dimensions for EV parking spaces, ensuring the safe and effective operation of the EVSE. Minimum dimensions for all EVSE parking should comply with the County's zoning requirements. At a minimum, EVSE parking spaces should be 21 feet (18 feet for the length of the parking space, 3 feet for EVSE clearance) by 9 feet. This would require the County to plan for parking spaces that are slightly longer than what the current County ordinance requires.

Parking space design includes establishing guidance on EVSE placement for perpendicular, parallel, or angled parking spaces at both on- and off-street locations. There are a variety of parking space dimension recommendations and case studies. The County may tailor EVSE parking designs to best fit its unique needs, but best practices[19] for on-street EVSE parking include:

- Installing the charging station(s) in the first and last spaces on a city block;
- Orienting the parking space and charger to allow PEVs to approach the charger in a diagonal or perpendicular (i.e., parallel parking) manner;
- Adding an access aisle of at least 3 feet between the parking space and the beginning or end of the block. This ensures that drivers are able to move around their vehicle and safely operate the EVSE; Building bollards or equivalent barrier for protection from street traffic;
- Using a retractable cord to increase ease of use and safety as well as maintaining an orderly aesthetic; and,
- Installing adequately lighting around the EVSE to ensure drivers can operate the EVSE safely and correctly.

[18] Prince George's County, Maryland – 2020 Code of Ordinances, Subtitle 27 (Part 11), retrieved from https://library.municode.com/md/prince_george's_county/codes/code_of_ordinances?nodeId=PTIITI17PULOLAPRGECOMA_SUBTITLE_27ZO_PT11OREPALO

[19] An example of EVSE dimension and design best practices is available in Appendix D.

Best practices for off-street parking:

- Installing charging stations at the front of parking spaces, allowing vehicles to approach the EVSE in a diagonal or perpendicular manner;
- Adding an access aisle of at least 3 feet on one side of the parking space to ensure drivers are able to move around their vehicle and safely operate the EVSE;
- Building bollards or equivalent barrier for protection;
- Using a retractable cord to increase ease of use and safety as well as maintaining an orderly aesthetic; and,
- Installing adequately lighting around the EVSE to ensure drivers can operate the EVSE safely and correctly.

Similarly, the County should consider the design of disabled access EVSE spaces. These requirements should include requirements for the number of spaces in areas that must be accessible in areas with multiple EV parking spaces and design standards for accessible spaces. In this case, the County should follow the U.S. Department of Energy's (DOE) guidance for complying with Americans with Disabilities Act (ADA) requirements outlined below:

TABLE 9. EVSE PARKING DIMENSION CONSIDERATIONS FOR ADA COMPLIANCE[20]

Design Element	Description
Number of Spaces	4% of parking spaces, or 1 for every 25 spaces, in any given lot, be designated as accessible
Parking Stall	8x18 feet for a car and 11x18 feet for a van
Accessible Route Width	Minimum 36 inches wide
Accessible Route Slope/Cross Slope	Maximum 1:20 (5%) running slope and 1:48 (2%) cross slope; Accessible vehicle spaces 1:48 (2%) in all directions and 90-inch clearance for vans
Reach Range	48 inches front and side to allow reach to all operable parts from a wheelchair
Accessible Controls	Operable with one hand and not requiring grasping, pinching, or twisting of the wrist or force more than 5 lbs. Exception: Gas pumps
Accessible Ramps	A ramp or curb-cut must be accessible in order to allow for operation of charging station
Facility Accessibility	Must be connected by a minimum of 50-inch-wide accessible route in proximity (not necessarily adjacent) to the entrance of the building
Side Access Aisle	Side access aisle of 60 inches wide to allow space for wheelchair and equipment in and out of space
Accessible Card Reading Devices	Must be connected by a minimum 50-inch-wide accessible route in proximity (not necessarily adjacent) to the entrance of the building
Other Considerations	Ensure that bollards, wheel stops, or curb do not obstruct use of charging station

[20] Guidance in Complying with ADA Requirements, U.S. Department of Energy, 2014, retrieved from https://afdc.energy.gov/files/u/publication/WPCC_complyingwithADArequirements_1114.pdf

The County should also consider weather-related situations, such as flood control zones, for EVSE installations and parking spaces. Due to the nature of EVSE, the County should guarantee that the EVSE will not be in standing water during flooding events or snowmelt.

There should be clear use instructions, pricing information, and customer support information clearly displayed on the EVSE.

Site Engineers
Site engineers are responsible for developing electrical designs to support on-site charging and may also coordinate with local permitting officials.

***Recommendation*:** The County should hire site engineers from the County Contracts List to design, develop, and evaluate all electrical designs to support on-site charging and communicate permitting needs with County officials.

General contractors: A general contractor may be required to make certain site upgrades related to electricity, site design, and construction.

***Recommendation*:** The County should hire general contractors from the County Contracts List to carry out all electricity pre- or re-wiring, trenching, or other activities that they County may not have the capacity to complete.

Internal transit agency staff: Facilities, operations, and maintenance teams should be involved to ensure that new electric transit buses and EVSE are integrated into agency operations.

***Recommendation*:** The County should improve communication between departments and fleet management to ensure all EVs in the fleet have EVSE that are adequately integrated into agency operations. To do this the County should establish a communication platform for information and knowledge sharing across County staff. As previously recommended, the County should establish the EVSE point of contact as the communications lead.

Networking and Interoperability

Providers
The County currently has 10 EVSE through SemaConnect and 6 EVSE through ChargePoint. Fleet PEVs currently use a proximity card to authorize charging, and the public can download the relevant apps for access to the EVSE. SMECO has contracted Greenlots to provide the hardware, software, installation, monitoring, maintenance and support for deployment of EVSE. Users will be able to access EVSE through the Greenlots app.

Recommendation: The County should ensure all EVSE providers can follow all EVSE codes, ordinances, and design specifications.

Communications and Interoperability
SemaConnect and ChargePoint use networked smart meters that separately meter EVSE electricity use and produce usage reports.

***Recommendation*: The County should track the evolution of open charge point protocol (OCPP) and develop a list of minimum requirements for EVSE hardware procurements which should include specifications for interoperability (OCPP v1.5 or higher).**

Networking helps maximize driver access to EVSE by providing a platform to locate and cycle through charging locations. The County should continue to install smart chargers to enable networking, maintain consistency, collect data, and ensure efficient energy use by fleet vehicles. To ease routes of communication, the County may choose between Wi-Fi, ethernet, or cellular service for data communication.

- For EVSE located near County buildings where Wi-Fi is available, a Wi-Fi-based communication network is feasible and affordable.
- For remote locations where ethernet service is available, running ethernet cables while trenching for power lines provides a low-cost communications solution. Ethernet cables are often the solution for connectivity in parking garages.
- For locations without Wi-Fi or ethernet options, cellular service may provide a stable and reliable connection, however it costs more than the other two options. To lower cellular costs, a bank of chargers can be installed with one cellular connection servicing all the chargers. Cellular connections must be continuously reliable, or a station may become inoperable. Cellular boosters can be used to enhance signals.
- For locations without access to any of the above options, open and non-networked charging stations must be used.

Stakeholder Engagement

Successful installation of EVSE relies on the County's coordination with other expert stakeholders. It is crucial to engage these partners early in the process to ensure project feasibility, establish reasonable timelines and costs, and minimize uncertainty surrounding deployment. The list below outlines the role of the County's key partners.[21]

Electric Utilities

Electric utilities are critical in EVSE infrastructure deployment as they provide power for the EVSE infrastructure. BGE, Pepco, and SMECO have service territories within the County and have an assortment of resources available to help install EVSE in an efficient and cost-effective manner. All utilities are actively engaged in EVSE infrastructure development and PEV adoption.

- BGE offers time-of-use (TOU) rate options to residential customers who purchase or lease a PEV and EVSE rebates to residential and multifamily customers for the purchase of Level 2 or DC fast chargers. For more information, visit the BGE EVsmart website.
- Pepco offers a TOU rate option to residential customers who purchase or lease a PEV and EVSE rebates to residential and multifamily customers for the purchase of Level 2 or DC fast chargers. For more information, see the EVsmart website.
- SMECO does not currently offer PEV or EVSE incentive programs, but the utility does offer an EV Guide[22] to help customers switch to a PEV.

[21] *Id.*

[22] SMECO, *Electric Vehicles,* https://www.smeco.coop/services/electric-vehicles

Recommendations:

- The County should continue to encourage the community and utilities to communicate and engage with each other. Larger community awareness of PEV and EVSE programs that are readily available will help reduce financial and mental barriers to PEV adoption within the community. To do this, the County should continue to engage with utility marketing representatives to spread program information within targeted populations.

- The County should also stay abreast with advancements in the PC44 working group. PC44 is currently examining rate design options for EVs that will have applications for the County, community, private, and non-profit sectors.

In 2019, the Maryland PSC approved a five-year pilot program that authorizes the installation of Level 2 and DC fast EVSE at public and government property in utility service areas.

Recommendation: The County should work closely with utilities to identify priority locations and streamline the permitting and construction process. The County should identify priority locations within each utility jurisdiction to maximize the efficacy of this pilot program.

Additional information on relevant utility programs and PSC orders is available in Attachment B.

PEV Drivers

Fleet drivers will be one of the first individuals impacted by the County's PEV and EVSE plans. They are responsible for operating PEVs and EVSE. An educated user group is less likely to experience range anxiety, misuse EVSE, or make mistakes when operating new equipment.

Recommendation: The County should engage with all employees that may use PEVs and EVSE. The focus of the engagement should be on understanding employee perceptions, training, and education. The County should consider implementing any or all of the following activities:

- Conduct a survey to assess current driver perceptions and understanding of PEV and EVSE.
- Provide training to employees on general PEV and EVSE facts, PEV and EVSE use, and updated County policies that pertain to the new technology.
- Allow employees to test drive PEVs to increase comfort with using new technology.
- Circulate informational materials to employees (e.g., Charging 101, PEV 101, etc.)
- Hold a virtual townhall for employees to engage with the County about this EV plan and how it will impact them.

Examples of workplace charging programs are available in Appendix D.

Members of the community have already begun adopting PEVs. Community adoption of PEVs is essential to helping both the County and State reach transportation electrification and GHG emissions reductions goals. While the County cannot determine the rate of PEV adoption within the community in the same manner it can with fleet vehicles, the County can play a role in stimulating the local PEV market.

Recommendations: The County should take an active role in encouraging community PEV adoption. The County may engage in any of the following activities to encourage PEV adoption:

- Conduct a survey to assess community perceptions and understanding of PEVs and EVSE. This will allow the County to better understand this stakeholder group and address any key barriers preventing adoption.

- Set up ride-and-drive events so that community members may experience PEVs and become more comfortable with the technology. However, due to COVID-19 and related health and safety concerns, virtual events may be preferable.
- Partner with utilities, OEMs, or dealerships to provide the community with information on PEVs, EVSE, financial incentives, and additional information to minimize barriers to adoption and facilitate positive relationships among these groups.

Both fleet and community PEV drivers play an important role in normalizing and accelerating PEV adoption. However, due to how new the technology is and how unfamiliar these stakeholder groups may be with charging stations, it is important to establish charging etiquette that is clear and accessible to all EVSE users.

Recommendations: The County should establish guidelines for charging station etiquette. These guidelines should apply to both PEV and ICE vehicle drivers, as ICE drivers may interfere with EV charger use. Guidelines should include the following instructions:

- Ask drivers to move their PEV as soon as it is done charging to allow others the opportunity to charge;
- Do not unplug other PEVs from an EVSE;
- Inform drivers of ICE vehicles to never park in spots designated for PEV charging, noting they could incur a fine if they choose to park there;
- Monitor battery charge level when leaving a vehicle at a charging station if the charging station is networked and has an app for easy tracking; and,
- Put the connector back on the EVSE when finished.

Establishing simple etiquette rules like these can help minimize any frustrations drivers may have during a technology transition. Sample workplace charging etiquette guides can be found at the following sources:

- ChargePoint, *5 ways to Master EV Etiquette*
- CleanTechnica, *EV Charging Etiquette – Manners, Please!*
- DOE, Outreach Resources for Your Employees
- DOE, Sample Workplace Charging Policy
- Electric Power Research Institute, *Consumer Guide to Electric Vehicle Charging*
- EVgo, *8 Dos and Don'ts for Courteous Electric Charging*
- Plugincars.com, *EV Charging Etiquette*

Ownership Models

The County currently owns a majority of the public EVSE in the County, but as PEV market share continues to increase residential users will require a larger network of EVSE. Privately-owned EVSE will need to be constructed and operated separate from County-owned EVSE and utility-owned EVSE on County property.

Recommendation: The County should require all new EVSE owners and operators to follow County codes, zoning ordinances, and EVSE dimension and design requirements. As the County solidifies requirements, it should limit the number of new EVSE owners, dimensions, and designs that are different from the existing infrastructure, making it easier to standardize charging stations in the future.

As the County expands beyond SemaConnect and ChargePoint stations, as discussed above, the County will need to work to unify standard operations of County-owned EVSE, including costs and maintenance contracts.

Setting Fees and Recouping Costs

Often, owners of publicly accessible charging spaces contract with EV service providers or third-party operators who install, operate, and set the fees on charging equipment. However, when owners do have the ability to set fees—either explicitly or implicitly through their choice of operator—they face conflicting goals. Site hosts often need to recoup the costs of installing, maintaining, operating chargers, and may also wish to price charging strategically to encourage turnover so chargers are available to those who need them most. On the other hand, pricing charging so that driving an EV is cheaper on a per-mile basis than a gasoline-powered vehicle creates an incentive for people to purchase EVs so that they use more electricity and less gasoline.

Stations owners can use a fixed fee, a fixed rate, or a pay per energy consumed basis:

- **An Access Fee** is a fee associated with gaining access to the charging station irrespective of if the vehicle is charging and/or how long it remains connected. It is essentially a flat rate per charging event, for initiating a session by connecting to the charging station.
- **A Station or Time-Based Fee** is a fee associated with the length of time a connection is established with the station, irrespective of whether the vehicle is charging or not (typically $1-2 per hour). A fixed rate fee may be charged if high utilization and turnover of vehicles is desired. Fees may be charged per hour or other intervals for Level 2 charging and a per minute basis for DC fast charging.
    - **Publicly accessible, county-owned stations currently charge $1 per hour.**
- **An Energy Fee** is a fee associated with the amount of energy consumed by the connected vehicle. This is based on a per kilowatt-hour flat rate and only applies when the vehicle is actively charging.

This fee is typically not applied when the vehicle is not receiving power even if the vehicle remains connected to the EV station. A multiplier on this cost may be applied to recover other operational costs.

These considerations are not applicable for fleet-only charging stations. Fleet charging stations, located in a private fleet yard, do not need to have payment features if access is restricted. This reduces the capital cost of the EVSE purchase and installation.

