Maryland Energy Administration Multifamily Residential EV Study

Maryland Energy Administration

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Table of Contents

List of Figures

List of Tables

Definitions

Internal Combustion Engine Vehicle: Vehicle that is powered by a regular internal combustion engine, it uses fuel which combusts inside a combustion chamber with the help of an oxidizer (typically oxygen from the air).

Electric Vehicle: Vehicle that can be powered by an electric motor that draws electricity from a battery and is capable of being charged from an external source. For the purposes of this study, plug-in hybrid (PHEVs) and battery electric vehicles (BEVs) are considered EVs.

Electric Vehicle Supply Equipment: Equipment that supplies electricity to an EV. Commonly called charging stations or charging docks, they provide electric power to the vehicle and use that to recharge the vehicle's batteries. EVSE equipment is classified as Level 1 (120 volts AC), Level 2 (240 volts, AC), and DC Fast Charger (480 volts DC and higher).

Level 1: Requires a 120V/1-Phase Alternating Current (AC) electricity connection. Level 1 chargers can take 40-50 hours to charge a light-duty BEV from empty.

Level 2: Requires a 208-240V/1-Phase Alternating Current (AC) electricity connection. Level 2 chargers can charge a light-duty BEV from empty in 4-10 hours.

Direct Current Fast Charger: Requires a 480V/3-Phase Alternating Current (AC) electricity connection (with the DCFC equipment converting AC to DC) and is the fastest charging EVSE type. DCFC equipment can charge a light-duty BEV to 80 percent in 20 minutes to 1 hour.

Overburden Communities: Overburdened communities are determined by measuring factors such as pollution burden exposure, environmental effects resulting from pollution burden, and the presence of sensitive populations within a given census tract. The areas that score higher represent communities that are environmentally overburdened.[1]

Underserved Communities: Underserved communities evaluate socioeconomic and demographic indicators including minority populations, poverty, and limited English proficiency at the census tract level. Areas that have higher scores in these indicators represent communities that are underserved.[2]

Environmental Justice Communities: The MDE Environmental Screening tool calculates a total environmental justice percentile score for each census tract combining both the overburdened and underserved scores.

Zero Emission Vehicle (ZEV): As defined by Section 23-206.4 of the Maryland Code, Transportation, a zero-emission vehicles is determined by the Secretary to be of a type that does not produce any tailpipe or evaporative emissions and has not been altered from the manufacturer's original specifications.

[1] Full statutory definition can be found in Section 1-701 of the Environment Article. https://mgaleg.maryland.gov/mgawebsite/Laws/StatuteText?article=gen&section=1-701&enactments=false

[2] Full statutory definition can be found in Section 1-701 of the Environment Article. https://mgaleg.maryland.gov/mgawebsite/Laws/StatuteText?article=gen&section=1-701&enactments=false

List of Acronyms

BAU: Business as Usual

CSNA: Climate Solutions Now Act

DCFC: Direct Current Fast Charger

EJ: Environmental Justice

EV: Electric Vehicle

EVSE: Electric Vehicle Supply Equipment

GHG: Greenhouse Gas

ICE: Internal Combustion Engine

L1: Level 1 Charger

L2: Level 2 Charger

MDE: Maryland Department of Environment

MEA: Maryland Energy Administration

SWEEP: Southwest Energy Efficiency Project

ZEV: Zero Emissions Vehicle

MUD: Multi-Unit Dwellings

Acknowledgements

The Maryland Energy Administration Multifamily Residential EV Study was prepared by AECOM under the direction of the Administration. This report includes feedback and insights from stakeholders in both the State of Maryland and the United States.

Executive Summary

This report summarizes the costs, barriers, and impacts related to Chapter 582 (HB830, 2023). This bill mandates that all newly constructed or renovated housing units with separate garages, carports, or driveways for each unit must include an Electric Vehicle Supply Equipment (EVSE)-installed or Electric Vehicle (EV)-ready parking space. Section 3 of Chapter 582 (HB830, 2023) has assigned the Maryland Energy Administration (MEA) the crucial task of studying the costs, barriers, and impacts related to requiring both new and existing multifamily residential buildings to include EVSE-installed or EV-ready parking spaces. Specifically, the bill mandates examining:

1. The cost implications of mandating multifamily residential buildings to include both EV-ready and EVSE-installed parking spaces.
2. The appropriate ratio of EVSE-installed parking spaces to dwelling units in a multifamily residential building, aligning with the State's greenhouse gas emissions reduction goals.
3. Different payment options for the charging of electric vehicles at EVSE-installed parking spaces in multifamily residential buildings.[3]

Findings in this report are based on analysis of publicly available datasets and feedback from stakeholder engagement. The report contains the following sections:

- **Introduction and Purpose** provides an overview of Chapter 582 (2023) requirements and how the bill aligns with other State transportation electrification targets, particularly the Advanced Clean Cars II Program.
- **Existing Conditions** summarizes the current landscape of EV adoption and EVSE infrastructure. The section contains results from equity mapping to examine EVSE infrastructure accessibility to multifamily dwelling residents in low-income and EJ communities.
- **Future Conditions** projects the State's EV adoption and EVSE infrastructure needs to meet the Advanced Clean Cars II Program targets and the amount of EVSE infrastructure deployed if existing multifamily units complied with Chapter 582 (2023). The section also provides upfront cost estimates to install infrastructure at multifamily units and available incentives.
- **Payment Options** summarizes common pricing mechanisms multifamily residents would pay to recharge their vehicle.

Key Findings:

- EV adoption and EVSE infrastructure are primarily concentrated in affluent counties within the State. Nevertheless, there is a proportionate distribution of EVSE infrastructure to the population levels in EJ and low-income communities.
- There is a lack of EVSE infrastructure within proximity to low-income housing complexes.
- Advanced Clean Cars II will significantly increase EV adoption to nearly 1,867,000, representing 82% of vehicles on the road, in 2035. Maryland is estimated to need a total of 1,970 DCFC ports and 1,978,865 Level 2 ports to meet this EV demand.
- Chapter 582 (2023) is expected to support the deployment of up to 263,930 Level 2 ports if all existing multifamily dwellings installed EVSE infrastructure for 50% of their parking spaces. The infrastructure comes at a steep cost, estimated at $7.4 billion dollars. For reference, MEA's FY24 budget for the Electric Vehicle Supply Equipment Rebate Program is $2.5 million dollars. [4]
- There are numerous payment options and ownership models available to ensure this cost is not borne solely by the property owner or tenants. Multifamily developers have provided key feedback on how these models are received by residents.

[3] Chapter 582 of the 2023 Laws of Maryland, Maryland General Assembly. Accessed November 22, 2023. mgaleg.maryland.gov/2023RS/chapters_noln/Ch_582_hb0830E.pdf
[4] Electric Vehicle Supply Equipment Rebate Program, Maryland Energy Administration. energy.maryland.gov/transportation/pages/incentives_evserebate.aspx

Recommendations:

The Maryland Energy Administration makes the following recommendations for further activities to advance adoption of EVSE infrastructure and EVs in MD.

- Agencies should continue to work together to gather granular data on EV adoption and EVSE locations and upload this information to the Maryland Open Data Portal.
- Relevant agencies should conduct a thorough feasibility study to explore the development of an EV program supporting EVSE installations in low-income residential buildings.
- Agencies should collaborate with key stakeholders to continue existing EV and EVSE financial programs and develop innovative offerings, especially for low-income residents. Potential programs would include incentives, EV charging rates, technical assistance offerings, innovative ownership models, and revenue generation models.
- Agencies should collaborate with key stakeholders to continue educational programs for multifamily residents and developers but also as workforce development initiatives to ensure there is an adequate workforce to properly install and maintain the EVSE infrastructure.