Recommendation: Maryland PSC approved the Public Conference (PC)44 workgroup to investigate ideal PEV rates.[23] The current average price per kWh to charge a PEV is approximately $0.10, but this can vary based on electricity provider, location, charger level, and rates exclusive to PEV owners. Prince George's County should evaluate their role in a community EV charging program, to determine their public charging rates. The County could support charging growth by providing free and/or discounted charging spaces at facilities located in low-income areas. However to establish a uniform cost of public charging in the County, the pricing model of their publicly-accessible to match the approved commercial EVSE rates for the utility, as follows:

- Level 2 Charging: $.18/kWh
- DCFC Charging: $.34/kWh
- Discount DCFC rate for Fleets using publicly-accessible stations with a paywall (Fleet rate): $.255/kWh on DCFCs

Current utility rates are as follows:

TABLE 10. UTILITY RATES

Utility	Market	Price per kWh
BGE	Residential	$0.07 (EV schedule: $0.147, on-peak; $0.047, off-peak)
	Commercial	$0.057 - $0.076
	Commercial EVSE	$0.18 - $0.34
Pepco	Residential	$0.065 (TOU pilot: $0.187 on-peak; $0.057 off-peak)
	Commercial	$0.062 (EV schedule)
	Commercial EVSE	$0.18 - $0.34
SMECO	Commercial EVSE	$0.18 - $0.34

Access fee-based pricing is ideal for stations that have set member groups like workplaces or private property while charging higher prices for non-members. This model could prove beneficial for keeping County fueling costs lower, but would likely disproportionately shift costs onto public users. This type of fee might be ideal at locations where the County would want to discourage public use of a charger and prioritize charging for fleet vehicles.

A time-based fee could remain for locations where the County wants to encourage vehicle turnover, such as shopping centers, on-street parking, libraries, or other high-traffic areas. To help recoup operation costs, the County should couple time-based fees with an energy fee. The ideal pricing structure for EVSE is still being explored. In Maryland, PC44 is studying charging rates for county- and privately-owned EVSE. The County should engage with its regional utilities and PC44 to determine ideal rate structures.

[23] Maryland PSC, https://www.psc.state.md.us/search-results/?q=9478&x.x=12&x.y=14&search=all&search=case

Maintenance and Upgrades

Many of the County's EVSE are older models which may need to be replaced or upgraded in the next 5 years. Networked stations often provide maintenance package as part of the network fee, and are beginning to introduce automatic EVSE upgrade packages after certain amounts of time.

> ***Recommendation:*** As the County continues to own stations or allow externally owned stations to be installed on County property, a regular maintenance schedule must be included with every EVSE installation. The County will need to budget for station maintenance and upgrades if it is not in the current EVSE contracts.

Permitting Process

Making the permitting process easy, affordable, and less time consuming can help speed the roll out of charging infrastructure and make installations more straightforward. Currently, the County does not track EVSE permit applications and is currently determining the number of EVSE permitted within County jurisdiction. The County's permitting process is online. There is a $47.25 application fee, and the permitting process is uniform across projects and applicants.

***Recommendations*:** The County should consider the following actions:

- Develop a permitting checklist for EVSE installation and have it readily available online. This will guarantee that EVSE providers are aware of all requirements and processes necessary for EVSE installation, increasing project efficiency.
- Streamline the permitting process for installations in single-family residences by reducing application material requirements. For example, eliminate site plan requirements and require installer to provide manufacturer specifications and approved equipment testing certification at the time of inspection, limit to one inspection, and set a fixed fee.
- Reduce or waive EVSE permitting fees. To reduce the cost of permitting to building owners, local governments should aim to levy permitting fees for charging stations. This may help remove financial barriers from EVSE installation.
- Work with local utilities to create a protocol for new EVSE construction and operation that works in tandem with the permitting process.

Building Codes

Building codes are the most common mechanism through which local governments can require pre-wiring or charging. Pre-wiring involves installing raceways and infrastructure capable of supporting future electrical demands from EV charging. Having the electrical infrastructure pre-installed will allow the charging station equipment to be easily and cost-effectively added later.

Safety Requirements

Prince George's County has adopted the National Fire Protection Association 70 (NFPA 70) National Electric Code. By adopting NFPA 70, all electric vehicle supply equipment (EVSE) installed within the County must meet standardized listing and labeling requirements. This standard ensures EVSE are installed safely but does not provide guidance for other EVSE building code requirements or issues.

***Recommendation*:** The County should adopt further regulations to standardize the EVSE specifications installed across facilities, dividing recommendations into public facing light-duty EVSE, light-duty fleet EVSE, and heavy-duty EVSE.[24]

Pre-Wiring Requirements

The State of Maryland's Building Performance Standards (MBPS) requires each jurisdiction to use the same edition of the same set of building codes which include the International Building Code (IBC) and the International Energy Conservation Code (IECC). Currently the 2018 IECC is in effect in Maryland. Under MBPS, local jurisdictions can modify these codes, except for the energy conservation and accessibility codes, which can only be modified to be more stringent. The IECC is revised every three years and the latest 2021 version attempted to include requirements for "EV ready" and/or "EV capable spaces" in new residential, multi-family residential, and commercial buildings. The provision ultimately failed due to a conflict of interest with the IECC scope, but does provide a more stringent EV ready code that Prince George's County could adopt for residential or commercial settings.

Error! Reference source not found.11 b elow presents the failed EV requirements of the 2021 IECC, that the County could consider:

- EV Capable Space - Electrical panel capacity and space to support a minimum 40-ampere, 208/240-volt branch circuit for each EV parking space, and the installation of raceways, both underground and surface mounted, to support the EVSE.
- EV Ready Space - A designated parking space which is provided with one 40-ampere, 208/240-volt dedicated branch circuit for EVSE servicing Electric Vehicles. The circuit shall terminate in a suitable termination point such as a receptacle, junction box, or an EVSE, and be located in close proximity to the proposed location of the EV parking spaces.

TABLE 11. IECC 2021 EV PROPOSED REQUIREMENTS FOR NEW COMMERCIAL AND MULTI-FAMILY RESIDENTIAL BUILDINGS[25]

Total Number of Parking Spaces	Minimum number of EV Ready Spaces	Minimum number of EV Capable Spaces
1	1	-
2-10	2	-

[24] See the suggested EVSE standards when presented in that section of the report. Can provide a high-level version here.

[25] IECC, *Proposed Changes to the 2019 International Codes*, http://media.iccsafe.org/code-development/group-b/2019-Group-B-CAH-compressed.pdf

11-15	2	3
16-19	2	4
21-25	2	5
26+	2	20% of total spaces

For new one- and two-family dwellings, the IECC proposed the provision of at least one EV ready space.

Recommendation**:** The County should pursue prewiring standards, as a building code policy for the entire County or simply for County buildings, seeking to pass an ordinance that builds upon the proposed 2021 IECC code for EVs

The County currently requires one EVSE per 50 parking spaces at all public buildings through the Green Fleet Policy.[26] The County does not have any EVSE requirements for residential or commercial locations.

Recommendation**:** The County should revisit the Green Fleet Policy Resolution's stance on parking. The market has changed dramatically since the Policy was adopted in 2014. The language used states that the County "shall include one electric charging station for every 50 parking spaces" however this presents several issues with current technology:

- Does not specify Level 1, Level 2, or DCFC stations.
- Does not account for dual-port Level 2 charging stations which could be considered two stations.
- Does not account for the mix of fleet, public, and workplace charging use at that location.

The Policy should switch instead to a minimal Level 2 EVSE and/or DCFC charging combination requirement, for buildings with over 50 parking spaces. For example, it could state that a building with fleet vehicle parking must have at least two ports of Level 2 EVSE or one DCFC available for fleet use. Public and/or workplace charging areas should have a minimum of two dual port Level 2 EVSE or one DCFC. When installing new EVSE to meet this requirement, the County should prewire enough load capacity to double their installation as needed, helping to future-proof EVSE demand. This policy should be reevaluated every 5 years, based on station utilization and fleet charging demand.

ADA Regulations

Currently, there are no County, Maryland, or Federal requirements for ADA-accessible EV charging spaces. Some other jurisdictions, with a higher concentration of EV deployment, have adopted ADA standards for EVSE,[27] which may be a situation the County faces in the future.

[26] Prince George's County, *Green Fleet Policy Resolution,* https://princegeorgescountymd.legistar.com/View.ashx?M=F&ID=4034915&GUID=BBCE02B5-A0B3-4926-8FF6-9F21293E1105

[27] Access Board, *ADA Standards,* https://www.access-board.gov/guidelines-and-standards/buildings-and-sites/184-ada-standards/guide/1798-chapter-5-parking

***Recommendation*:** The County should consider placing EVSE in a location that could easily meet ADA certifications in the future. The County does not have a current demand for ADA-accessible EVSE, however if the County prewires extra spaces, as recommended above, the design plan should include access for an EVSE adjacent to an ADA-accessible space.

For a make-ready best practice example, see Attachment E.

Zoning

Local governments specify how much parking should be provided at different locations and/or land uses in their zoning ordinances, development guidelines and standards, or accompanying parking codes, and as such these documents can also include charging requirements or incentives. The County is planning to revise the parking regulations within the Zoning Ordinance for incentives and regulations for PEV charging areas for Level 2 EVSE.

***Recommendations*:**

- Allow PEV parking to count towards minimum requirements. If EV parking is not counted toward these requirements it can discourage developers from installing charging infrastructure. This is because developers must either build more structured parking or reduce the amount of developed space to accommodate the extra parking needed for EVs to access charging stations. Amending the zoning or parking code to allow EV parking to count toward parking requirements would allow developers to provide EV charging without increasing the total number of parking spaces required.
- The County should create new zoning codes that include only Level 2 and DC fast chargers – Level 1 chargers are primarily residential and do not require electrical upgrades. Similarly, the County should zone areas as high-priority areas for EVSE installations.

For zoning best practices examples, see Attachment E.

Solar Charging

Solar photovoltaic arrays with incorporated into EV charging system, if a battery storage option is also included, creating a microgrid. Due to fluctuating solar intensity, the battery system is needed to provide a reliable electricity source for EVSE. Typically, these microgrids only power Level 2 EVSE, unless also connected to the main grid to provide the extra power needed for a DC fast charger.

Creating these microgrids provides resiliency in emergency situations, which is why Montgomery County has installed two microgrids combining solar power and EVSE at government buildings.[28] Portable, all-in-one solar arrays with a battery and charging station are available, allowing fleets to move charging as needed while pending a permanent EVSE installation or when needed in an emergency situation.

***Recommendations*:**

- Apply for solar, battery storage, and/or EVSE grant funding to test a microgrid charging system at a County facility with solar potential as marked in Table 5, above.
- Explore whether a portable microgrid would provide additional resiliency and/or emergency capabilities for the County.

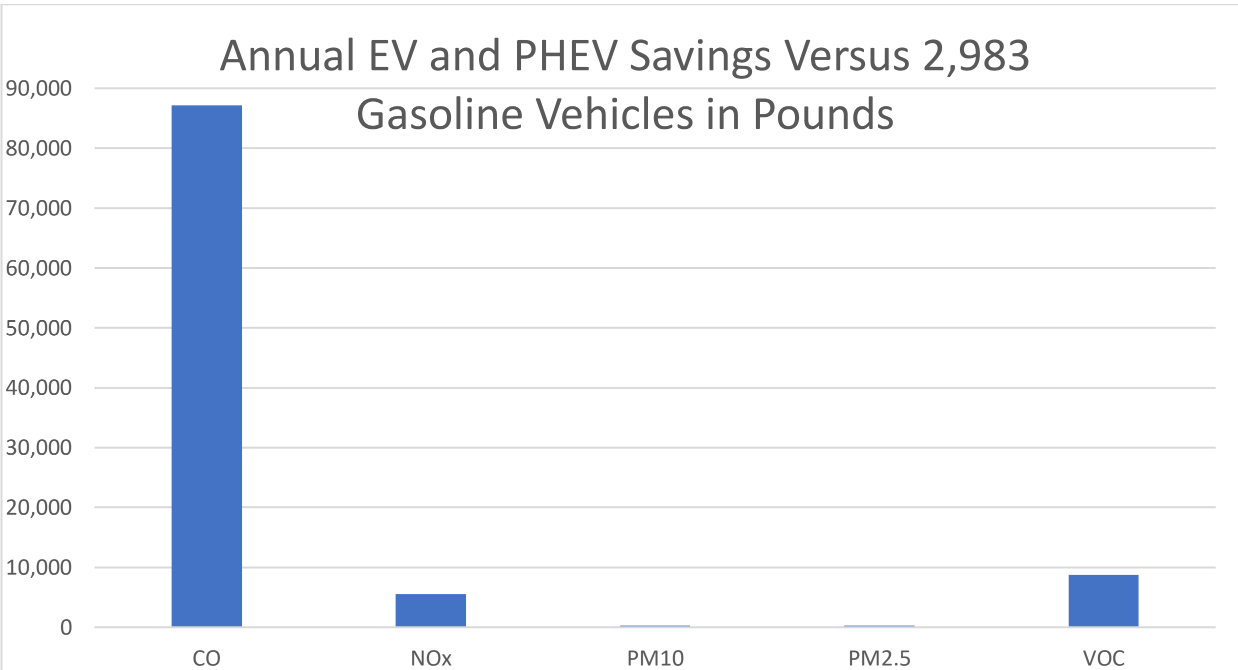
[28] Greentech Media, *Why Electrified Transportation Needs Microgrids,* https://www.greentechmedia.com/articles/read/why-electrified-transportation-needs-microgrids

Section 4: Environmental Benefits

Vehicle Emissions Savings

As discussed in Section 1, light-duty BEVs reduce GHG emissions by over 72% compared to light-duty gasoline-powered ICE vehicles, supporting the County's Green Fleet Policy goal of a 25% reduction in GHG emissions by 2025. If the entire Prince George's County light-duty vehicle fleet were to convert to a 50:50 mix of EVs and PHEVs, the fleet would save over 85,000 pounds of CO_2e annually, by far exceeding the Green Fleet Policy goal, as shown in Figure 9.[29]

FIGURE 9. FLEET AIR POLLUTION SAVINGS FOR LIGHT-DUTY VEHICLE ELECTRIFICATION

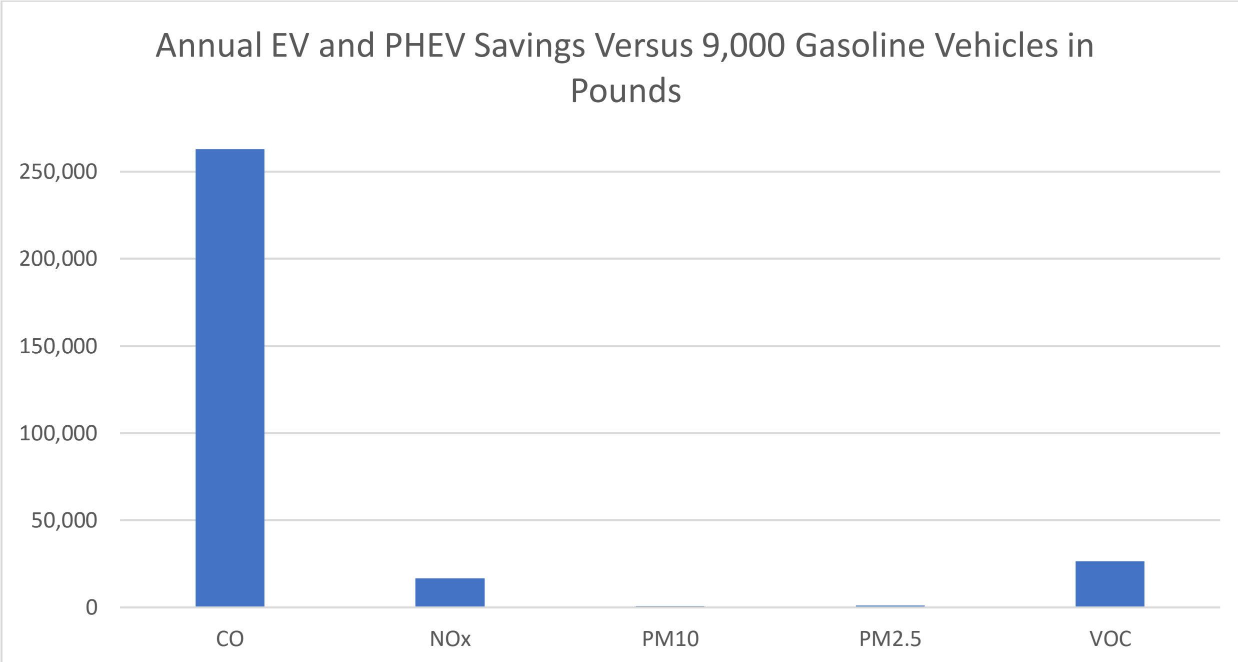


Similarly, if the County was able to support and accelerate the replacement of registered internal combustion engine vehicles with EVs and PHEVs within the County, eventually quadrupling the current PEV registrations, the County could see over 250,000 pounds of CO_2e eliminated annually, as shown in Figure 10[30].