1 Introduction and Purpose

The Climate Solutions Now Act (CSNA) of 2022 heralded a new era of environmental commitment for the State of Maryland. The legislation set an ambitious target of reducing greenhouse gas (GHG) emissions by 60 percent compared to a 2006 baseline by 2031, ultimately reaching net-zero emissions by 2045.[5] To attain this environmental objective, it is imperative to accomplish substantial electrification within Maryland's transportation sector. Currently, this sector accounts for 35% of the state's total greenhouse gas emissions.[6]

Maryland, in collaboration with seven other states, established a task force dedicated to ensuring the effective execution of a Zero Emission Vehicles (ZEV) program. In 2007, Maryland adopted California Clean Cars Program, an initiative that compels automobile manufacturers to progressively introduce a greater number of ZEVs into the state. In 2023, Maryland further solidified its commitment to incentivizing transportation electrification and greenhouse gas emissions reduction by adopting the Advanced Clean Cars II Program, an extension of the existing Clean Cars Program. This new initiative is designed to achieve a milestone of 100 percent zero-emission passenger car and light truck sales by the year 2035. Additionally, Maryland has set ambitious targets to have 300,000 ZEVs on the road by 2025 and 600,000 ZEVs on the road by 2030.[7]

During the 2023 legislative session, Maryland lawmakers enacted House Bill 830 (Chapter 582 (2023)), which concerns the readiness of residential construction for electric vehicle charging infrastructure.[8] This bill mandates that all newly constructed or renovated housing units with separate garages, carports, or driveways for each unit must include an Electric Vehicle Supply Equipment (EVSE)-installed or Electric Vehicle (EV)-ready parking space. Furthermore, Section 3 of Chapter 582 has assigned the Maryland Energy Administration the crucial task of studying the costs, barriers, and impacts related to requiring both new and existing multifamily residential buildings to include EVSE-installed or EV-ready parking spaces.

The goal of this report is to provide recommendations for policymakers to mitigate the challenges and leverage the available opportunities involved with the enactment of Chapter 582. The report first assessed existing conditions in Maryland to understand EV adoption and EVSE deployment with a focus on multifamily building density and equity mapping. The report then projected future EV conditions to align with the Advanced Clean Cars II Program and the impact of implementing Chapter 582. Finally, considerations of different EV charging payment options are presented to detail how EV infrastructure costs may be recovered from those who use the services.

Stakeholders were actively engaged in the discourse surrounding the implementation of EVSE in multifamily buildings through a comprehensive survey published online on October 18, 2023. The survey was designed to solicit feedback and gather insights from a diverse array of participants, including real estate developers, multifamily buildings, EV companies, and nonprofit organizations. This inclusive approach ensured that the feedback obtained was representative of the varied interests and expertise. The survey included questions on EVSE market projection, barriers and gaps to installed EVSE in multifamily developments, payment options, and other considerations. Throughout the report, we have integrated feedback fragments that enrich the discussions surrounding specific topics.

[5] Climate Solutions Now Act of 2022, Maryland General Assembly. Accessed November 9, 2023. mgaleg.maryland.gov/mgawebsite/Legislation/Details/sb0528?ys=2022RS
[6] MCCC 2022 Status Report, Maryland Department of Transportation. Accessed November 9, 2023. www.mdot.maryland.gov/OPCP/MDOT_MCCC_State_Agency_Report_MSAR_14367.pdf
[7] Zero Emission Vehicles in Maryland, State of Maryland. Accessed November 9, 2023. mgaleg.maryland.gov/cmte_testimony/2022/ent/10029_03102022_14355-993.pdf
[8] Chapter 582 of the 2023 Laws of Maryland, Maryland General Assembly. Accessed November 22, 2023. mgaleg.maryland.gov/2023RS/chapters_noln/Ch_582_hb0830E.pdf

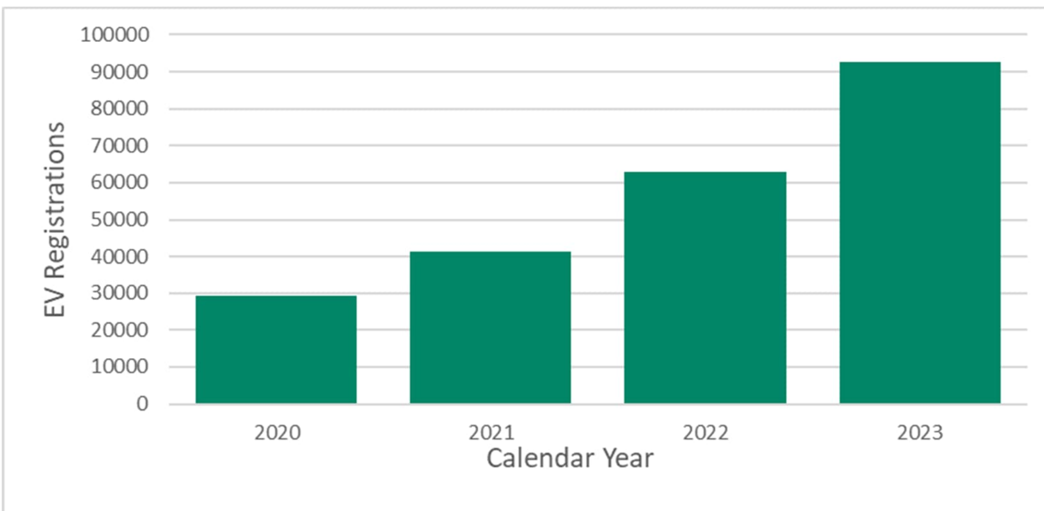
2 Existing Conditions

An understanding of existing conditions is critical to determine the current trends of EV adoption and EVSE infrastructure deployment. With this insight, policymakers can identify gaps and develop appropriate initiatives. In the United States, EV adoption and EVSE infrastructure deployment have rapidly increased in recent years but predominantly in wealthier communities. Thus, this report will specifically examine EVSE infrastructure to ensure initiatives support an equitable transition to EVs.

Historical EV and EVSE Adoption

EV registrations in the state of Maryland have been steadily increasing as shown in Figure 1. As of 2023, the State was home to 92,722 registered EVs, accounting for approximately 4% of the 2,270,862 registered passenger vehicles.[9] This data highlights the increasing prevalence of EVs within the state's transportation landscape. Based on this trend, the average compound annual growth rate in the number of registered EVs is 31%.

Figure 1: Historical EV Registrations



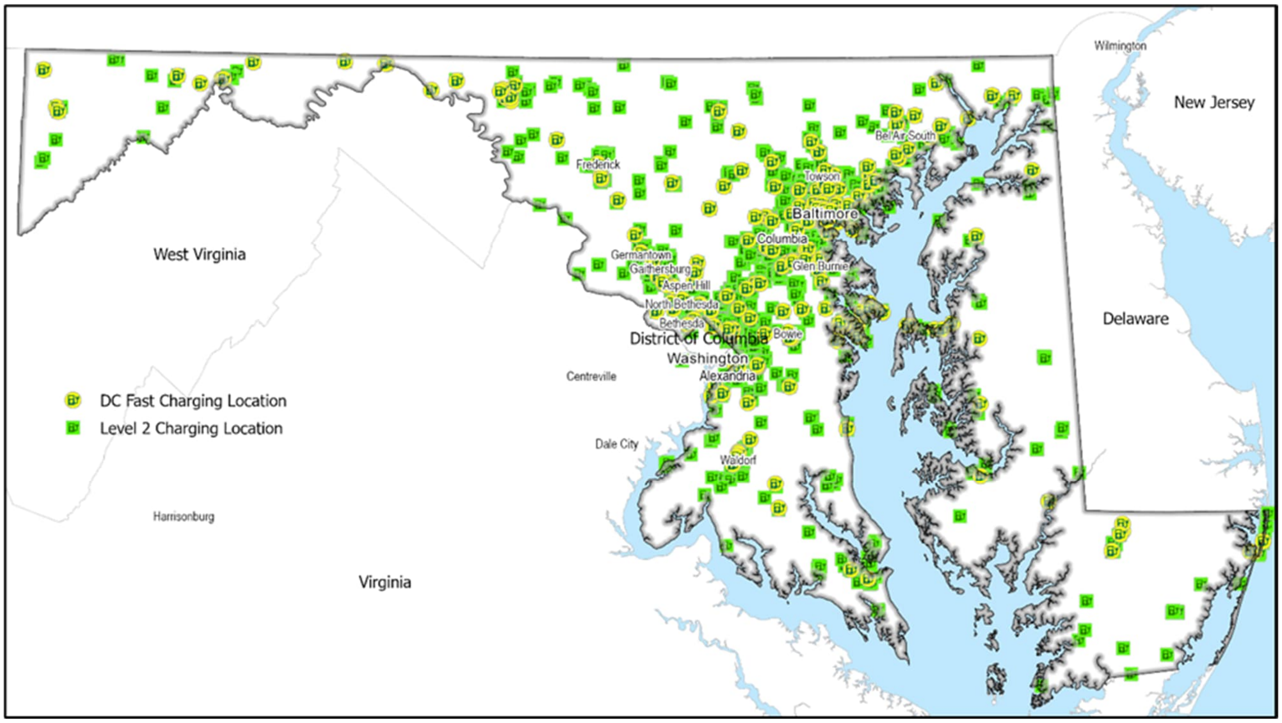
Maryland has made substantial progress in its EVSE infrastructure to support the EV adoption levels, boasting a network of 860 DC fast chargers (DCFC) ports and 3,903 Level 2 charging ports.[10] As depicted in Figure 2, this EVSE infrastructure network is primarily concentrated around urban areas in proximity to Washington, D.C. and Baltimore. To ensure convenient and practical EV travel throughout the state, expanding the EV charging infrastructure network to cover a broader geographical area in Maryland is imperative. This would support local and commuter charging, which is crucial for widespread adoption of EVs.

Future expansion of EV infrastructure holds significant promise in rural areas, offering a pivotal opportunity to not just boost EV adoption but also to drive economic and environmental benefits. Through strategic extension of the EV charging network into rural regions, Maryland can seamlessly facilitate electric vehicle travel statewide, fostering sustainability and incentivizing the adoption of cleaner transportation alternatives. Acknowledging diverse use cases, it becomes imperative to guarantee that all residents, including those in multifamily settings, have accessible charging infrastructure either within their buildings or nearby communities. This commitment enhances overall accessibility and convenience, contributing to the broader goal of promoting electric vehicle ownership throughout Maryland.

[9] Open Data Port. State of Maryland. Accessed December 26, 2024. opendata.maryland.gov/Transportation/MDOT-MVA-Electric-and-Plug-in-Hybrid-Vehicle-Regis/qtcv-n3tc/data

[10] Alternative Fuels Data Center. US Department of Energy. afdc.energy.gov/stations/#/find/nearest

Figure 2: Distribution of EVSE Infrastructure Across Maryland



Equity Mapping

The Maryland Department of the Environment (MDE) Environmental Screening Tool (2.0 Beta) was developed with the objective of implementing programs aimed at mitigating existing environmental disparities and preventing future inequities in communities that have been identified as overburdened or underserved. Overburdened communities are determined by measuring factors such as pollution burden exposure, environmental effects resulting from pollution burden, and the presence of sensitive populations within a given census tract. The four indicators are scored and areas that score higher represent communities that are environmentally overburdened. Underserved communities are determined based on socioeconomic and demographic indicators including minority populations, poverty, and limited English proficiency at the census tract level. Areas that have higher scores in these indicators represent communities that are underserved.[11] The MDE Environmental Screening tool calculates a total environmental justice (EJ) percentile score for each census tract combining both the overburdened and underserved scores. This section of the report will examine EVSE infrastructure and multifamily unit density in EJ and low-income communities to identify areas where future programs can be aimed to drive EVSE deployment.

Summary of Equity Mapping Findings

To date, Maryland has succeeded in supporting EVSE infrastructure deployment in low-income and EJ communities in terms of the number of EVSE ports, particularly in urban centers such as the Washington D.C outskirts and Baltimore City. Continuing initiatives that have led to deployment in such areas are encouraged to continue as these populations face the largest barriers to EV adoption yet would benefit the most by transitioning to EVs; thus, they can be seen as priority areas for deployment. Mapping exercises performed in this section illustrate that EVSE infrastructure could geographically be more dispersed to provide access to all Marylanders, particularly in rural areas. One area for potential impact is providing EVSE infrastructure at or near low-income housing throughout the State.

EVSE Infrastructure within Environmental Justice Communities

The presence of existing public EVSE infrastructure in communities that may have EJ census tracts that are within the 75th-100th percentile of the overall EJ score are mapped in Figure 3. The overall EJ score represents the calculated score for both underserved and overburdened communities by census tract represented as a statewide percentile. The higher the percentile, the greater the environmental and/or socioeconomic and demographic burdens that may exist for that community. For the purposes of this study, a community is considered an EJ community if it exceeds the 75th percentile statewide. For

[11] Maryland Department of Environment (MDE) Environmental Screening Tool (2.0 Beta), mde.maryland.gov/Environmental_Justice/Pages/EJ-Screening-Tool.aspx

each county, a summary review of the percentage of the population within the 75th-100th percentile of the overall environment justice score and existing EVSE that fall within the potential EJ communities are presented in Table 1. Figure 3 demonstrates that the amount of EVSE infrastructure is proportionate to EJ communities, indicating that the amount of current EVSE infrastructure is sufficient to serve EJ populations. It is critical to ensure EVSE in these communities is easily accessible and visible to encourage EV adoption. For an additional review of both overburdened and underserved communities, refer to Appendix B.

Figure 3: Infrastructure in Census Tracts with an EJ Score in the 75th-100th Percentile

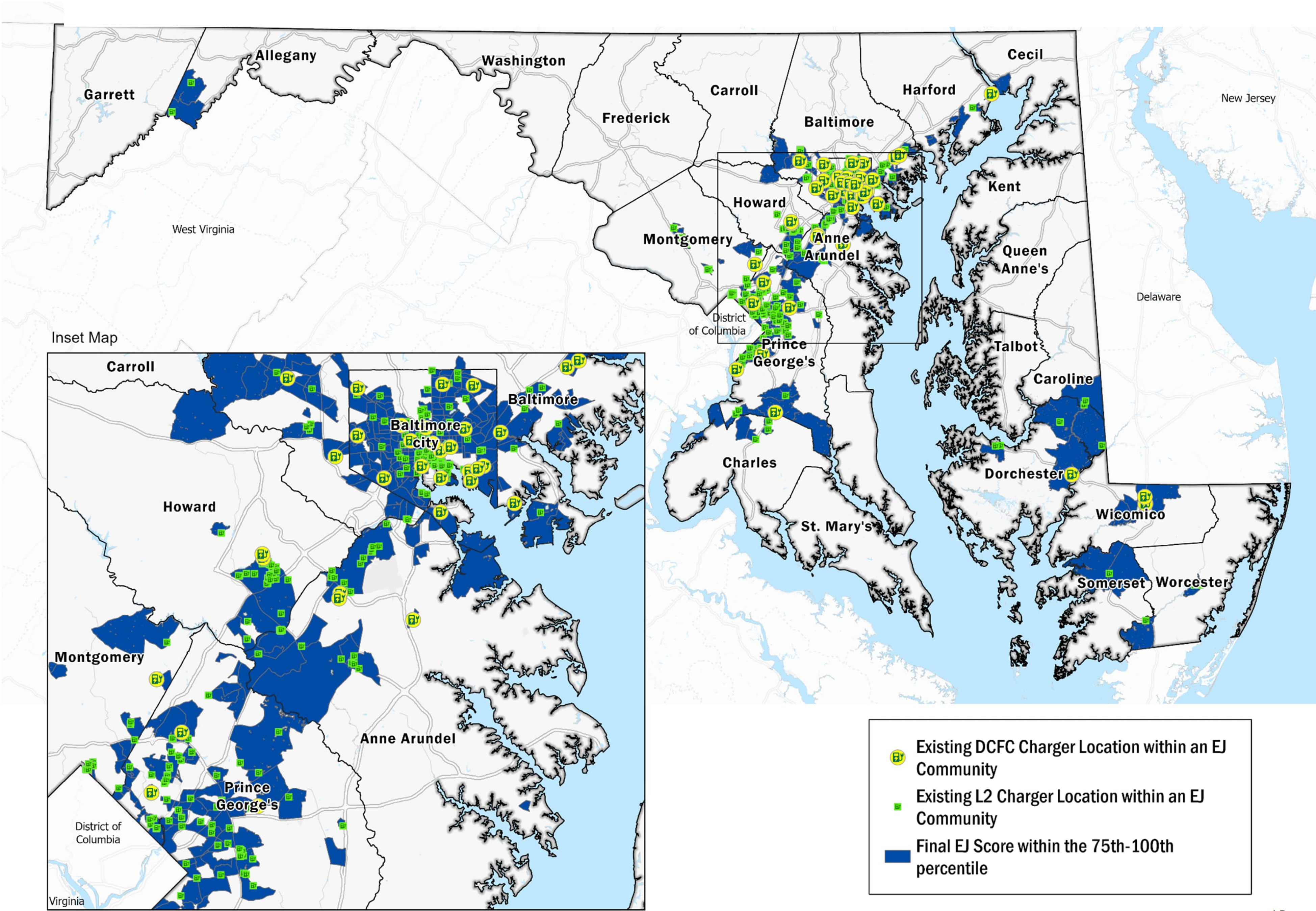


Table 1: EVSE in Census Tracts with an EJ Score in the 75th-100th percentile, By County