[29] Argonne National Laboratory, *Alternative Fuel Life-Cycle Environmental and Economic Transportation (AFLEET) Tool*, https://greet.es.anl.gov/afleet_tool

[30] *Id.*

FIGURE 10. COMMUNITY AIR POLLUTION SAVINGS FOR 9,000 VEHICLES



Firmer goals, calculations, and PEV deployment support methodologies should be established in a community wide EV plan, and coordinated with any Climate Action Plan goals being planned by the County.

Charging Station Emissions Savings

Emissions savings from workplace and public BEV charging on County property are additional benefits of County EVSE deployment. The standard calculations from the Maryland utilities and EVSE providers uses the methodology used in Table 12.

TABLE 12: EVSE EMISSIONS SAVINGS CALCULATIONS

Measurable Unit	Calculation Methodology
Charging Sessions	Number of charging sessions
Duration	Energy used per charging session (kWh)
Energy Used	(Charging session) X (Duration)
Gasoline Saved	(kWh) X (3.5miles/kWh) / (30MPG)[31]
CO_2 Offset	(Gasoline saved) X (19.59 pounds C02/gallon)[32]

[31] Not that the average miles/kWh varies per location depending on vehicle model efficiency and vehicle mix. The average range is 3-4 miles/kWh, so ICF utilized the median 3.5 miles/kWh.

[32] U.S. EPA Greenhouse Gases Equivalencies Calculator, https://www.epa.gov/energy/greenhouse-gases-equivalencies-calculator-calculations-and-references

If a 50kw DCFC were installed, a 20-minute charging session would use 16.66kWh. Assuming the station is fully utilized daily by 2 sessions per hour across a 10-hour day, 333.2 kWh of energy would be used. Per the above calculator, this would result in 58.46 pounds of CO_2 offset daily, totaling 21,330 pounds of CO_2 offset annually per DCFC station.

(333.2kWh) X (3.5miles/kWh) / (30MPG) X (19.59 pounds C02/gallon) = 58.46 pounds of CO_2

Supporting Documentation

A set of resources and information to inform the plan.

- Attachment A. Policies, Programs, and Incentives
  - County
  - State Agencies
  - PSC
  - Utility (include compliance with utility electric vehicle charging station pilot program)
  - Grant Funding
  - Other/Private/OEMs
- Attachment B. Siting Criteria and Best Practices
  - Vehicle Forecasts (*Light-duty, bus, etc.)*
  - Type of charging infrastructure available (e.g. Smart chargers) and pros and cons of each
  - Technical requirements
- Attachment C. EVSE Costs
- Attachment D. Electric Bus
- Attachment E. Best Practice Examples
- Attachment F. EVSE in Maryland by ZIP Code
- Attachment G. Maps
- Attachment H. Organizational Chart
- Attachment I. Electrical Surveys
- Attachment J. Summary of Recommendations

Attachment A. Policies, Programs, and Incentives

A summary of the current incentives and programs in Maryland are below. The is not a comprehensive list of city, county, and other EV programs as many are not advertised.

State Incentives

- **EVSE Rebate Program:** The Maryland Energy Administration (MEA) offers a rebate to individuals, businesses, or state or local government entities for the costs of acquiring and installing qualified EVSE.
- **PEV and Fuel Cell Electric Vehicle (FCEV) Tax Credit:** Qualified PEV and FCEV purchasers may apply for an excise tax credit of up to $3,000.
- **PEV High Occupancy Vehicle (HOV) Lane Exemption:** Permitted PEVs may operate in any Maryland HOV lanes regardless of the number of occupants.
- **Alternative Fuel Infrastructure Grants:** The Maryland Alternative Fuel Infrastructure Program (AFIP) provides grants to plan, install, and operate public access alternative fueling and charging infrastructure. Maryland-based private businesses are also eligible, and projects must take place in the state.
- **Zero Emission School Bus Grant Program and Study:** The Maryland Department of the Environment administers a Zero Emission School Bus Transition Grant Program to purchase zero emission school buses, install charging infrastructure, and transition to zero emission school bus fleets.
- **Idle Reduction Weight Exemption:** Any motor vehicle equipped with a qualified auxiliary power unit or idle reduction technology may exceed the state gross, axle, tandem, or bridge weight limits by up to 550 pounds to account for the weight of the technology.
- **EV Emissions Inspection Exemption:** Vehicles powered exclusively by electricity are exempt from state emissions inspections.

Utility Incentives

The Maryland Public Service Commission initiated a proceeding in 2017, PC44, to launch a targeted review of electric distribution systems in Maryland. The Commission established guiding principles and a list of topics, and one of those was Electric Vehicles (Case No. 9478). The EVSE Infrastructure Pilot Program was approved by the Maryland PSC in 2019. The decision supports the deployment of more than 5,000 total Level 2 and DC fast charging stations in the service territories of Baltimore Gas and Electric Company (BGE), Delmarva Power and Light Company, Potomac Edison and Potomac Electric Power Company (Pepco). Stations in SMECO territory were approved as well. The utilities are able to own and install charging stations on public territory, such as County property, per this decision.

Prince George's County is actively working with the utilities to install stations on County property. For questions about utility programs or contact information, please contact Erica Bannerman.

BGE

The Maryland PSC has approved BGE to install 500 charging stations on property owned, leased or occupied by state, county or local municipal government. Charging stations must be available to the public 24/7. All subcontractors supporting the installation of public charging stations will be Exelon-approved vendors and licensed to operate in the state of Maryland. Contractors are selected per locations based on availability and demonstrated ability to meet the scope of work requirements. BGE installs EV Parking Only signs on each parking space, however BGE cannot enforce parking restrictions, it is up to the site host to enforce and local policies. The stations will be listed on Plugshare.com, AFDC.Energy.Gov, BGE.com/ElectricVehicles and the Greenlots app to ensure that customers can locate and access BGE's charging stations. All charging stations are OCPP 1.5 and 1.6 compliant

Siting criteria for Level 2 and DCFC stations:

- Open to public 24/7
- Government property
- No existing charging on site
- Accessible electrical infrastructure
- Space for chargers and associated support equipment
- ROW agreement in place with Site Host
- L2s are better for longer dwell times; parks, park and rides, libraries, metro station
- DCFCs are better for shorter dwell times; visitor centers, rideshare lots, government offices
    - Most sites are best suited for a combination of L2 and DCFC

Public charging rate for all users in cents per kWh:

- Level 2 Charging (L2): $.18/kWh
- Level 3 Charging (DCFC): $.34/kWh
- Discount DCFC rate for Fleets (Fleet rate): $.255/kWh on DCFCs

For any issues with the stations, inquiries should be directed to Greenlots using the number listed on all chargers: 1-855-900-PLUG (7584). For questions about the BGE program contact 866-414-1256

Pepco

The Maryland PSC has approved Pepco to install 250 charging stations on property owned, leased or occupied by state, county or local municipal government. Charging stations must be available to the public 24/7. All subcontractors supporting the installation of public charging stations will be Exelon-approved vendors and licensed to operate in the state of Maryland. Contractors are selected per locations based on availability and demonstrated ability to meet the scope of work requirements. It is up to the site host to enforce and local parking policies. The stations will be listed on Plugshare.com, AFDC.Energy.Gov, and Pepco.com. All charging stations are OCPP 1.5 and 1.6 compliant

Siting criteria for Level 2 and DCFC stations:

- Open to public 24/7
- Government property
- No existing charging on site
- Accessible electrical infrastructure
- Space for chargers and associated support equipment
- Dedicated EV parking spaces
- Accessible amenities
- Within 2 miles of major roads
- ROW agreement in place with Site Host

Public charging rate for all users in cents per kWh:

- Level 2 Charging (L2): $.18/kWh
- Level 3 Charging (DCFC): $.34/kWh
- Discount DCFC rate for Fleets (Fleet rate): $.255/kWh on DCFCs

SMECO

SMECO has been authorized by the Maryland PSC to install up to 60 public EV charging stations throughout its service territory through a 5-year pilot program. SMECO is targeting 50 Level 2 chargers and 10 DC Fast

Chargers, however, up to 20 of the charging stations can be DC Fast Chargers. The charging stations must be installed on property leased, owned or occupied by a unit of State, county or municipal government for public use with 24/7 access.

Siting criteria includes adhering to the Maryland PSC siting requirements, installation costs, location, location of existing EV charging infrastructure, geographic dispersion throughout SMECO's service territory and input from our government partners. The process for determining selection of DCFC vs Level 2 is primarily based on existing SMECO infrastructure and its ability to handle DC Fast.

SMECO will be responsible for ensuring that signage is in place at each EV charging location. SMECO does not have the authority to enforce parking or situations of overcharging at EV stations.

The rate for Level 2 charging is currently $0.18/kWh and the rate for DC Fast Charging is currently $0.34/kWh. SMECO has not filed for nor been approved for any fleet rates at this time. The stations will be listed on Plugshare.com, AFDC.Energy.Gov, and the Greenlots app to ensure that customers can locate and access BGE's charging stations.

For any issues with the stations or customer questions, inquiries should be directed to Greenlots using the number listed on all chargers: 1-855-900-PLUG (7584)

Additional utility incentives

- BGE
  - **PEV Charging Rates – BGE:** BGE offers time-of-use (TOU) rate options to residential customers who purchase or lease a PEV.
  - **EVSE Rebate – BGE:** BGE provides rebates to residential and multifamily customers toward the purchase of qualified Level 2 and direct current fast charging EVSE.
- Pepco
  - **PEV Charging Rate Incentive – Pepco:** Pepco offers a time-of-use rate to all qualified residential customers in Maryland who own or lease a PEV.
  - **EVSE Rebate – Pepco:** Pepco provides rebates to residential and multifamily customers toward the purchase of qualified Level 2 EVSE.

EV Laws and Regulations

- **EVSE Regulation Exemption:** Owners and operators of EVSE are not subject to state regulation as electricity suppliers or public service companies.
- **PEV Information Disclosure:** The Maryland Motor Vehicle Administration may provide the address of a registered PEV owner and information about the vehicle to electric companies for planning electric power supply.
- **Zero Emission Vehicle (ZEV) Infrastructure Promotion:** The Maryland Zero Emission Electric Vehicle Infrastructure Council (ZEEVIC) promotes the use of promotes the use of ZEVs, including plug-in electric vehicles (PEVs) and fuel cell electric vehicles (FCEV), in the state.
- **ZEV Deployment Support:** Maryland signed a multi-state memorandum of understanding (MOU) to support the deployment of ZEVs through involvement in a ZEV Program Implementation Task Force (Task Force) that published ZEV Action Plans in 2014 and 2018.
- **ZEV Sales Requirements and Low Emission Vehicle (LEV) Standards:** Maryland has adopted the California motor vehicle emissions standards and compliance requirements specified in Title 13 of the California Code of Regulations.

- **Aftermarket Alternative Fuel Vehicle (AFV) Conversion Requirements:** Conventional original equipment manufacturer vehicles altered to operate on propane, natural gas, methane, ethanol, or electricity are classified as aftermarket AFV conversions and must meet California Air Resources Board standards for aftermarket conversions.

City Efforts

- **Baltimore**
  - Expanding publicly available EVSE infrastructure throughout the city to facilitate the adoption of EVs. The Baltimore Department of Public Works installed 13 EVSE in city garages and at street-side locations.
  - In 2016 the city ran an electric fleet vehicle pilot program.
- **Bowie**
  - Bowie has a variety of PHEVs and EVs in their fleet. The Bowie Police Department also purchased electric motorcycles for its patrol fleet.
- **College Park**
  - Installed EVSE and 85% of its fleet vehicles are hybrids or EVs.
- **Frederick**
  - The city adopted a Plug-in EV Charging Infrastructure Plan in March of 2018.
- **Greenbelt**
  - The city has hybrid and all-electric vehicles in its fleet. The city also installed multiple Level 2 chargers and one DCFC charger at the Public Works and Municipal buildings.
- **Hyattsville**
  - The police department has the first all-electric police vehicle in the United States in its fleet (video). They also have an all-electric police motorcycle, hybrid police vehicle, and all-electric Segways and golf carts.

Other Counties Efforts

- **Anne Arundel**
  - Converting the County fleet to all-electric vehicles over the next 15 years.
- **Howard**
  - The county passed an anti-icing regulation to enforce EVSE parking restrictions
- **Montgomery**
  - The EV infrastructure Plan summarizes the County's Department of Transportation's preparations and actions taken to facilitate the development of EVSE infrastructure in county parking facilities.