County	**Total Population**	**EVSE Ports (L2 + DCFC)[12]**	**Percentage Population within a 75-100th percentile Overall EJ Score***	**Percentage Charging Ports within a 75-100th percentile Overall EJ Score**
Allegany	71,002	54	10.1%	7.4%
Anne Arundel	575,421	486	15.8%	23.0%
Baltimore	828,193	458	25.6%	20.3%
Calvert	92,094	40	0.0%	0.0%
Caroline	33,260	15	13.3%	33.3%
Carroll	168,233	75	0.0%	0.0%
Cecil	102,889	47	5.4%	0.0%
Charles	161,448	84	23.7%	9.5%
Dorchester	31,994	32	54.1%	68.8%
Frederick	255,955	150	0.0%	0.0%
Garrett	29,155	33	0.0%	0.0%
Harford	253,736	185	10.6%	10.3%
Howard	322,407	410	11.7%	29.5%
Kent	19,456	22	0.0%	0.0%
Montgomery	1,047,661	857	10.4%	11.9%
Prince George's	910,551	652	43.6%	49.8%
Queen Anne's	50,163	52	0.0%	0.0%
St. Mary's	113,182	72	0.0%	0.0%
Somerset	25,699	9	42.8%	22.2%
Talbot	37,087	30	0.0%	0.0%
Washington	150,575	100	3.3%	0.0%
Wicomico	103,222	55	37.0%	25.5%
Worcester	51,967	83	14.1%	18.1%
Baltimore City	602,274	762	78.7%	84.6%
Total	**6,037,624**	**4,763**	**24.5%**	**31.2%**

* Overall EJ Score is the combined score measuring overburdened and underserved communities by census tract calculated as a statewide percentile. Data represents the population or charging ports that reside within a census tract that is above the 75 percentile sitewide.

[12] Alternative Fuels Data Center. US Department of Energy. Accessed October, 2023. https://afdc.energy.gov/stations

Multifamily Units within Environmental Justice Community

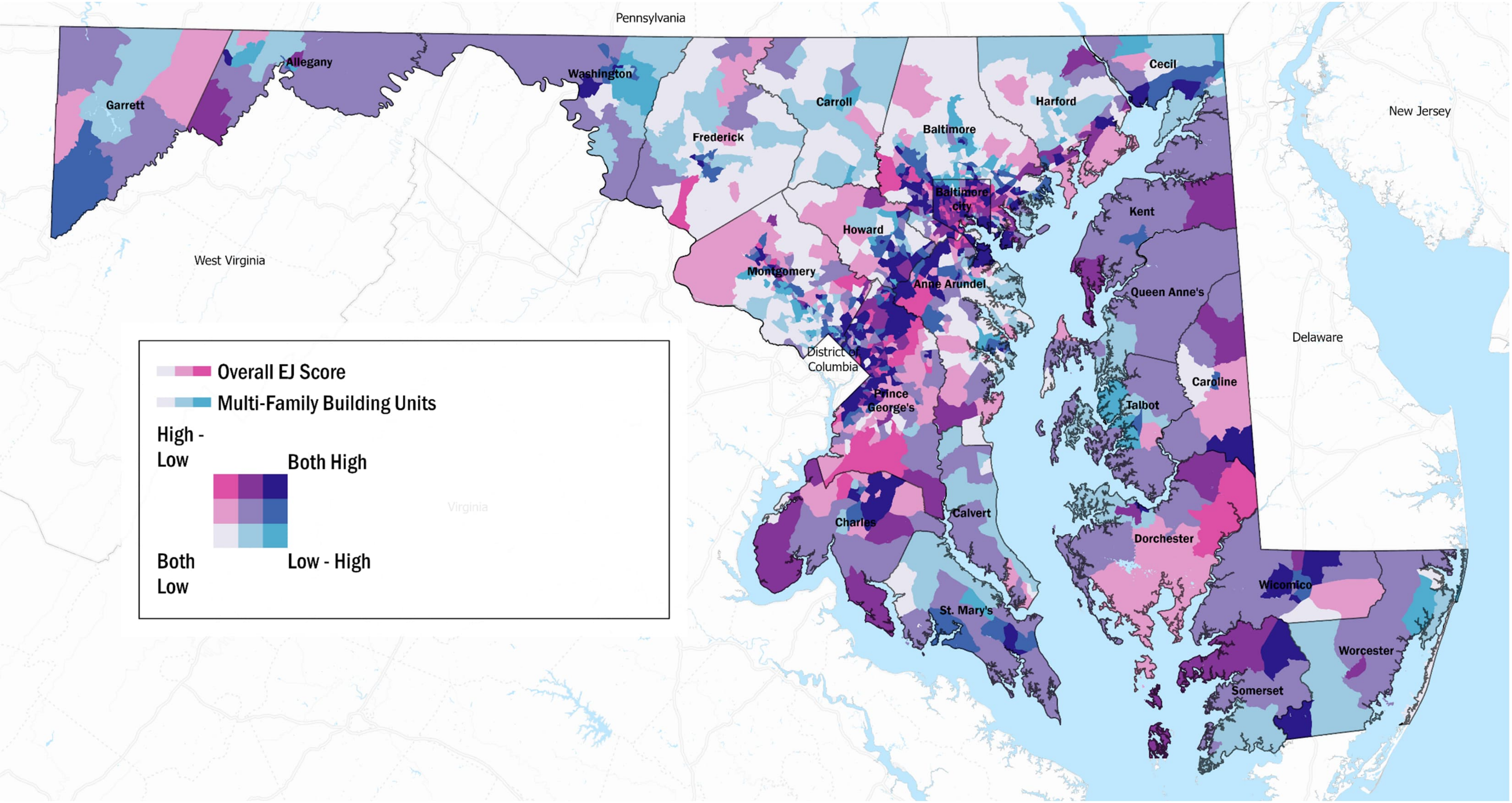
To understand the distribution of multifamily residential housing across the state, particularly in relation to potential EJ communities, a comparison between the counts of multifamily units within the county and those communities with potential EJ considerations is displayed in Table 2. For the purpose of identifying EJ communities, the Overall EJ score from the Environmental Justice screening tool was used and is defined as a census tract that has an Overall EJ score that falls within the 75th to 100th percentile statewide. Multifamily parcels were identified using a state-wide parcel dataset provided by the Maryland Open Data Portal. Within this dataset, any property categorized as having a residential land use and a unit count of more than two were considered multifamily residential properties.

Table 2:Multifamily Units in Census Tracts with an EJ Score in the 75th-100th percentile, By County

County	Multifamily Residential Units	Multifamily Residential Units within a 75-100th percentile census tract Overall EJ Score	Percentage of Multifamily Residential Units within a 75-100th percentile census tract Overall EJ Score
Allegany	4,782	197	4.1%
Anne Arundel	41,932	10,441	24.9%
Baltimore	78,607	30,944	39.4%
Calvert	1,717	0	0.0%
Caroline	1,629	522	32.1%
Carroll	5,881	0	0.0%
Cecil	5,283	400	7.6%
Charles	6,994	2,595	37.1%
Dorchester	1,302	688	52.9%
Frederick	8,880	0	0.0%
Garrett	1,436	0	0.0%
Harford	8,407	2,545	30.3%
Howard	22,748	3,472	15.3%
Kent	1,141	0	0.0%
Montgomery	68,933	17,570	25.5%
Prince George's	83,383	55,289	66.3%
Queen Anne's	1,137	0	0.0%
St. Mary's	7,035	0	0.0%
Somerset	1,077	696	64.6%
Talbot	3,124	0	0.0%
Washington	13,678	1,725	12.6%
Wicomico	9,236	4,550	49.3%
Worcester	3,444	739	21.5%
Baltimore City	70,051	58,266	83.2%
Total	451,836	190,637	42.2%

The presence of multifamily housing in EJ communities across the state is shown in Figure 4 with a state-wide bivariate thematic map that shows the range of both multifamily housing units and EJ scores. The dark blue Census Tracts, which represent the most underserved, overburdened areas of the state with high multifamily unit housing, should be a priority for policymakers to support equitable EV adoption.

Figure 4:Comparison of EJ Score and Density of Multifamily Housing



EVSE Infrastructure within Communities Below 80% Median Household Income

The 2021 median for the State was $96,004, higher than the national median household income of $70,784. As income is one of the most significant barriers to adopting an EV and installing EVSE equipment, understanding where having EVSE infrastructure may be a potential financial burden to residents will be important to spur the transition to EVs. Census Tracts with median household income at or below 80% of the average median household income ($76,803) for the state were mapped alongside existing EVSE infrastructure in Figure 5 and summarized in Table 3. The largest quantity of charging ports within lower income communities are in Baltimore (139), Montgomery (149), Prince George's (177), and Baltimore City (477).

Figure 5:EVSE Infrastructure in Census Tracts at or Below 80% of the State-wide Median Household Income

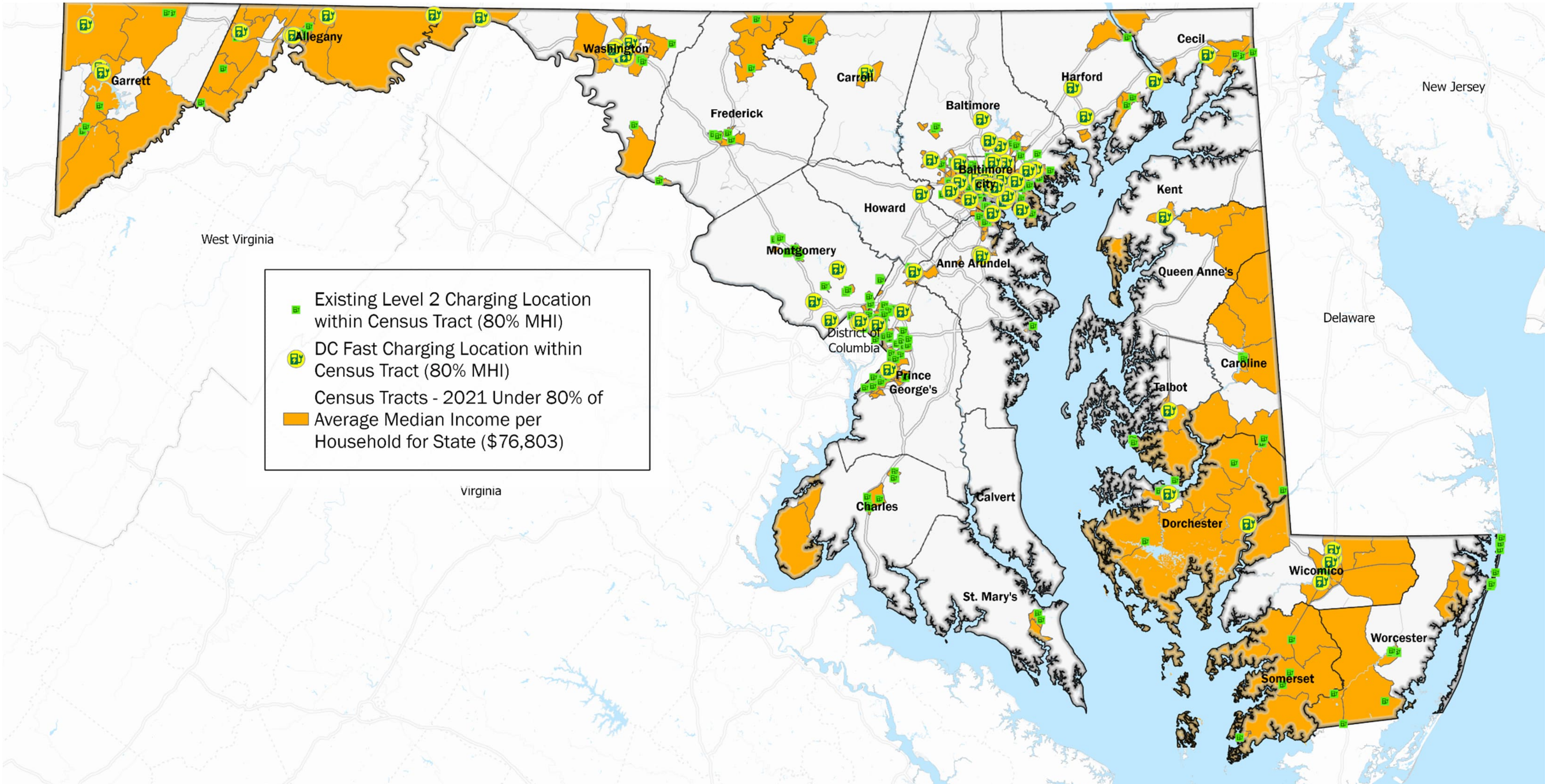
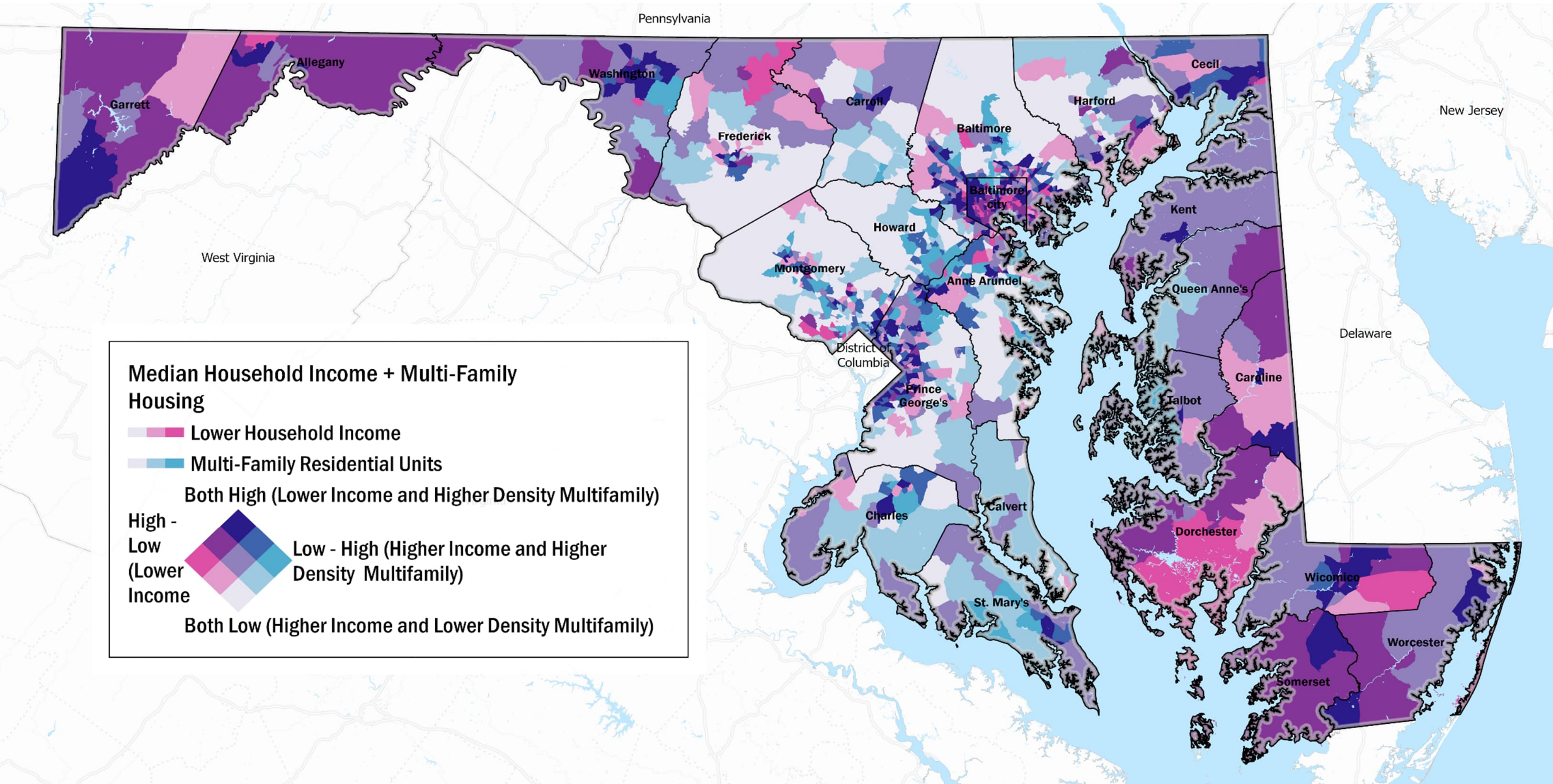