Additional Government or Nonprofit EV Programs

In addition to MWCOG's EV efforts, the following organizations promote EV deployment in the region:

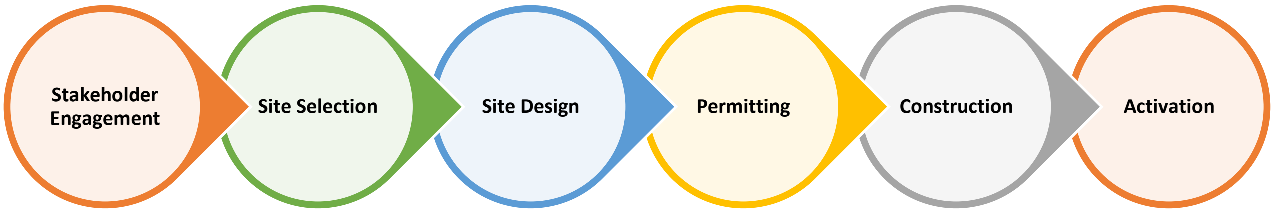
- **Electric Vehicle Association of Greater Washington DC (EVADC)**
  - EVADC is an organization of electric vehicle owners, educators and enthusiasts dedicated to promoting the use of EVs. EVADC holds regular monthly meetings, public displays, car shows and tech sessions to exchange information.
- **Greater Washington Region Clean Cities Coalition**
  - The EV page on their website has resources for EVs and EVSE in the DMV region. They also host EV showcases and clean transportation expositions.
- **Maryland Clean Cities**

  - Works with vehicle fleets, fuel providers, community leaders, and other stakeholders to save energy and promote the use of domestic fuels and advanced vehicle technologies in transportation. Administered by MEA.
- **Maryland Green Registry**
  - Offers tips and resources to help businesses and other organizations set and meet their own goals on the path to sustainability, including EV adoption. Administered by the Maryland Department of Energy (MDE).
- **Maryland EV**
  - Maryland EV is an EV education and outreach resource, organized by MDOT, MEA, and MDE. Their purpose is to facilitate discussion, information exchange, education, business and economic development, and planning related to ZEVs and ZEV infrastructure in support of Maryland's ZEV adoption and climate goals.
- **Climate Mayors EV Purchasing Collaborative**
  - The Collaborative works to leverage the buying power of Climate Mayors cities to reduce the costs of EVs and charging infrastructure for all U.S. cities, counties, state governments and public universities, thereby accelerating fleet transitions. The Collaborative also provides training, best practices, educational resources, and analysis support, creating a one-stop shop to support EV transitions for public fleets.
  - Participating Maryland cities/counties: Baltimore, College Park, Greenbelt, Hyattsville, Takoma Park, and Montgomery County

Attachment B. EVSE Siting Criteria and Best Practices

Siting and deployment of EV charging infrastructure to support transit bus electrification is a complex, time-intensive process. However, early coordination with key stakeholders – including the electric utility – can ultimately reduce deployment timelines and costs to installing EVSE that meets transit agencies' core needs.

FIGURE 9. STEPS TO DEPLOYING TRANSIT BUS EV CHARGING INFRASTRUCTURE



The figure below illustrates a step-by-step approach to deploying transit bus charging infrastructure.[33]

1. Stakeholder Engagement

Successful installation of EVSE relies on the transit agency's coordination with other expert stakeholders. It is crucial to engage these partners early in the process to ensure project feasibility, establish reasonable timelines and costs, and minimize uncertainty surrounding deployment. The list below outlines the role of key partners.[34]

- **Electric utilities:** As the entities responsible for delivering safe and reliable electricity to the EVSE, electric utilities are critical in the planning of charging infrastructure deployments.[35] Because transit bus charging places new electricity demands on the distribution grid, transit agencies must work collaboratively to determine if any electrical upgrades are needed to meet new loads. Utilities may also have incentives or other resources available to help transit agencies navigate EVSE installation cost-effectively.
- **Bus and EVSE manufacturers:** Equipment providers can provide transit agencies with technical information on the charging compatibility, capabilities, and limitations of the buses and chargers. Bus manufacturers can also provide recommendations for charging in a manner that preserves the health of the vehicle's battery.
- **Site engineers:** Site engineers are responsible for developing electrical designs to support on-site charging and may also coordinate with local permitting officials.
- **Permitting agencies:** Local governments typically require permits for new EVSE installations to ensure they conform with local health and safety standards.
- **General contractors:** A general contractor may be required to make certain site upgrades.

[33] Linscott, M. and A. Posner. 2020. *Guidebook for Deploying Zero-Emission Transit Buses.* Pre-publication draft of TCRP Research Report 219. Transportation Research Board, Washington, D.C.

[34] *Id.*

[35] Edison Electric Institute, *Preparing to Plug In Your Bus Fleet*, December, 2019. Available at: https://www.eei.org/issuesandpolicy/electrictransportation/Documents/PreparingToPlugInYourBusFleet_FINAL_2019.pdf

- **Internal transit agency staff:** Facilities, operations, and maintenance teams should be involved to ensure that new electric transit buses and EVSE are integrated into agency operations.

2. Site Selection

Site selection is influenced by several related factors, including bus duty cycles, permitting requirements, and future electric bus procurement plans. There are two primary site types for EVSE that supports transit buses: depot charging and on-route charging. Depot charging is well-suited to electric bus refueling because depot facilities are owned by transit agencies and the central location where buses tend to sit idle when they are not in service. Operations and maintenance staff may also be on hand at depots to charge and assess the battery life of the buses before going into service. When considering depot charging, transit agencies must also consider if bus operations will require the deployment of dedicated chargers for each bus and what ratio of redundant chargers may be needed to ensure reliable service.[36] Space constraints may also be a challenge for some depots and facilities managers should determine whether the installation of pedestal or wall-mounted EV chargers disrupts depot operations. Overhead or pantograph charging may alleviate space limitations, but will require additional planning and costs.

On-route charging refers to charging that takes place away from the depot while the bus may be in service. Large transit centers or last stop locations may be ideal sites for on-route charging. However, transit agencies will need to have or acquire rights to deploy infrastructure at these sites. Charging at these locations can extend the service that electric buses could provide and mitigate space constraints at depots. On the other hand, transit agencies may need to take additional steps to ensure that remote equipment will remain reliable and that active bus routes remain close to fixed charging infrastructure once it is installed. The table and figure below provides more information on the advantages and disadvantages of depot and in-route charging configurations.

TABLE 12. EVSE SITE SELECTION TRADE-OFFS

Charging Configuration	Depot Charging	In-Route Charging
Concept	All energy added "overnight," using 50-100 kilowatt (kW) chargers at a depot	All energy added "in-route" using 300-600 kW chargers located throughout service area
Advantages	• More direct control over infrastructure • Potentially less expensive in the long run • Potentially lower electricity costs	• Potentially less expensive now • No modifications to bus routes needed • No loss of depot parking capacity
Cost and Trade-Offs	• Space required for chargers may reduce parking capacity • May need to modify bus routes depending on bus performance	• Charger site acquisition and permitting • Less control over infrastructure • Higher infrastructure costs • Higher charger maintenance costs

[36] EVSE may need repairs and upkeep that temporarily preclude its use.

	• Potentially challenging to provide back-up power	• Higher electricity costs • Additional in-route time needed to accommodate charging

Source: MJ Bradley, 2019[37]

FIGURE 10. PARAMETERS FOR DETERMINING OPTIMAL BUS CHARGING CONFIGURATIONS

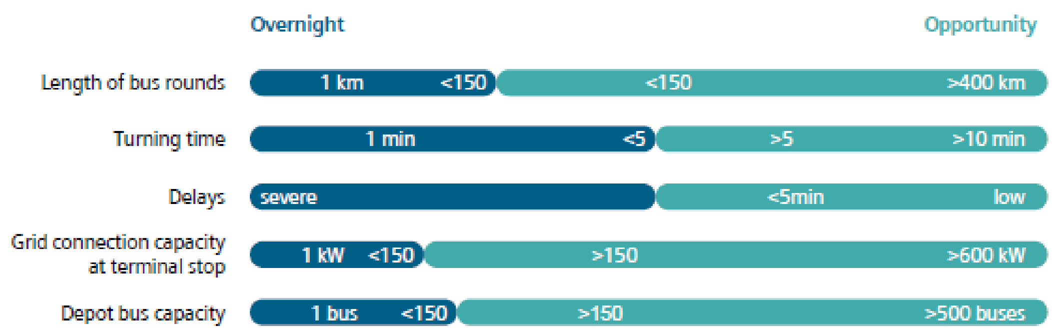


Figure 5:
Five characteristic parameters of a transport provider to decide whether to focus on overnight or opportunity charging.

Source: Siemens[38]

3. Site Design

Once a site has been identified, transit agencies may choose to develop the site design in-house or may need to procure an engineering firm to develop the site design. Competitive procurements for engineering firms may add additional time to the deployment process. If charging infrastructure deployments are part of a utility's transportation electrification program offering, the utility may have already procured an engineering firm or internal expertise to complete site designs.

All relevant key stakeholders should be involved in this step, including permitting officials who may provide additional guidance to streamline the permitting process.[39] Utilities may also have metering recommendations that influence final site designs. Transit agencies also have flexibility over how active they are in the site design process: depending on the unique circumstances of the project, agencies may choose to lead the site and infrastructure design themselves, have the bus manufacturer include charging equipment in the bus purchase and install the EVSE themselves, or have the bus manufacturer control the site and infrastructure specifications end-to-end.[40] Each approach may have varying costs and risks.

Transit agencies may also wish to ensure that transit bus operations are resilient in emergency situations. Understanding that grid disruptions may hamper agencies' ability to recharge their vehicles, developing backup solutions can mitigate or avoid further disruptions to bus operations. Coordinating with the local utility and other large customers with emergency response plans (e.g. hospitals) may provide transit agencies with better insight into what options may best serve their needs during power outages. Solutions such as on-

[37] https://www.mjbradley.com/sites/default/files/EVIElectricBus101FINAL15may19.pdf

[38] *Accelerating bus fleet electrification: Key aspects for overnight and opportunity charging*

[39] Linscott, M. and A. Posner. 2020. *Guidebook for Deploying Zero-Emission Transit Buses.* Pre-publication draft of TCRP Research Report 219. Transportation Research Board, Washington, D.C.

[40] *Id.*

site generators, battery storage, and distributed solar, all have strengths and drawbacks that will need to be considered against transit agencies' operational needs.[41]

4. Permitting

Permitting is required by local jurisdictions to ensure the safe and lawful installation of EV charging equipment. In some circumstances, permitting officials may be available to meet with transit agencies prior to permit application submittal to review local requirements and minimize the risk of modifications or submission of incomplete applications.[42] Local jurisdictions will ideally provide a publicly accessible, electronic, and transparent checklist of all requirements needed to expedite the permit review process; in some cases, permits should also be able to be submitted online without the need for paper forms.[43] Once submitted, projects will typically undergo zoning, electrical, architectural, and fire department review. Small projects or projects solely focused on Level 2 chargers will likely require less time for review than projects with large deployments of DCFC infrastructure.

5. Construction

Once permits are obtained, construction can begin. Timelines for construction may vary significantly depending on the complexity of the deployment and utility resources. There are three broad infrastructure components necessary to complete EVSE installation:

- **Utility-side infrastructure:** This infrastructure refers to all necessary distribution system upgrades needed to support the deployment – up to and including the utility meter. This infrastructure is owned and maintained by the utility and typically includes transformers, pads, poles, cabling, and other equipment needed to safely deliver power to the site.
- **Customer make-ready infrastructure:** "Make-ready" infrastructure refers to all electrical equipment on the customer's side of the utility meter – up to the EV charger – needed to deliver power to the charger. These components include any necessary electrical panel upgrades, trenching, conduit, wiring, and other electrical infrastructure needed to accommodate new EV charging loads.
- **EV charger:** This refers to the asset that connects to and charges an electric transit bus. L2 chargers may be wall-mounted or pad-mounted and may have multiple plugs. DCFC units are typically pad-mounted.

Some utilities have developed programs that offer incentives and technical assistance in the development of charging infrastructure for electric transit buses and other heavy-duty vehicles. For example, Pacific Gas & Electric's (PG&E) EV Fleet program supports elevated incentives for transit bus charger deployments.

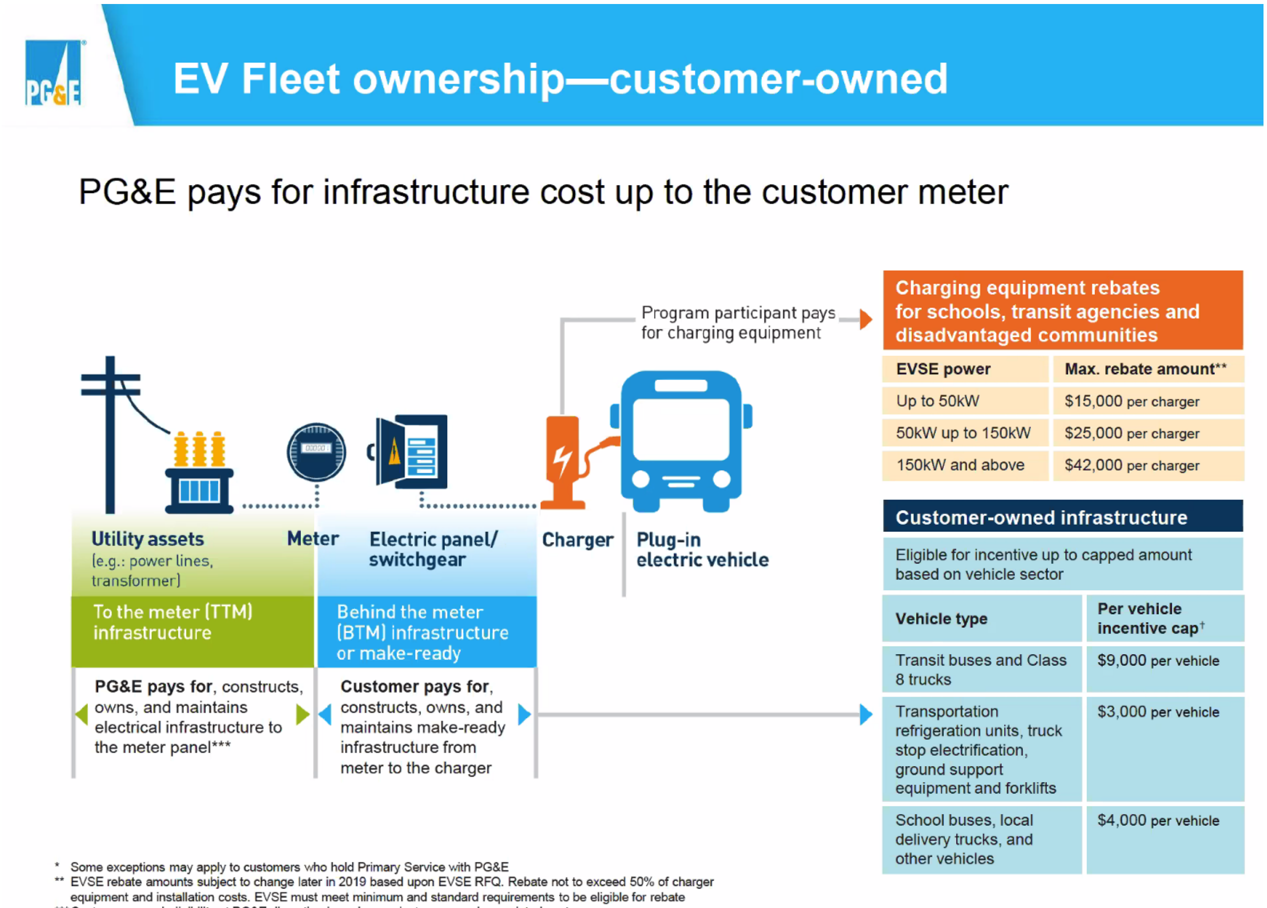
---

[41] *Id.*

[42] California Governor's Office of Business and Economic Development, *Electric Vehicle Charging Station Permitting Guidebook*, July 2019. Available at: https://static.business.ca.gov/wp-content/uploads/2019/12/GoBIZ-EVCharging-Guidebook.pdf

[43] *Id.*

FIGURE 11. PG&E EV FLEET PROGRAM INFOGRAPHIC



Source: PG&E

In cases where the transit agency is managing the construction, agencies should ensure that contractors are licensed and adhere to a pre-defined schedule that includes quality assurance/quality control milestones.[44] Transit agencies should also seek to complete project construction before buses are delivered to allow for testing and validation during any applicable acceptance period.[45]

6. Activation

After construction is complete, the project must be commissioned by authorities to ensure that it meets all applicable local codes and standards. Transit agencies or contractors should check with local jurisdictions prior to project completion on what criteria will be used to evaluate the installation. Both bus and charger manufacturers should be on-site during the commissioning to address any questions or technical issues that may arise.[46]

[44] Linscott, M. and A. Posner. 2020. *Guidebook for Deploying Zero-Emission Transit Buses.* Pre-publication draft of TCRP Research Report 219. Transportation Research Board, Washington, D.C.