Table 3:EVSE in Census Tracts with Population Below 80% of the State-wide Median Household Income, By County

County	Total Households	Households within Census Tract with less than 80% MHI	Percentage Households with less than 80% MHI	EVSE Ports in Census Tracts at 80% of MHI	Percentage of EVSE Ports in Census Tracts at 80% of MHI
Allegany	27,563	24,672	89.5%	46	85.2%
Anne Arundel	198,446	28,637	14.4%	22	4.4%
Baltimore	316,667	130,986	41.4%	138	30.0%
Calvert	28,132	0	0.0%	0	0.0%
Caroline	11,906	10,288	86.4%	15	100.0%
Carroll	62,907	8,904	14.2%	15	20.0%
Cecil	34,746	12,400	35.7%	9	19.1%
Charles	56,122	9,433	16.8%	12	14.3%
Dorchester	11,039	9,967	90.3%	27	83.5%
Frederick	97,615	20,814	21.3%	19	12.7%
Garrett	12,392	9,990	80.6%	31	93.9%
Harford	92,684	19,592	21.1%	41	22.3%
Howard	118,037	3,104	2.6%	4	1.0%
Kent	7,417	3,172	42.8%	13	59.1%
Montgomery	383,307	55,910	14.6%	149	17.4%
Prince George's	334,053	121,033	36.2%	177	27.1%
Queen Anne's	14,936	1,987	13.3%	0	0.0%
St. Mary's	35,667	5,787	16.2%	4	5.6%
Somerset	6,407	6,407	100.0%	7	82.0%
Talbot	13,489	6,887	51.1%	14	46.5%
Washington	58,630	34,124	58.2%	62	62.0%
Wicomico	39,026	30,793	78.9%	55	100.0%
Worcester	17,360	9,027	52.0%	31	36.8%
Baltimore city	237,466	187,464	78.9%	477	62.6%
Total	2,216,015	751,378	33.9%	1,367	28.7%

The presence of multifamily housing in lower income communities across the state is shown in Figure 6 where a state-wide bivariate thematic map shows the range of both multifamily housing units and lower income communities. Results from this assessment are similar to those provided in the EJ assessment, EVSE infrastructure deployment is roughly proportional to population levels in lower income areas and similar areas of the state rank as a higher priority for deployment (dark blue colors in Figure 4 and Figure 6 overlap). However, a key differentiator is rural areas of the state overall appear as a higher priority compared to urban areas (as displayed by darker colors in those Census Tracts). This could be due to rural areas experiencing lower pollution levels and less minority populations in the rural areas compared to the urban centers, as both factors are considered in the EJ measurement. Thus, identifying priority areas are different based on the metrics used for the assessment.

Figure 6: Density of Multifamily Housing in Relation to the Median Household Income

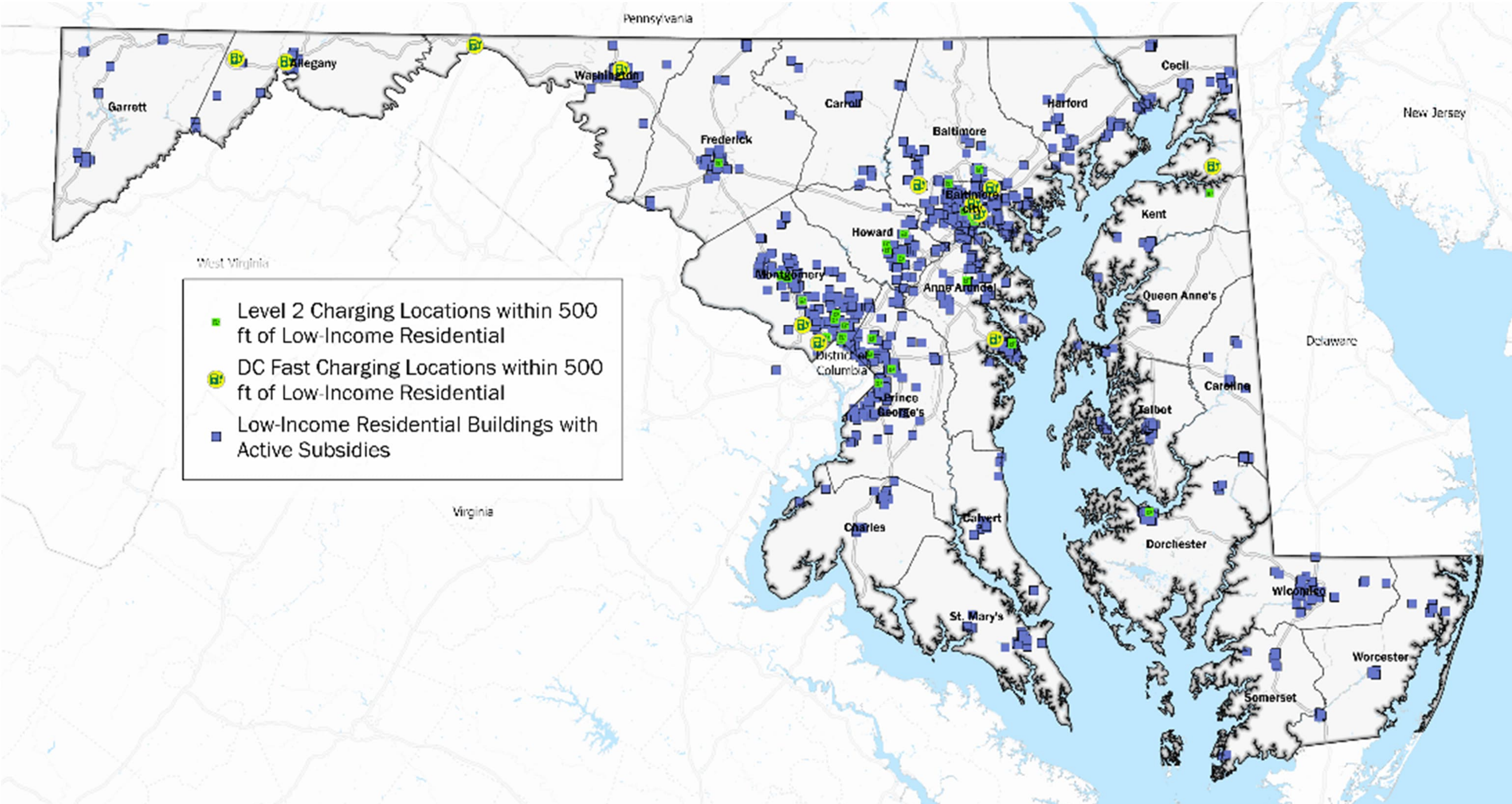


EVSE Infrastructure within Low-Income Residential Buildings

From the MDE Building Stock Data Summary from September 2023, there are 1,198 residential buildings identified in the database with 1,925 active subsidies and 102,878 total units in all identified buildings.[13] The locations of existing EV charging infrastructure within 500 feet of a low-income residential building were identified and mapped in Figure 7. There are 80 Level 2 locations with 193 ports and 15 DCFC locations with 44 ports within the defined distance of a low-income residential building. Results from the assessment illustrate that EVSE infrastructure is not easily accessible to many in the identified buildings.

[13] As mentioned in the MDE Building Stock Data Summary, all actively subsidized residential buildings in Maryland were identified using the list of properties with active subsidies from the National Preservation Database.

Figure 7:Low-Income Residential Buildings and EVSE Infrastructure



Existing Policies for EVSE-Installed Parking Spaces to Dwelling Units in a Multifamily Residential Building Ratio

In the last several years, Maryland and other States aiming to drive EVSE deployment have regulated the number of EVSE parking spaces required in multifamily residential dwelling units. The existing regulations, building codes, and ordinances show a ratio range spanning from 4 percent to 40 percent, and with some jurisdictions adopting a phased approach (i.e., New Jersey increases the EVSE percentage three times, every three years).

Maryland's approach is starting to mirror the policy effort of its counterparts in several states, showcasing a similar commitment to supporting EV adoption. While the landscape evolves, it is important to consider the existing policies dictating the various EVSE ratios. Evaluating these policies not only informs the current state of EV adoption but also lays the groundwork for future developments, ensuring a comprehensive and sustainable approach to electric mobility in Maryland. Table 4 presents a summary of the policy findings for different jurisdictions. A more detailed account of each of these findings is included in Appendix A, organized by state.

Table 4:Summary of EVSE-Installed Parking Spaces to Dwelling Units in a Multifamily Residential Building Ratio

State	Regulation/Code/Ordinance	Requirements for New Constructed or Major Renovated Multifamily Houses
Maryland	House Bill 830 (2023)	● 10% of the parking spaces are to be EV–ready or EVSE–installed ● 25% of the parking spaces are to be EV–ready or EVSE–installed ● 50% of the parking spaces are to be EV–ready or EVSE–installed **The parking categories include open air parking lots, underground parking structures, and parking garages
	Howard County EV Readiness (2019)	● One EV charging station for every 25 residential units
Washington, D.C.	Law 23-194 (2022)	● 20% of the parking spaces shall include EV charging sites
New York	Senate Bill S1736C (2023)	● 100% of parking spaces shall be EV-ready ● 20% of parking spaces shall include EV charging stations
New Jersey	EVSE Requirements (2021)	● Immediately: 15% of parking spaces shall be make-ready and 1/3 of those shall have EVSE installed ● Within 3 years: install EVSE in an additional 1/3 of the original 15%, and ● Within 6 years: install EVSE in the final 1/3 of the original 15%. ● Overall, at least 5% of EVSE must be accessible for people with disabilities ● New garage/parking lot: ▪ < 50 parking spaces – 1 Make-ready or EV charging station ▪ 51-75 parking spaces – 2 Make-ready or EV charging stations ▪ 76-100 parking spaces – 3 Make-ready or EV charging stations ▪ 101-150 parking spaces – 4 Make-ready or EV charging stations ▪ > 150 parking spaces – 4% Make-ready or EV charging stations
Delaware	Senate Bill No. 103 (2023)	● 5% of parking spaces must be EV charging infrastructure parking spaces ● 10% of parking spaces must be EV capable parking spaces ● One EV charging infrastructure parking space must be accessible
	New Castle County Ordinance No. 21-094 (2021)	● 5% of parking spaces must be EV charger installed parking spaces ● 50% of parking spaces must EV charger ready parking spaces

<table>
<tr><td>Massachusetts</td><td>City of Boston
EV Readiness Policy
(2019)</td><td colspan="3">● 25% of parking spaces to be EVSE-Installed
● 75% of parking spaces to be EV-Ready</td></tr>
<tr><td rowspan="2">California</td><td rowspan="2">California
Green Building Code
(2022)</td><td>Mandatory</td><td>Tier 1 (Voluntary)</td><td>Tier 2 (Voluntary)</td></tr>
<tr><td><u>NEW CONSTRUCTION</u>
• 10% of parking spaces to be EV Capable
• 25% of parking spaces require EV Ready
• 5% of parking spaces in buildings with 20 + units
<u>EXISTING BUILDINGS</u>
• 10% of new added parking spaces to be EV Capable
• 10% of altered spaces to be EV Capable</td><td><u>NEW CONSTRUCTION</u>
• 35% of parking spaces require EV Ready
• Projects with 20+ units must offer 10% of total parking spaces with EVSE</td><td><u>NEW CONSTRUCTION</u>
• 40% of parking spaces require EV Ready
• Projects with 20+ units must offer 15% of total parking spaces with EVSE</td></tr>
<tr><td rowspan="2">Illinois</td><td>Chicago
EV Chargers
Ordinance (2020)</td><td colspan="3">● 20% of parking spaces must be ready for EV charging equipment to be installed.
** Applies to residential buildings with five or more units and commercial buildings with 30 or more parking spaces.</td></tr>
<tr><td>Public Act 103-0053 (2023)</td><td colspan="3">● For permits issued 24 months after the effective date of this Act, a minimum of 40% EV-capable parking spaces
● for permits issued 5 years after the effective date of this Act, a minimum of 50% EV-capable parking spaces
● for permits issued 10 years after the effective date of this Act, a minimum of 70% EV-capable parking spaces</td></tr>
<tr><td>Oregon</td><td>Oregon House Bill 2180 (2021)</td><td colspan="3">● 20% of the parking spaces must have EV charging infrastructure, or the minimum percentage required by local government
**This rule only applies to newly constructed buildings and newly constructed parking areas</td></tr>
</table>

3 Future Conditions

Maryland's ambitious targets and policies will drastically change the EV and EVSE landscape in the future. This section projects the impact of the Advanced Clean Car II standard in Maryland through 2050 to estimate the number of ZEVs on the road and the costs to deploy EVSE infrastructure at existing multifamily housing aligning with the Chapter 582 requirements. Understanding these impacts may help policymakers determine the level of intervention needed from the state and a timeline to rollout future initiatives. Additionally, information in this section can be leveraged to monitor progress toward achieving the State's targets.

EV and EVSE Adoption Forecast

The EV projection utilizes EV historical data, EV and internal combustion engine (ICE) vehicle cost projections, EV model availability, policy environment, and demographics data that correlate with EV adoption. This section provides an overview of the forecasted model results and offers recommendations for attaining the projected outcomes. For a detailed description of the forecast methodology, refer to Appendix C (Figure C1).

The EV adoption forecast aligns with the Advanced Clean Cars II Standard, which mandates all new light-duty vehicle sales to be zero emission following 2035. Specific details on rollout of the legislation and associated policies to support the mandate remain unknown; thus, it is assumed that future initiatives will be implanted in tiers between 2026 and 2035 for a smooth transition.

The projected EV results until 2050 from the forecast model is demonstrated in Figure 8. The target forecast based on the Advanced Clean Cars II Standard reaches 100% sales by 2035. The increase in EV adoption under the target projections far exceeds the business-as-usual (BAU) scenario, where Advanced Clean Cars II Standard is not achieved. It is worth noting that in 2037 Maryland is expected to have a fully electrified fleet of public passenger vehicles, as represented by the flattening of the curve. This flattening of the curve in the target forecast is largely due to the assumption of the model that the number of total vehicles in the state is fixed over time. To reach 100% EVs on the road by 2037 would necessitate specific initiatives to encourage early retirement of the ICEs purchased prior to their end of life.