[45] *Id.*

[46] *Id.*

Attachment C. EVSE Costs

EVSE Operations and Fueling Costs

Determining the appropriate quantity and type of EV charging infrastructure is critical to transit fleets' successful transition to electric buses. EV chargers must reliably meet core transit operations while optimizing costs associated with fueling and accommodating future charging needs. Although infrastructure needs will vary depending on unique conditions in each transit agency's service area, fleets can follow the steps below – coordinating with relevant bus manufacturers and charging vendors – to determine depot EV charging infrastructure configurations that meet their needs.[47]

FIGURE 12. METHODOLOGY FOR DETERMINING FLEET EV CHARGING NEEDS

Step	Description	Calculation
1. Determine Individual Vehicle Energy Use	For each vehicle, determine its expected energy use in kilowatt-hours (kWh) by multiplying the vehicle's energy efficiency (kWh/mile) by the expected vehicle miles traveled (VMT) between charges.	Vehicle Energy Use (kWh) = Vehicle Energy Efficiency (kWh/mile) * VMT (mile)
2. Determine Fleet Energy Use	For each vehicle that requires charging within a certain window, sum their individual energy use requirements.	Fleet Energy Use (kWh) = ∑ Vehicle Energy Use$_1$ + Vehicle Energy Use$_2$ + … + Vehicle Energy Use$_n$
3. Identify Daily Charging Window	Identify the period of time that fleet vehicles are available to charge (e.g. 10 p.m.- 6 a.m.).	Hours (hr)
4. Identify Average Charging Demand	Divide fleet energy use by the charging window to determine average kilowatts (kW) of charging needed for truck operations.	Average Charging Demand (kW) = Fleet Energy Use also as kWh
5. Determine Average Per Vehicle Charging Demand	Divide average charging demand by the number of vehicles that require charging	Vehicle Charging Demand (kW) = Average Charging Demand (kW) / Vehicles

Determining vehicles' average charging demand is important for two reasons. First, average EV charging demand may influence the type of EV chargers fleets decide to purchase. Fleet managers will seek to ensure that charging equipment can deliver electricity at the rate necessary for vehicles to complete their duty cycles. Fleets with relatively low average vehicle charging demands may be able to satisfy their charging requirements with L2 chargers, which are significantly less expensive per unit than DCFC equipment.

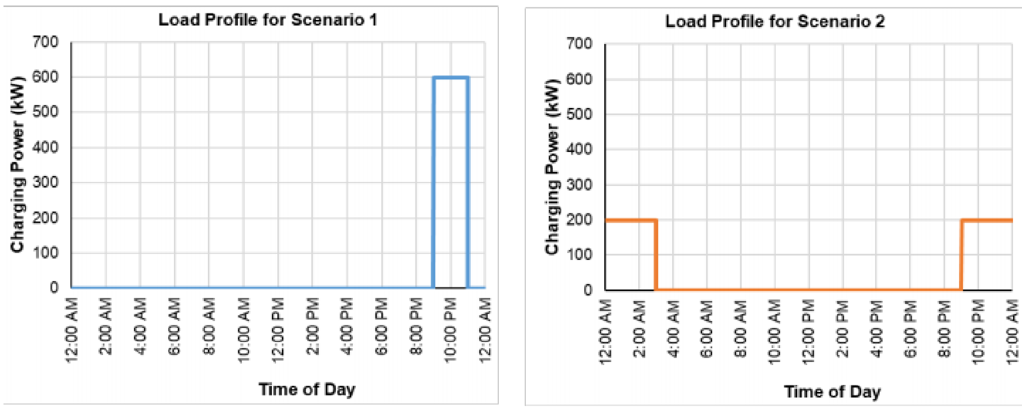
Second, the average charging demand generally represents the most efficient pathway to refuel an EV from an electricity system perspective. Electric utilities typically bill large commercial customers not only for how much energy (kWh) they use, but also for how much peak electricity demand (kW) they draw from the grid on a monthly basis.[48] These charges associated with peak demand are called "demand charges" and are typically expressed in terms of dollars per kilowatt of electricity demand at a given customer site; the higher a customer's peak demand, the higher the demand charge. Left unmanaged, bus fleet charging can significantly affect monthly electricity bills due to the impact of increased demand charges during peak periods. To optimize fuel cost savings relative to diesel and support the reliability of the grid, fleet managers have

[47] For more information on determining fleet EV charging needs, visit https://www.gladstein.org/gna_whitepapers/electric-vehicle-charging-guidebook-for-medium-and-heavy-duty-commercial-fleets/

[48] For more information on Pepco's current electricity rates and tariffs, visit: https://www.pepco.com/MyAccount/MyBillUsage/Pages/MD/CurrentTariffsMD.aspx

reduced exposure to high demand charges by spreading out EV charging over longer charging periods. This strategy reduces average charging demand levels and reduces fuel costs associated with charging electric transit buses. Fleet managers can also work with EV charging service providers to use technology-driven solutions to actively manage EV charging loads and minimize electricity costs. The figure below illustrates how electricity costs may vary depending on when buses are charged.[49] Although both scenarios deliver the same amount of energy (1,200 kWh) to an equal number of buses, the fleet in Scenario 2 experiences much lower average electricity costs due to lower peak demands.

FIGURE 13. ILLUSTRATIVE BUS FLEET CHARGING SCENARIOS AND COSTS



Scenario 1	Scenario 2
4 electric buses charging at 150 kW	4 electric buses charging at 50 kW
Charge for 2 hours (9 p.m. to 11 p.m.)	Charge for 6 hours (9 p.m. to 3 a.m.)
Peak demand: 600 kW	Peak demand: 200 kW
Daily energy delivered: 1,200 kWh	Daily energy delivered: 1,200 kWh
Monthly electric bill: $8,905	Monthly electric bill: $4,105
Effective electric cost: $0.37/kWh	Effective electric cost: $0.17/kWh

Source: Edison Electric Institute

EVSE Costs

Charging infrastructure capital costs include hardware, permitting, and installation. These costs vary by charging type, site characteristics, and equipment features. Operation and maintenance (O&M) costs of EV charging stations vary depending on the type and quantity of charging equipment, station utilization, and ownership structure. Typical on-going O&M costs include electricity charges, station management and maintenance, and network fees.

Table 13 below summarizes a range of expected costs of Level 1, Level 2, and DC fast charging installations in non-residential applications.

TABLE 13. COST RANGES FOR ELECTRIC VEHICLE CHARGING STATIONS IN NON-RESIDENTIAL APPLICATIONS, $/CHARGE PORT[50]

[49] Edison Electric Institute, *Preparing to Plug In Your Bus Fleet*, December, 2019. Available at: https://www.eei.org/issuesandpolicy/electrictransportation/Documents/PreparingToPlugInYourBusFleet_FINAL_2019.pdf

[50] Cost ranges are based on data from U.S. Department of Energy. 2015. Costs Associated With Non-Residential Electric Vehicle Supply Equipment and EPRI. 2013. Electric Vehicle Supply Equipment Installed Cost Analysis.

Cost Element	Level 1		Level 2		DC fast charge	
	Low	High	Low	High	Low	High
Hardware	$300	$1,500	$400	$6,500	$20,000	$150,000
Permitting	$100	$500	$100	$1,000	$500	$1,000
Installation	$100	$3,500	$600	$12,700	$50,00	$90,000
Total	**$500**	**$5,500**	**$1,100**	**$20,200**	**$70,500**	**$241,000**

Data Sources:
-*U.S. Department of Energy. 2015. Costs Associated With Non-Residential Electric Vehicle Supply Equipment*
-*New York State Energy Research and Development Authority. 2019. Benefit Cost Analysis of Electric Vehicle Deployment in New York State'*
-Rocky Mountain Institute. 2020. Reducing EV Charging Infrastructure Costs

The values presented in the table above are costs per charge port. There are cost benefits to installing more than one charging station at a site, as the average installation cost decreases as more charging ports are added. The charging equipment hardware is the only cost element that does not yield some benefit with increased number of installations. This is particularly relevant because the hardware represents a small fraction of the overall cost for both Level 1 and Level 2 equipment.

Factors that affect the cost of electric vehicle charging infrastructure include:

- **Type of mounting**: Charging hardware is available as a wall mounted or a pedestal mounted unit. Pedestal mounted units typically costs $500-$700 more than their wall mounted counterparts due to material, manufacturing, and install construction costs.
- **Technological Features**: The simplest units provide a charging port and electricity, however there are many amenities and features that can be included in hardware and subscriptions such as data collection, usage monitoring, user communication, and billing options.
- **Location:** The further away the charging station is from the electrical panel, the higher the installation costs. This is due to the need to trench or bore long distances to lay electrical supply conduit from electrical panel to the charging location. A 2013 EPRI study found that Level 2 sites that required special work such as trenching or boring were about 25% more costly.
- **Electrical needs:** In most cases, charging stations need a dedicated circuit for each EVSE unit on the electrical panel, sufficient electrical capacity from the utility connection the electrical panel, and sufficient electrical capacity at the panel. If the selected site does not meet these three key electrical needs, then electrical upgrades are required. The most common electrical upgrade for installing a Level 2 electric vehicle charging station is a re-organization of the panel to create space for a 40 amp circuit. However, more significant electrical work such as upgrading transformers is more expensive.
- Another consideration is **accessibility compliance** which can require special curb cutouts, van accessible parking spaces, level parking spaces, and specific connector heights, all of which affect the design and cost.

It is also important to consider long term EVSE needs when planning charging infrastructure. Fleet managers should consider the quantity and location of charging stations that they plan to install over the next 5—15 years before they install their first charging unit. Taking a "dig once" approach can help minimize the cost of installing future units–this includes upgrading the electrical service for the estimated future charging load and running conduit to the anticipated future charging locations.

Network and Charging Session Fees

If the EV charger unit is networked, station owners will have to pay a fee that covers the cost for cellular/Wi-Fi network communications and back office support. Network fees will vary from $100-$900 annually, depending on the type of EVSE unit (Level 1, Level 2, DCFC), the EVSE unit features, and the EVSE manufacturer or provider. Typically for Level 2 chargers, network fees are around $250 per charge port. Networked charger owners may also be responsible for paying a charging session fee to the network provider, which is typically 10% of the total fees.

Electricity Costs and Power Management Strategies

EVSE electricity costs are comprised of two separate factors – the electricity consumption charges and demand charges. Electricity consumption charges are determined by the utility rate ($/kwh) and the amount of electricity consumed. The consumption of electricity will vary based on the number of vehicles using the chargers, power output of the equipment, vehicle power acceptance rate, and amount of time the vehicles charge. Large commercial and industrial electricity rate structures typically have demand charges that can be costly if not managed properly. Demand charges are additional fees based on the maximum energy load drawn by a customer during the billing period. Utilities use demand charges to cover the wear-and-tear on the distribution system components (i.e., transformers, substations, and primary conductors) and some portion of the transmission system, if the load is large enough. They are meant to cover the maximum capacity needed to satisfy all their customers' peak energy needs. Demand charges are typically not a big financial burden in smaller Level 2 deployments, but can be high for DC fast chargers or larger deployments of Level 2 chargers. The metering configuration of chargers also affects demand chargers. If a Level 2 charger is put on an existing building meter that already has high overall demand, then charging events may not cause a spike, but rather blends in with the existing usage.

One way to reduce demand chargers from larger banks of Level 2 chargers is to use power management strategies. These take form as network software capabilities and can be used to dynamically manage and split the amount of power delivered to each charge port based on site-specific factors. Vehicle charging can be controlled and staggered during high consumption periods or prioritized by need based on the existing state of battery charge.

Smart charging allows for either the EV owner, station owner, or grid operator to control the timing and amount of power the charger delivers to the vehicle based on driver preferences and grid conditions. In non-residential applications, smart charging strategies can be implemented to match charging power with network capacity to help alleviate demand charges or limit charging when rates are highest. More sophisticated smart charging that is currently being piloted involves vehicle-to-grid integration, in which a utility provider can pull electricity from the EV when demand gets high, then return to regular charging when demand on the grid lightens.

The more sophisticated and "smart" the charging equipment is, the more expensive it will be to purchase and maintain. Jurisdictions should assess these costs and benefits for each charging station deployment, as a one-size fits all approach does not apply. Power management and smart charging strategies may reap cost savings for some site hosts whose stations involve many charge ports or who are faced with limits on available electrical capacity and do not want to take on the cost of electrical upgrades.

Attachment D. Electric Bus

Electric Bus Market and Trends

Holder for Highlight of the Prince George's County Proterra bus demonstration.

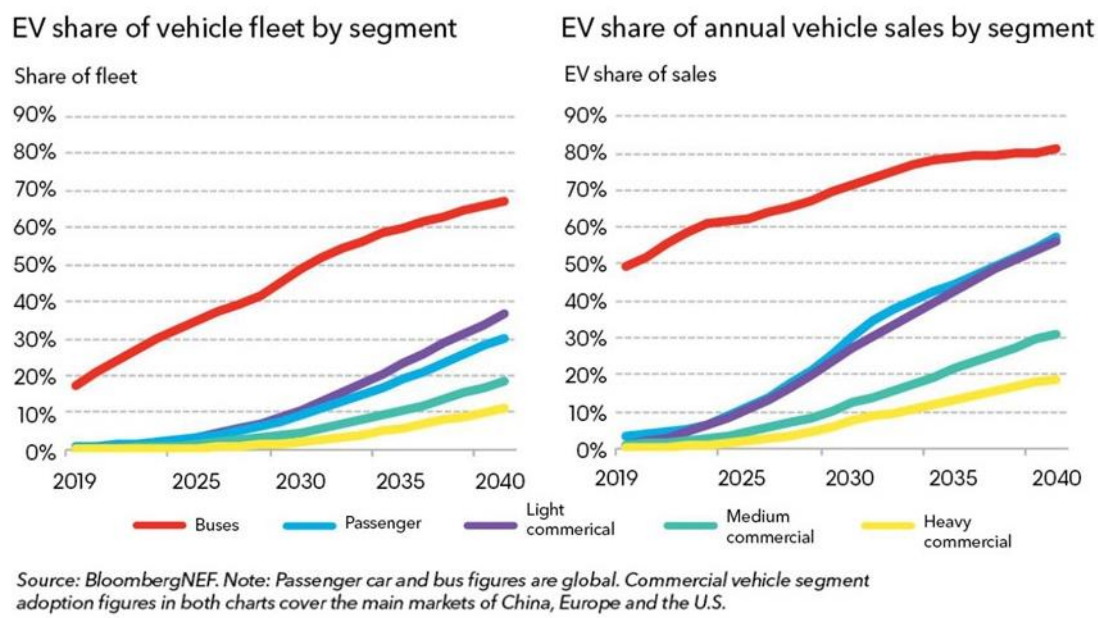
Electric buses (e-buses) – also called battery-powered electric buses (BEB) – are a nascent market in the United States and are highly dependent on government incentives and regulations at this early stage. According to CALSTART, there were 1,650 zero emission buses (ZEBs) in 2018, increasing to 2,255 in 2019—a 36 percent increase. The relative increase shows a positive trend in the transition toward ZEBs, which are defined as BEBs and hydrogen fuel cell buses. In total, there are approximately 65,000 transit buses in the U.S., making the share of e-buses to be minimal at roughly 3.5 percent. Procurement decisions as well as fleet turnover lag will dictate the rate which e-buses are added to the transit fleet. In 2018, there were 528 e-buses purchased, which represented approximately 4 percent of new transit bus sales.[51] The trend towards e-buses is especially apparent in major cities around the U.S. where transit agencies have made public commitments to transition their entire fleets to e-buses. These include Los Angeles County by 2030, King County (Seattle) by 2040, San Francisco by 2035, and New York by 2040. Although only a handful of transit agencies have made commitments, many more have purchased e-buses. As of 2018, twenty-one U.S. transit agencies have purchased e-buses for their transit fleets.[52]

At a global level, there is estimated to be approximately 386,000 e-buses, with 99 percent of e-buses located in China. With that said, BNEF is projecting that global e-bus bus sales are projected to increase to 81 percent while representing nearly 70 percent of all transit buses by 2040 (**Error! Reference source not found.**). Thus, a lthough the number of e-buses in the U.S. remains low, there is a global push towards electrifying transportation. In addition, the industry has and will continue to evolve and benefit from lessons learned by early adopters, particularly in the U.S.

[51] CALSTART, 2019. "Zeroing on ZEBs: The Advanced Technology Transit Bus Index." https://calstart.org/zeroing-in-on-zebs-2019/

[52] EESI. 2018. *Fact Sheet: Battery Electric Buses: Benefits Outweigh Costs.* https://www.eesi.org/papers/view/fact-sheet-electric-buses-benefits-outweigh-costs

FIGURE 14. GLOBAL PROJECTION OF EV PERCENT SHARE OF VEHICLE FLEET & ANNUAL VEHICLES SALES BY SEGMENT[53]



Electric Bus Costs

Similar to the obstacles to light-duty EV adoption, capital costs of e-buses compared to conventional models can be an obstacle to transit agencies and operators. For e-buses, the primary reason for the price difference compared to hybrid and diesel buses is the high cost of the battery. With that said, battery costs are projected to decline through mid-century due to economies of scale, chemistry and manufacturing innovations, and other cost-cutting factors.[54] In the interim, government subsidies and other financial incentives will help to increase e-bus adoption until e-buses and conventional buses reach price parity.

TABLE 14. HISTORIC AND PROJECTED BATTERY PRICES[55]

Year	Price per kWh
2010	$1000
2011	$800
2012	$642
2013	$599
2014	$540
2015	$350
2016	$273
2017	$209
2025	$100
2030	$73

[53] BNEF. 2019. *Electric Transport Revolution Set to Spread Rapidly Into Light and Medium Commercial Vehicle Market.* https://about.bnef.com/blog/electric-transport-revolution-set-spread-rapidly-light-medium-commercial-vehicle-market/

[54] Lowell, Dana. 2019. *Electric Bus 101 – Economics, Politics, Myths and Facts.* https://www.mjbradley.com/sites/default/files/EVIElectricBus101FINAL15may19.pdf

[55] Curry, C. 2017. *Lithium-Ion Battery Costs and Market,* presentation.

While battery prices remain high for e-buses, another metric is helpful to understand the true cost over the lifetime of the vehicle: total cost of ownership (TCO). TCO considers the capital expense of purchasing the vehicle as well as the operating, maintenance, and facility operating expenses. For instance, an e-bus may cost more upfront, but the difference compared to a CNG or diesel bus can be recovered due to savings resulting from less expensive fuel and maintenance costs. Several resources look at the TCO and payback of e-buses, but the results vary. One study by BYD found that e-buses (at their current price) were cheaper over the operating lifetime compared to CNG and diesel buses. Estimates were calculated assuming 50 buses and found that the TCO for each e-bus were $1,000,000, versus $1,700,000 for CNG and $1,200,000 for diesel.[56]

In another study conducted by the Los Angeles County MTA, the cost per mile to operate e-buses through 2055 is $4.27 to $4.28 (depending on the type of charging). Conventional and renewable natural gas-powered vehicles, however, experienced a lower cost per mile of $4.18 and $4.53 to $4.61 for conventional and renewable natural gas, respectively.[57] In conclusion, while the capital costs associated with e-buses remain relatively high, the lower maintenance and operational costs can offset these costs. Consequently, the payback period is commonly shorter for vehicles that drive more miles per year, and as the vehicle costs decline, transit operators will experience faster payback periods.

- o Type of charging infrastructure available (e.g. Smart chargers) and pros and cons of each

Bus EVSE Market

EVSE Technology

There are two types of charging infrastructure available for e-buses: conductive and inductive. Conductive charging technology transfers energy directly to a vehicle's battery through a direct connection, commonly with a plug. Inductive charging, however, does not require a direct connection with the vehicle. Instead, the vehicle only has be in close proximity to the inductive coils of the charger where the energy is transferred to charge the battery. In general, inductive charging is less efficient than conductive charging, though it can be more convenient to charge, particular for opportunity charging applications.[58]

Conductive charging can also be classified into two categories: connector chargers and pantograph, often called 'overhead' chargers. Most overhead chargers are a proprietary charging technology, requiring a specific charger unit to match specific bus manufacturers. Connector chargers are similar in appearance, albeit with a larger footprint, to Level 2 or DC fast charging stations used for light- and medium-duty applications (

[56] Swanton, A. 2016. *BYD*, presentation.

[57] Lowell, D. & Seamonds, D. 2017. *Zero Emission Bus Options: Analysis of 2015-2055 Fleet Costs and Emissions*. https://efiling.energy.ca.gov/GetDocument.aspx?tn=220202&DocumentContentId=29846

[58] Weiss et al. 2017. *Electrification: Emerging Opportunities for Utility Growth.* https://brattlefiles.blob.core.windows.net/files/7298_electrification_emerging_opportunities_for_utility_growth.pdf

Exhibit 1).

EXHIBIT 1. ELECTRIC BUS CHARGING TYPES[59]

Overhead Charger


Connector Charger

Inductive charging systems are still in the demonstration phase, with an example being a small loop system being demonstrated at Utah State University.[60] Commercial systems are likely to be feasible in the near- to mid-term, though the total costs are largely unknown at this point. Inductive charging would allow an e-bus to charge while driving via inductive charging equipment installed in the road below the vehicle. Some of the upsides to this technology is that it would eliminate the need for larger vehicle batteries and possibly address the challenge of coordinating charging. It is predicted that the initial commercial systems will likely be university campuses, downtown shuttles, and airport buses, all on a small loop to charge repeatedly.

Electric Bus Charging Infrastructure Costs

The high cost of e-bus charging infrastructure, including trenching and upgrading the distribution system, is often seen as a barrier by transit agencies and operators.[61] One of the challenges is that with few examples to point to little is known about the costs. However, as the industry is preparing for the influx of e-buses and the need for ample infrastructure, several publications emphasize the need for establishing a standard for charging infrastructure, which would result in a reduction of costs through increased volume and scale.

---

[59] Siemens. n.d. *Charging Systems for E-buses – Efficient Public Transport With Zero Emissions.* https://new.siemens.com/global/en/markets/transportation-logistics/electromobility/ebus-charging.html

[60] Utah State University, *Utah State University Unveils Wirelessly Charged Electric Bus,* https://www.usu.edu/today/story/utah-state-university-unveils-wirelessly-charged-electric-bus

[61] CALSTART. 2015. *Electric Truck & Bus Grid Integration.* https://calstart.org/libraries-publications-electric_truck_bus_grid_integration_opportunities_challenges_recommendations-sflb-ashx/

Table 15 summarizes charging infrastructure costs, which range between $5,000 and $350,000 for stationary chargers, and up to $800,000 per kilometer for inductive charging. The high upfront cost of for in-road inductive charging systems make them most appropriate for heavily traveled transit corridors; however, inductive in-road charging corridors would necessitate vehicles having smaller batteries, thus reducing the upfront cost of e-buses.[62] Siemens conducted a comparative review of its electrified road system and other technologies. The results showed that the total costs through 2050 of an electrified road system could be roughly 50 percent compared to internal combustion engine vehicles, more than 50 percent the cost of LNG vehicles, and almost a third of the cost of hydrogen fuel cell vehicles.[63]

TABLE 15. ELECTRIC BUS CHARGING INFRASTRUCTURE COST ESTIMATES

Year	Measure	Cost	Additional Considerations	Source
2015	70 kW (2018 VAC/200A)	$5,000-$10,000	Installation is $20,000-$75,000	CALSTART, 2015[64]
2015	450 kW (208 VAC/640A)	$350,000	Installation is $150,000-$200,00	
2016	Proterra depot charger	$50,000	Maintenance is $500/year	CARB, 2017[65]
2016	Proterra on-road charger	$350,000	Maintenance is $13,000/year	
2016	On-route charger installation	$250,000		
2016	250 kW WAVE wireless charger	$286,000	Installation is $220,000; receiver is $103,000	

[62] Moultak, M., N. Lutsey, and D. Hall. 2017. *Transitioning to Zero-Emission Heavy-Duty Freight Vehicles*, International Council on Clean Transportation. https://theicct.org/publications/transitioning-zero-emission-heavy-duty-freight-vehicles

[63] Siemens. 2017. *eHighway: Electrified Heavy Duty Road Transport*, presentation. https://assets.new.siemens.com/siemens/assets/api/uuid:78f7ac2f-d2e6-46b5-82bb-d15fee791fc6/presentation-eHighway-Sustainable-road-freight-transport.pdf

[64] CALSTART. 2015.

[65] CARB. 2017. *Innovative Clean Transit*.https://ww2.arb.ca.gov/our-work/programs/innovative-clean-transit

2017	200 kW	$400,000	Equivalent to $2/watt	Chandler et al., 2017[66]
2017	In-depot charger	$50,000		Eudy and Jeffers, 2017[67]
2017	Two 500 kW Eaton overhead fast chargers	$665,000	Maintenance on chargers is $1,500/month	
2017	Inductive charging on exisiting roads ($/km)	$800,000		IEA, 2017[68]
2017	Inductive charging on exisiting roads ($/km)	$800,000		IEA, 2017[69]

Attachment E. Case Studies

EVSE Parking Sign Designs

The City of Boston established a set of requirements for EVSE and EV-ready parking spaces in 2020. Signage requirements detail: what vehicles are permitted to part in EVSE parking spots, the duration of time that PEVs may park and/or charge at EVSE, and any additional restrictions and information (hours and days of operations, towing, and contact information). The City of Boston includes sign dimension and placement requirements of: 12" x 18" and must be placed immediately adjacent to the EVSE at a height of 7 feet. Example regulatory designs are below:

[66] Chandler et al. 2017. *Delivering Opportunity: How Electric Buses and Trucks Can Create Jobs and Improve Public Health in California*. https://www.ucsusa.org/sites/default/files/attach/2016/10/UCS-Electric-Buses-Report.pdf

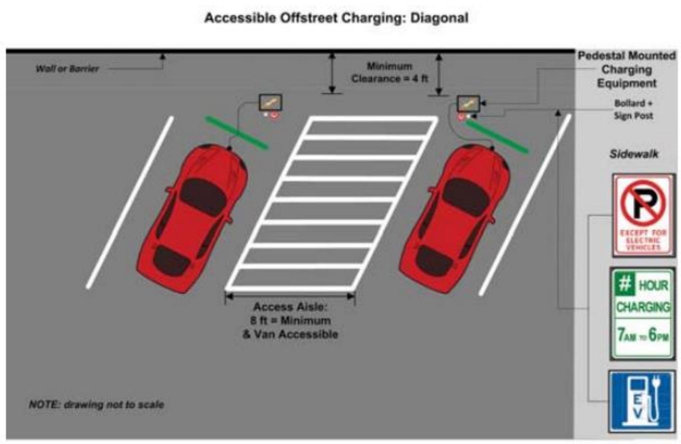
[67] Eudy and Jeffers. 2017. *Foothill Transit Battery Electric Bus Demonstration Results: Second Report.* https://www.nrel.gov/docs/fy17osti/67698.pdf

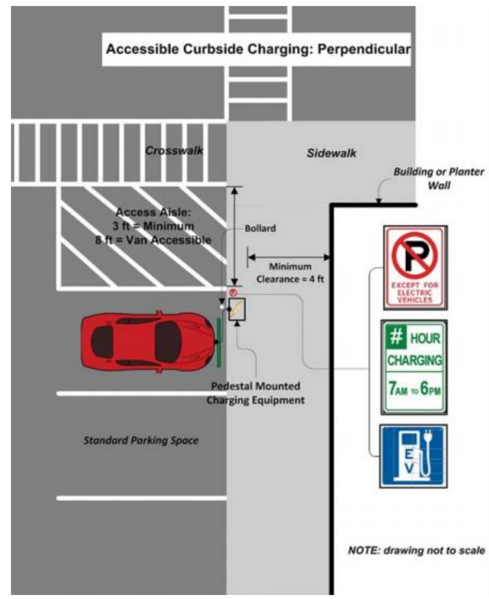
[68] IEA. 2017. *The Future of Trucks: Implications for Energy and the Environment*. https://www.lowcvp.org.uk/assets/reports/TheFutureofTrucksImplicationsforEnergyandtheEnvironment.pdf

[69] IEA. 2017. *The Future of Trucks: Implications for Energy and the Environment*. https://www.lowcvp.org.uk/assets/reports/TheFutureofTrucksImplicationsforEnergyandtheEnvironment.pdf

EVSE Dimension and Design

The California Plug-In Electric Vehicle Collaborative published an Accessibility and Signage for Plug-In Electric Vehicle Charging Infrastructure guidance document to ensure a strong and enduring transition to a plug-in electric vehicle marketplace. The document included diagrams of example EVSE designs, including:





EVSE Parking Ordinances

- The City of Millbrae's electric vehicle parking ordinance states that electric vehicles are prohibited "from parking longer than two hours in an electric vehicle charging station" and "the vehicle must be plugged in while parking in the space, and forbids any non-electric vehicle from parking in a charging station".[70]
- In Washington State a penalty of $124 is charged for cars parked in a charging station that are not connected to a charging station.[71]
- In Boulder, Colorado a penalty of $50 is charged for violators who park non-electric vehicles at electric vehicle charging stations.[72]

Make-Ready Requirement

San Francisco

The City and County of San Francisco approved an Ordinance that establishes requirements for installation of electric vehicle charging infrastructure at new buildings or buildings undergoing major

[70] City of Millbrae, Electric Vehicle Parking Ordinance. http://ci.millbrae.ca.us/Home/Components/News/News/490/24

[71] Washington State Legislature Title 46.08 Electric Vehicle Charging Stations-Signage-Penalty, http://app.leg.wa.gov/rcw/default.aspx?cite=46.08.185

[72] City of Boulder, Colorado. City Council Agenda Item, 2014. https://documents.bouldercolorado.gov/WebLink/ElectronicFile.aspx?docid=124881&dbid=0

alterations.[73] Starting January 2018, the ordinance required new residential, commercial, and municipal buildings provide the following[74]:

- Electrical capacity and raceway infrastructure to facilitate future installation and use of EV chargers in 100% of off-street parking spaces provided for passenger vehicles and trucks.
- Install full circuits for PEV chargers (also referred to as turnkey or EVSE-ready outlets) to at least 10% of parking spaces, including listed raceway, sufficient electrical panel service capacity, overcurrent protection devices, wire, and suitable listed termination point such as a receptacle.
- Install sufficient electrical infrastructure to simultaneously charge vehicles in 20% of parking spaces.

As part of this legislation process, Energy Solutions conducted a study that estimates the costs associated with including EV charging infrastructure during initial construction for multi-family and non-residential projects compared to retrofitting this infrastructure at a later date.[75] The study found that that the cost for installing complete or nearly complete 240-volt 40-amp electric circuits as a retrofit is several times more expensive than installing this infrastructure during new construction, as shown in

❄♋♌●♏ 16 below.

TABLE 16. ESTIMATED COST-EFFECTIVENESS OF SAN FRANCISCO PROPOSAL, TWO SCENARIOS[76]

[73] Defined as "Alterations and additions where interior finishes are removed and significant upgrades to structural and mechanical, electrical, and/or plumbing systems are proposed where areas of such construction are 25,000 gross square feet or more in Group B, M, or R occupancies of existing buildings."

[74] City of San Francisco. Ordinance number 92-17. http://sfbos.org/sites/default/files/o0092-17.pdf

[75] Energy Solutions. November 17, 2016. Plug-In Electric Vehicle Infrastructure Cost-Effectiveness Report for San Francisco. http://evchargingpros.com/wp-content/uploads/2017/04/City-of-SF-PEV-Infrastructure-Cost-Effectiveness-Report-2016.pdf

[76] Energy Solutions. November 17, 2016. Plug-In Electric Vehicle Infrastructure Cost-Effectiveness Report for San Francisco. http://evchargingpros.com/wp-content/uploads/2017/04/City-of-SF-PEV-Infrastructure-Cost-Effectiveness-Report-2016.pdf

For existing buildings, only 25,000 gross square feet or larger undergoing major renovations will be applicable due to the cost-prohibit characteristics of electrical service upgrades.[77]

	Per PEV Parking Space with Electrical Circuit		Total Incremental Cost of Building	
	New	Retrofit	New	Retrofit
Scenario A - 10 Parking Space Building, two PEV Parking Spaces	$920	$3,710	$1,840	$7,420
Scenario B - 60 Parking Space Building, 12 PEV Parking Spaces	$860	$2,370	$10,320	$28,440

Zoning

Through its planning regulations, the City of Emeryville CA requires that at least 3% of parking spaces in parking facilities containing 17 or more spaces serving multi-unit residential and lodging uses shall be electric vehicle charging stations. Such spaces may be counted towards parking requirements.[78]

The City of Montlake Terrace WA requires a certain percentage of parking spaces that are required to be electric vehicle charging stations by varying land use types, ranging from multi-family to retail and lodging.[79]

Workplace Charging

The California Department of General Services installed 24 Level 2 charging stations. Parking spaces for EV charging are available to both state employees and the public.[80]

In Research Triangle Park, North Carolina, Biogen Idec installed workplace charging to help achieve its goal of reducing total natural resources consumption and address the infrastructure hurdle many drivers face when considering a PEV.[81]

The DOE Alternative Data Center notes local businesses that have successfully installed and offer workplace charging.[82] Hollywood Woodwork, Mom's Organic Market, and Posty Cards all installed EVSE for their employees to reduce emissions, minimize environmental impact, and support their employees.

[77] City of San Francisco. Ordinance number 92-17. http://sfbos.org/sites/default/files/o0092-17.pdf

[78] City of Emeryville Planning Regulations, Emeryville Municipal Code Title 9 http://www.codepublishing.com/CA/Emeryville/.

[79] https://www.codepublishing.com/WA/MountlakeTerrace/html/MountlakeTerrace19/MountlakeTerrace19126.html

[80] California Department of General Services Office of Fleet and Asset Management, https://www.dgs.ca.gov/OFAM/Resources/Page-Content/Office-of-Fleet-and-Asset-Management-Resources-List-Folder/State-Electric-Vehicle-Charging-Guide

[81] Biogen Idec Case Study, https://www.hrccc.org/wp-content/uploads/Biogen-Idec-Case-Study.pdf

[82] U.S. Department of Energy Workplace Charging Case Studies, https://afdc.energy.gov/case/2828

Boeing Company built four EVSE for its employees in Mesa, Arizona. In this case, Boeing required employees to pay $1 per hour for a maximum of 4 hours to charge their vehicles. Boeing chose to install EVSE as a way to meet their regulatory trip reduction requirements.[83]

Evernote in Redwood City, California launched a workplace charging program that aims to increase employee productivity. They installed 10 Level 2 EVSE and one DC fast charger and offer each employee a $250 monthly stipend to lease or buy a vehicle that qualifies them for a California carpool lane sticker. Approximately 20% of Evernote's employees used the workplace charging provided, and Evernote expects this percentage to increase.[84]

[83] http://driveelectricnoco.org/wp-content/uploads/2015/01/CalStartBestPracticesWPCharging.pdf

[84] *Ibid.*

Attachment F. EVSE in Maryland by ZIP Code

ZIP	Level 1	Level 2	DC Fast
2064 Total	0	4	0
20601 Total	0	7	1
20602 Total	0	3	0
20603 Total	0	6	2
20619 Total	0	7	2
20629 Total	0	3	0
20636 Total	0	2	0
20637 Total	0	2	1
20640 Total	3	5	0
20646 Total	0	1	0
20657 Total	0	1	0
20664 Total	0	2	0
20670 Total	2	6	0
20678 Total	0	3	0
20688 Total	0	5	0
20701 Total	0	12	0
20705 Total	0	3	1
20706 Total	0	5	0
20707 Total	0	12	8
20708 Total	0	2	0
20712 Total	0	3	0
20714 Total	0	2	0
20715 Total	0	66	0
20716 Total	0	8	6
20722 Total	0	2	0
20723 Total	0	4	0
20724 Total	0	4	0
20732 Total	0	1	1
20737 Total	0	2	8
20740 Total	0	23	0
20742 Total	0	6	0
20743 Total	0	1	0
20744 Total	0	0	1
20745 Total	0	34	12
20746 Total	0	4	1
20748 Total	0	2	2
20754 Total	0	2	0
20755 Total	0	8	0
20759 Total	0	22	0
20763 Total	0	1	0
20770 Total	0	8	2
20771 Total	0	1	0
20772 Total	0	1	0
20774 Total	0	11	0
20781 Total	0	9	4
20782 Total	0	1	0
20784 Total	0	12	0
20785 Total	0	25	0
20794 Total	0	9	4
20814 Total	0	45	0
20815 Total	0	19	0
20817 Total	0	17	0
20832 Total	0	1	2
20837 Total	0	3	0
20841 Total	0	0	4
20850 Total	0	61	11
20852 Total	0	60	10
20854 Total	0	15	8
20855 Total	0	2	1
20874 Total	0	17	0
20877 Total	0	5	0
20878 Total	0	23	14
20879 Total	0	9	0
20889 Total	0	2	0
20895 Total	0	1	0
20899 Total	0	4	0
20902 Total	0	8	0
20903 Total	0	2	0
20904 Total	0	40	9
20906 Total	0	1	2
20910 Total	0	33	0
20912 Total	0	14	6
20993 Total	0	36	0
21001 Total	0	22	18
21005 Total	0	3	0
21009 Total	0	3	16
21012 Total	0	3	0
21014 Total	0	13	5
21015 Total	0	4	0

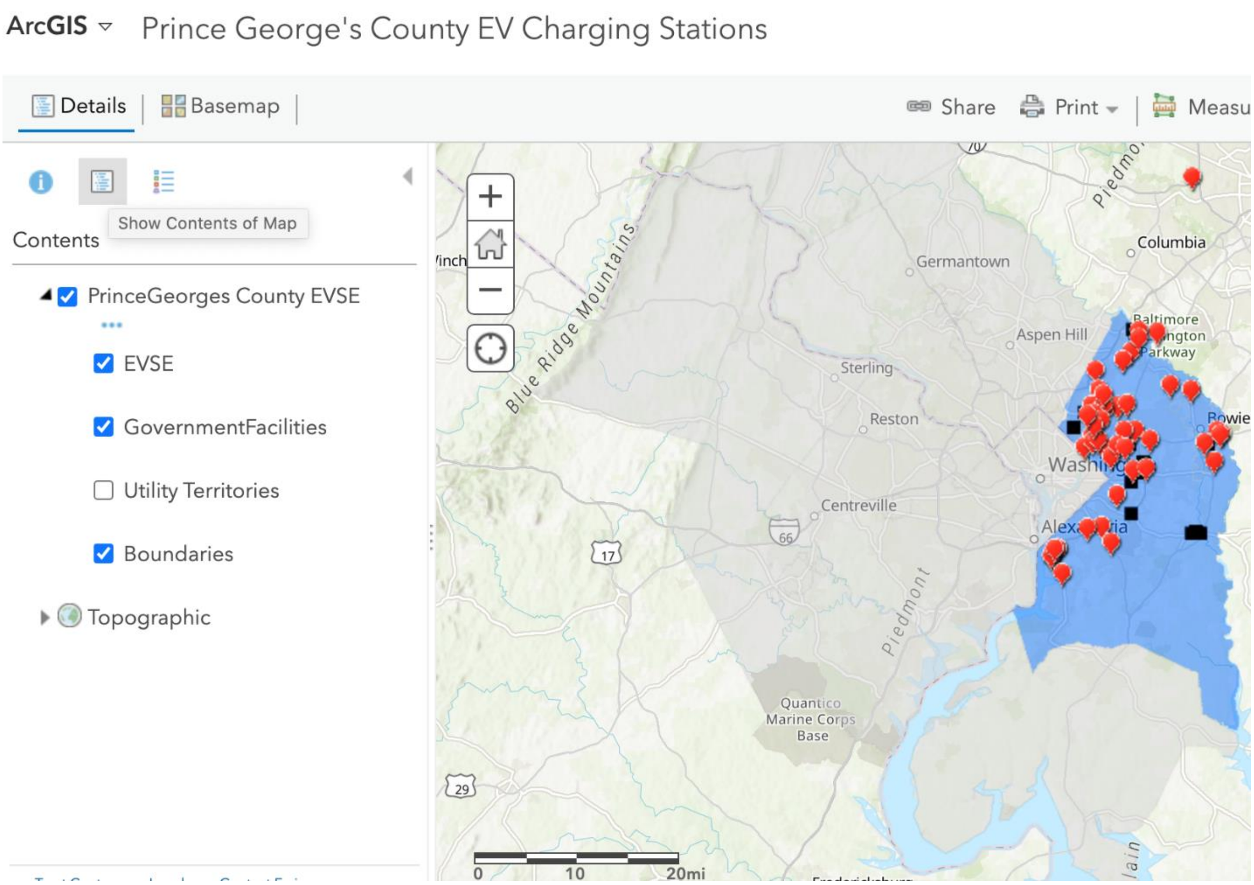
21017 Total	0	2	0
21029 Total	0	10	1
21030 Total	0	3	0
21031 Total	0	6	2
21034 Total	0	2	0
21037 Total	0	1	0
21040 Total	0	1	0
21042 Total	0	6	3
21043 Total	0	8	1
21044 Total	0	98	2
21045 Total	0	25	5
21046 Total	0	43	0
21047 Total	0	8	0
21048 Total	0	4	4
21050 Total	0	1	0
21054 Total	0	0	2
21060 Total	0	1	0
21061 Total	0	16	8
21074 Total	0	10	0
21075 Total	0	13	2
21076 Total	0	20	16
21077 Total	0	4	0
21078 Total	0	7	2
21085 Total	0	0	2
21090 Total	0	18	0
21093 Total	0	6	1
21108 Total	0	2	0
21113 Total	0	7	0
21114 Total	0	1	0
21117 Total	0	12	0
21122 Total	0	3	0
21133 Total	0	1	0
21152 Total	0	12	0
21153 Total	0	2	0
21157 Total	0	7	2
21158 Total	0	4	0
21162 Total	0	5	12
21201 Total	0	122	0
21202 Total	1	111	1
21204 Total	0	17	2
21205 Total	0	13	2
21206 Total	0	2	0
21207 Total	0	8	1

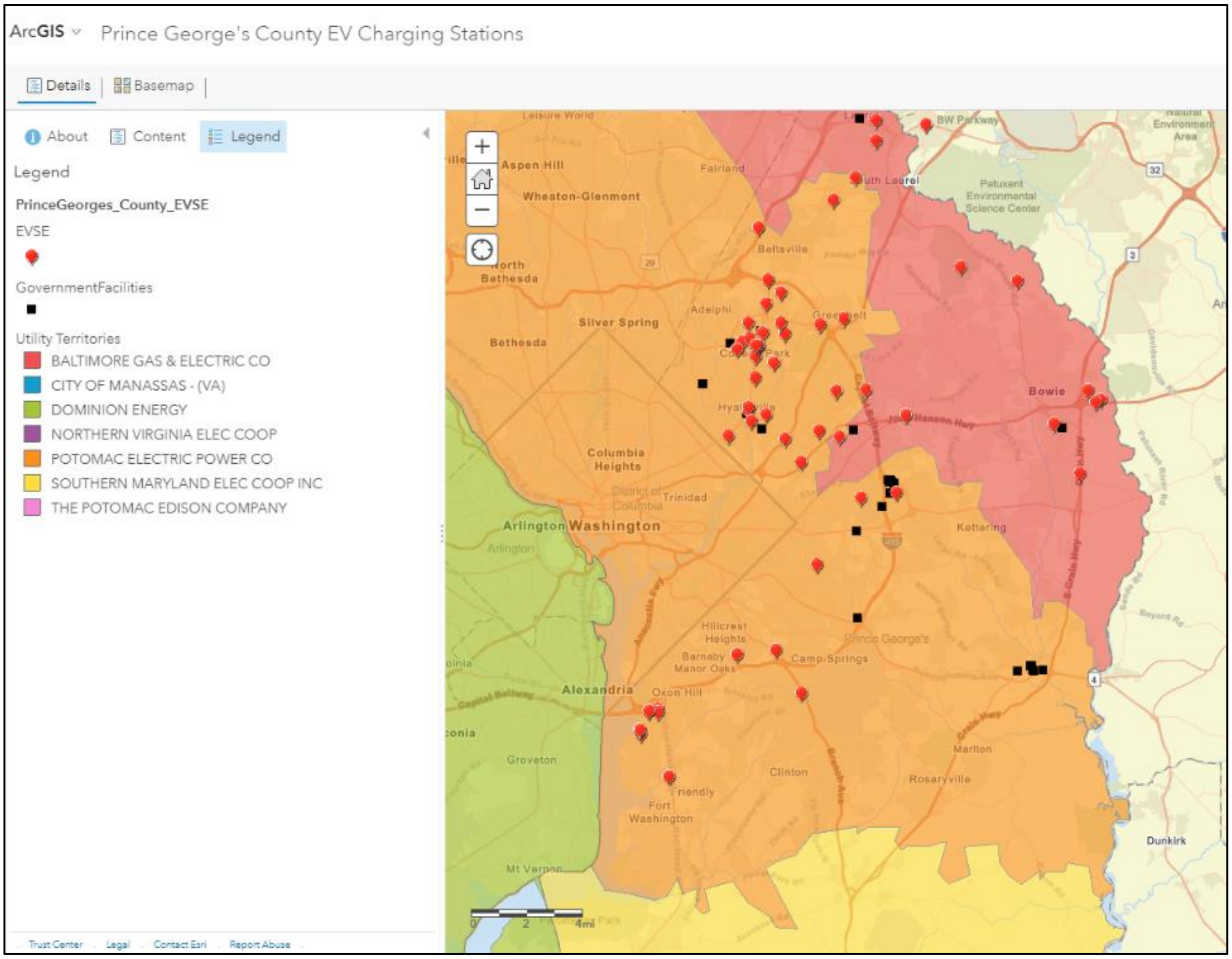
21208 Total	0	2	0
21209 Total	0	19	0
21210 Total	0	0	1
21211 Total	0	24	0
21212 Total	0	5	0
21213 Total	0	21	1
21214 Total	0	6	1
21215 Total	0	7	1
21216 Total	0	4	0
21217 Total	0	18	1
21218 Total	0	13	0
21220 Total	0	6	0
21222 Total	0	4	1
21223 Total	0	5	0
21224 Total	0	23	21
21225 Total	0	1	0
21226 Total	0	0	10
21227 Total	0	3	2
21228 Total	0	18	2
21230 Total	0	69	11
21231 Total	0	27	1
21234 Total	0	4	0
21235 Total	0	7	0
21236 Total	0	25	6
21237 Total	0	9	1
21239 Total	0	12	0
21240 Total	0	16	0
21244 Total	0	30	0
21247 Total	0	2	0
21250 Total	0	19	0
21286 Total	0	5	0
21401 Total	6	34	11
21402 Total	10	4	0
21403 Total	0	13	0
21409 Total	0	2	1
21502 Total	0	7	8
21530 Total	0	3	0
21532 Total	0	4	0
21536 Total	0	2	0
21541 Total	0	6	0
21550 Total	0	3	0
21601 Total	0	0	8
21610 Total	0	2	0

21613 Total	0	15	2
21619 Total	0	3	0
21620 Total	0	17	0
21632 Total	0	2	0
21638 Total	0	7	12
21643 Total	0	4	0
21654 Total	0	2	0
21658 Total	0	1	2
21659 Total	0	2	0
21663 Total	0	11	0
21679 Total	0	4	0
21701 Total	0	13	0
21702 Total	0	10	10
21703 Total	0	1	11
21704 Total	0	7	4
21723 Total	0	6	4
21727 Total	0	4	0
21737 Total	0	0	2
21740 Total	0	8	28
21742 Total	0	3	0
21750 Total	0	0	2
21756 Total	0	4	0
21766 Total	0	3	0
21769 Total	0	2	0
21770 Total	0	4	0
21771 Total	0	16	4
21777 Total	0	2	0
21780 Total	0	2	0
21782 Total	0	2	0
21784 Total	0	10	0
21787 Total	0	2	0
21788 Total	0	4	0
21801 Total	0	17	9
21842 Total	0	26	10
21863 Total	0	2	0
21869 Total	0	4	6
21901 Total	0	2	12
21903 Total	0	6	0
21904 Total	0	1	6
21913 Total	0	0	2
21921 Total	0	4	0
Grand Total	22	2188	447

Attachment G. Maps

Mapped stations, governmnent facilities, boundaries, and utility territories for Prince George's County can be found at ArcGIS.




ArcGIS
Prince George's County EV Charging Stations
Details
Basemap
About
Content
Legend
Legend
PrinceGeorges_County_EVSE
EVSE
GovernmentFacilities
Utility Territories
BALTIMORE GAS & ELECTRIC CO
CITY OF MANASSAS - (VA)
DOMINION ENERGY
NORTHERN VIRGINIA ELEC COOP
POTOMAC ELECTRIC POWER CO
SOUTHERN MARYLAND ELEC COOP INC
THE POTOMAC EDISON COMPANY
Aspen Hill
Wheaton-Glenmont
Fairland
South Laurel
Beltsville
Silver Spring
Bethesda
Adelphi
Greenbelt
College Park
Bowie
Hyattsville
Columbia Heights
Trinidad
Arlington
Washington
Kettering
Hillcrest Heights
Barnaby Manor Oaks
Camp Springs
Alexandria
Oxon Hill
Groveton
Clinton
Rosaryville
Marlton
Friendly
Fort Washington
Mt Vernon
Dunkirk
Patuxent Environmental Science Center
Trust Center
Legal
Contact Esri
Report Abuse

Attachment H. Organizational Chart

At a high level, the government is organized along these lines as far as where the various departments line up:

1. **Government Operations**
    a. Central Services
    b. Information Technology
    c. Department of Permits, Inspections and Enforcement
    d. Office of the County Executive
    e. Office of Community Relations
2. **Public Safety**
    a. Homeland Security
    b. Police
    c. Fire and EMS
    d. Corrections
    e. Sheriff
3. **Health, Human Services and Education**
    a. Health Department
    b. Social Services
    c. Family Services
4. **Economic Development**
    a. Housing and Community Development
5. **Environment**
    a. Department of The Environment
    b. Landfill
    c. Public Works and Transportation
6. **County Council**

Attachment I: Electrical Surveys

Prince George's County Current Electrical Service Audit by Building				
	BUILDING NUMBER AND NAME			
33 facilities (original list): 18 buildings + 15 libraries 8 of 18: completed assessments 6 uncompleted: existing charging 1 uncompleted: on Pepco list 3 uncompleted	**L30073** **Health Department Admin** **1701 McCormick Dr.** **Largo 20774**	**L60058** **Animal Services Facility** **3750 Brown Station Rd.** **Upper Marlboro 20772**	**L60080** **Marburger Building** **8400 D'arcy**	**L30019** **LGC** **9201 Basil Ct.** **Largo**
DATA NEED				
Notes				
Incoming amperage and phase	1200 amp 3 phase 277/480 volt Pepco supply 201/466	1200 amp #phase 480/277 Actual Pepco supplied voltage 465/201	800 amp 3 phase 120/208 volt	3000 amp 3 phase 4 wire 480/277 Actual supplied Pepco voltage 465/201
Distance from transformer (ft)	200	50	20	50
Transformer rating (kVa)	Not available	#09J17503	Not available	Pepco #843393 5557 and #843393 4847 no kW rating on transformer
Location of electrical meters (ft)	Middle of building near MDP	Inside electric room next to MDP	In boiler room	In main electrical room around back down bottom next to main service
Type of electical meter	Digital	Digital	Digital	Digital
Location of electrical panel	Middle of building	Midpoint rear of building (see drawing)	In boiler room southwest corner	In main electrical room around back lower level
Number of breakers per site		11	1	MDP has one 3 pole unused 200 amp breaker
Maximum load per breaker (A) MDP*	Based on Pepco kW demand 250 kW 300 amps w/500 kW available		Based on Pepco demand there should be 200 kW available	200 amp 3 Pole
Maximum voltage per breaker (V)	277/480	480/277	120/208	480/277
Available unused load capacity per panel (A)	500 kW	Based on Pepco kW demand there should be 600 kW available (200 amp in MDP)	Based on Pepco demand there should be 200 kW available	MDP kW demand use is 450 kW, Minumum of 200 amp
Available unused breaker slots per panel (#)	4	Multiple unused spaces in multiple sub-panels	None in the main switch gear	3 spaces available
Distance from panel box to parking area (ft)	150	150	200	150 ft most of which will need to be slotted or bored
Availability of space on wall to add additional panel box	None	Electrical closet is tight with no available wall space	None	24 ft
Notes:				There is a Pepco transformer near the ATM that is only 50' from the curb with multiple parking spaces next to the curb. This would require a new service but would eliminate boring, slotting and new curb work.
*MDP = Main distribution panel				

Prince George's County Current Electrical Service Audit by Building				
	BUILDING NUMBER AND NAME			
33 facilities (original list): 18 buildings + 15 libraries 8 of 18: completed assessments 6 uncompleted: existing charging 1 uncompleted: on Pepco list 3 uncompleted	**L30068 RMS** **1400 McCormick**	**L30094** **9200 Basil Ct.** **Largo 20774**	**L60037** **Facilities Operations and Management** **3414 N Forestedge Rd.** **Forestville 20747**	**L30074** **JAW's (Consolidated Warehouse)** **7600 Jefferson Ave.** **Landover 20785**
DATA NEED				
Notes				
Incoming amperage and phase	2000 amp 3 phase 4 wire 480/277	3000 amp main service	800 amp 3 phase 120/208 Volt	1600 amp phase 480/277 Pepco voltage 460/201
Distance from transformer (ft)	75	Pepco transformer to propose EVSE 75ft	150	
Transformer rating (kVa)	Pepco #843391 6357 no kW rating on transformer	Unavailable	On pole not available	
Location of electrical meters (ft)	In electrical room	In electric room located on NE corner of building	In basement	Inside print shop
Type of electical meter	Digital	Digital	Digital	
Location of electrical panel	In electrical room rear northwest corner exterior entrance	In main electric room	In basement	Main id (?) inside electrical room inside print shop
Number of breakers per site	1 space available in MDP up to 200 amps 3 pole	MDP 6 spare spaces, panel HIC 3 spare space, panel HIB 3 spare space	Spare 1-25 amp, 1-300 amp, 1-50 amp, 4 spaces	
Maximum load per breaker (A) MDP*		1000		1600 amp
Maximum voltage per breaker (V)	480/277	480/277 actual Pepco system voltage 460/265		480/277
Available unused load capacity per panel (A)	MDP 200 amp at least 166 kW available	MDP 2 3 pole spare spaces, panel HIC 3 spare space, panel HIB 3 spare space 200 A 166 kW	Based on Pepco kW demand there should be about 200 kW available	Have not been able to get load information
Available unused breaker slots per panel (#)	3 slots	3	3	
Distance from panel box to parking area (ft)	250	60	30	Sub panels on exterior wall back up to parking lot
Availability of space on wall to add additional panel box	8 ft of cleat wall space howevet would have to be flush mount panel to maintain 3 ft space	None	Plenty	
Notes:	Pepco meter #KZD351048409			Main switch gear is 200 ft from parking area. Subpanels near vending machines have available spaces as well as wall space

Attachment J: Summary of Recommendations

No.	Recommendation	Page
1	Increase the proportion of ZEVs purchased each year.	3
2	Increase the share of total VMT by PEVs versus ICE vehicles.	3
3	Add conduit and capacity for fleet and/or public charging when upgrading electrical capacity to install bus charging, particularly along D'Arcy Road.	5
4	Keep fleet yard charging nonproprietary and accessible to all bus manufacturers.	5
5	Use marketing around the electric bus deployment as a low-cost way to market all the County electrification efforts.	5
6	Acquire technical information for all vehicles and EVSE and ensure the specifications are compatible.	5
7	Take inventory of current EV and EVSE programs and initiatives across departments and establish a joint effort to increase EV uniformly and efficiently and EVSE adoption.	9
8	Establish an EVSE planning lead position to serve as the primary point of contact for County officials, fleet managers, drivers, and other stakeholders.	9
9	Construct EVSE at the three locations that have domiciled PEVs and expand infrastructure out to all County buildings.	9
10	Install a bank of 3 Level 2 chargers at the new Health and Human Services building, and future-proof the site.	9
11	Work closely with utilities to identify priority locations and streamline the permitting and construction process.	10
12	Install an additional 54 charging plugs across 27 locations over the next 5 years to serve County fleet electrification needs.	11
13	Install 201 workplace charging plugs, 157 public Level 2 charging plugs, and 29 public DCFC charging plugs to meet 4 times the number of currently registered EVs (2,365) in the County.	11
14	Leverage State-level incentives that encourage adoption of PEVs and EVSE in residences, multifamily dwellings, commercial fleets, utility fleets, and non-profit organizations.	11
15	Add EVSE station signage requirements to the County code.	13
16	Restrict the use of EV charging stations to vehicles that are currently charging.	
17	For designating EV parking, consider applicable definitions, restrictions, enforcement policies, time limits, and fees.	13
18	Establish minimum dimensions for EV parking spaces.	14
19	Hire site engineers from the County Contracts List to design, develop, and evaluate all electrical designs to support on-site charging and communicate permitting needs with County officials.	16

20	Hire general contractors from the County Contracts List to carry out all electricity pre- or re-wiring, trenching, or other activities that they County may not have the capacity to complete.	**16**
21	Improve communication between departments and fleet management to ensure all EVs in the fleet have EVSE that are adequately integrated into agency operations.	**16**
22	Ensure that all EVSE providers can follow all EVSE codes, ordinances, and design specifications.	**17**
23	Track the evolution of open charge point protocol (OCPP) and develop a list of minimum requirements for EVSE hardware procurements which should include specifications for interoperability (OCPP v1.5 or higher).	**17**
24	Continue to encourage the community and utilities to communicate and engage with each other.	**18**
25	Stay abreast with advancements in the Public Service Commission of Maryland Public Conference (PC44) working group.	**18**
26	Engage with all employees that may use PEVs and EVSE.	**18**
27	Take an active role in encouraging community PEV adoption.	**19**
28	Establish guidelines for charging station etiquette. These guidelines should apply to both PEV and ICE vehicle drivers.	**19**
29	Require all new EVSE owners and operators to follow County codes, zoning ordinances, and EVSE dimension and design requirements.	**20**
30	Evaluate role in a community EV charging program to determine public charging rates and support charging growth by providing free and/or discounted charging spaces at facilities located in low-income areas.	**21**
31	Include a regular maintenance schedule with every EVSE installation.	**22**
32	Develop a permitting checklist for EVSE installation and have it readily available online.	**22**
33	Streamline the permitting process for installations in single-family residences by reducing application material requirements.	**22**
34	Reduce or waive EVSE permitting fees.	**22**
35	Work with local utilities to create a protocol for new EVSE construction and operation that works in tandem with the permitting process.	**22**
36	Develop a permitting checklist for EVSE installation and have it readily available online.	**22**
37	Adopt further regulations to standardize the EVSE specifications installed across facilities, dividing recommendations into public facing light-duty EVSE, light-duty fleet EVSE, and heavy-duty EVSE.	**23**
38	Pursue prewiring standards, as a building code policy for the entire County or simply for County buildings, seeking to pass an ordinance that builds upon the proposed 2021 IECC code for EVs.	**24**
39	Revisit the Green Fleet Policy Resolution's stance on parking.	**24**
40	Consider placing EVSE in a location that could easily meet ADA certifications in the future.	**25**

41	Allow PEV parking to count towards minimum zoning requirements.	**25**
42	Create new zoning codes that include only Level 2 and DC fast chargers.	**25**
43	Apply for solar, battery storage, and/or EVSE grant funding to test a microgrid charging system at a County facility with solar potential as marked in Table 5, above.	**25**
44	Explore using portable microgrid for additional resiliency and/or emergency capabilities.	**25**