Figure 8:Maryland EV Adoption Forecast Advanced Clean Car II

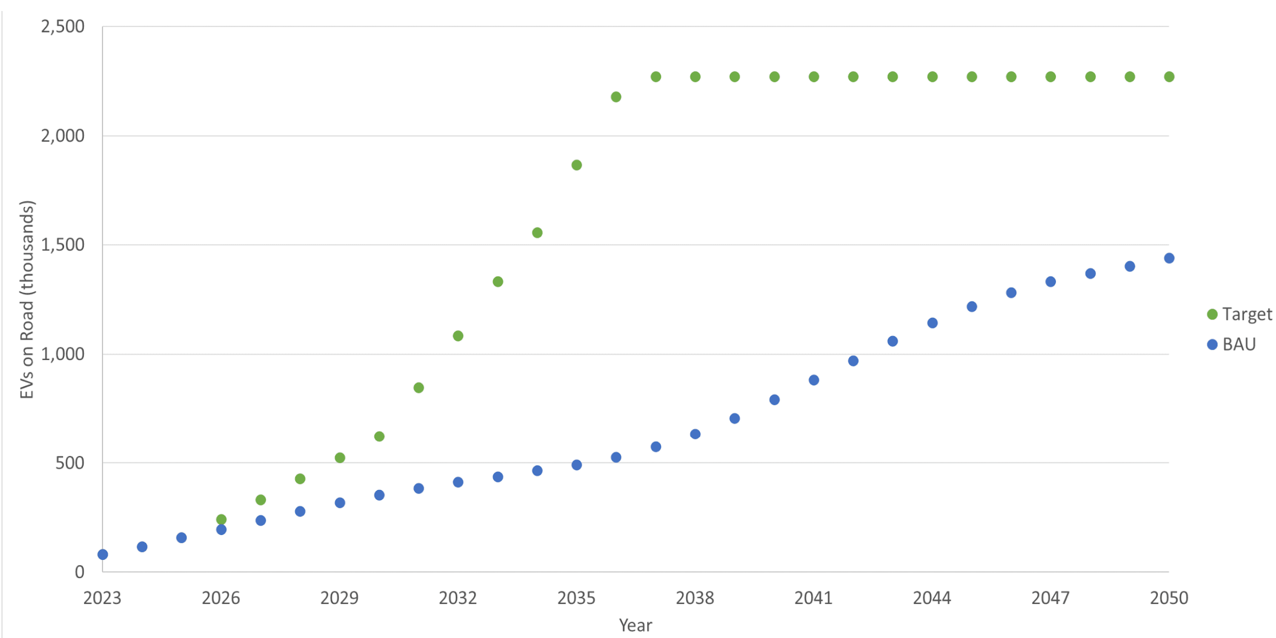


Table 5 compares EVs on the road percentage and EV sales percentage between the target and BAU projections. Under the target projections, Maryland is expected to have nearly 158,000 EVs on the road by 2025, which represents 7% of vehicles on the road. By 2035, the number of EVs will increase to 1,867,000, representing 82% of vehicles on the road – a significant increase compared to the 22% of vehicles under the BAU scenario.

Table 5: Maryland EV Adoption Forecasts (2025, 2035, 2050)

EV Adoption Rate	Forecast Scenario	2025	2035	2050
EV Sales % of Total Sales	BAU	13%	23%	45%
	Target	13%	100%	100%
% EV on the Road	BAU	7%	22%	64%
	Target	7%	82%	100%

The number of EVSE ports required to support the forecasted EV adoption scenarios is shown in Table 6. These amounts are intended solely to serve as high level estimates based on the assumptions utilized for the EV adoption forecast. Refer to Appendix C for more details. Based on the findings, Maryland is already on track to meet the 2025 DCFC forecast. However, significant development of a Level 2 charging network is needed. These counts also include chargers needed for at-home charging which may not be captured in the existing conditions count. Supporting EVSE infrastructure deployment at multifamily housing units, such as through Chapter 582, will help reach these counts but further initiatives will be needed.

Table 6: Maryland EVSE Port Forecasts (2025, 2035, 2050)

EV Infrastructure	Forecast Scenario	2025	2035	2050
DCFC Ports	BAU	633	1,970	5,764
	Target	633	7,467	9,083
Level 2 Ports	BAU	167,688	522,173	1,527,403
	Target	167,688	1,978,865	2,407,114

EVSE Infrastructure Cost Estimates

As EV adoption surges, the demand for accessible and cost-effective EVSE will reach a critical juncture. This section examines the cost to deploy EVSE infrastructure in various residential settings, including townhomes, low-rise and high-rise buildings, parking facilities, and multifamily new construction, all of which will be impacted by the guidelines outlined in Chapter 582.

Cost estimation for Level 2 charging stations within these diverse parking structure types is a multifaceted endeavor that necessitates careful consideration of multiple variables. Each building type presents a distinctive set of challenges, mandating custom-tailored financial assessments. The cost estimation process includes a wide spectrum of factors, including power supply, structural needs, equipment selection, and installation.

Understanding the nuanced cost estimations is particularly important for stakeholders, such as property developers, city planners, and EV users engaged in the planning and development of the EV charging infrastructure. This section presents cost estimates for each different building type, shedding light on the financial intricacies of promoting sustainable and accessible EV charging solutions in diverse residential environments. For a complete list of the basis of estimate and assumptions, please refer to Appendix D.

Table 7: Summary of EVSE Cost Estimates, by Multifamily Unit Type

Type	Quantity	Labor Direct Cost	Material Cost	Soft Cost	Total Installed Cost
Townhomes - L2 Charging Stations	1	$9,669	$7,795	$8,544	$26,008
Low Rise - L2 Charging Stations	1	$10,680	$18,995	$14,302	$43,977
High Rise - L2 Charging Stations	1	$12,282	$19,523	$15,271	$47,076
Structured Parking - L2 Charging Stations	1	$12,282	$19,523	$15,271	$47,076
New Construction - L2 Charging Stations	1	$10,286	$18,995	$14,115	$43,396
DCFC Charging Ports	1	$41,313	$39,012	$35,245	$115,570

DCFC costing is included in the assessment as it was deemed valuable information. DCFC is applicable for visitor parking or areas with a limited number of parking stalls, where a fast-charging solution is necessary to avoid occupying the spot for an extended period.

To apply the EVSE cost estimates to multifamily housing within the state, the estimated total number of parking spaces in existing multifamily housing was first calculated. A review of zoning ordinances across the state was conducted to determine the number of parking spaces required for each property based on the number of bedrooms within each unit. Typically, the zoning codes are consistent, specifying one point five spaces for a studio to one-bedroom units and two spaces for units with two or more bedrooms.

However, the available multifamily property dataset in the Open Data Portal lacks information about unit sizes. To address this gap, the US Census data for 2021 was utilized, identifying the number of households by bedroom quantity in each Census Tract. The percentage of studio to one-bedroom units and two or more-bedroom units was calculated for each census tract. By combining this information with the zoning codes, a parking space ratio per building unit was derived and applied to each multifamily building based on the number of units.

It's important to note certain limitations in the analysis, including the absence of adjustments for zoning variances (such as transportation-oriented development and historic districts) and a lack of distinction in parking types (lot, driveway, garage). To accommodate potential zoning variances, an adjusted parking space ratio was applied to urban areas, as defined by the US Census. In these urban areas, the adjusted ratio became one space for a studio to one-bedroom unit and one point five spaces for units with two or more bedrooms.

The various building types analyzed come with unique parking infrastructures and associated challenges. By addressing the different EVSE adoption levels, Chapter 582 aims to guarantee the establishment of essential infrastructure capable of accommodating the anticipated growth in EV adoption. Additionally, by assessing variations in percentages (10%, 25%, 50%), a scalable framework that offers flexibility to different building sizes and capacities can be developed.

Table 8: Quantity of Level 2 Ports, by Multifamily Unit Type

Type	Count of Structures	Total Parking Spaces	Quantity of L2 Chargers (10%)	Quantity of L2 Chargers (25%)	Quantity of L2 Chargers (50%)
Townhomes - L2 Charging Stations	24,163	469,544	46,954	117,386	234,772
Low Rise - L2 Charging Stations	4,394	22,647	2,265	5,662	11,323
High Rise - L2 Charging Stations	195	35,670	3,567	8,917	17,835
Total	28,752	527,861	52,786	131,965	263,930

Table 9: Associated Costs of L2 Chargers, Based on Different Building Types

Type	Total Unitary Cost	Associated costs of L2 Chargers (10% of parking spaces)	Associated Costs of L2 Chargers (25% of parking spaces)	Associated Costs of L2 Chargers (50% of parking spaces)
Townhomes – L2 Charging Stations	$26,008	$1,221,179,632	$3,052,975,088	$6,105,950,176
Low Rise – L2 Charging Stations	$43,977	$99,607,905	$248,997,774	$497,951,571
High Rise – L2 Charging stations	$47,076	$167,920,092	$419,776,692	$839,600,460
Total	N/A	$1,488,707,629	$3,721,749,554	$7,443,502,207

By analyzing the costs associated with different adoption levels, the study aims to balance the need for widespread EV charging infrastructure with the financial implications for property owners and developers. Understanding the cost implications at different percentage levels helps in making informed decisions regarding feasibility and economic viability.

The unique landscape of townhomes, often characterized by dedicated parking spaces with a personal garage, presents a distinctive opportunity for encouraging EVSE adoption. Streamlining the process for installing EVSE in these dedicated parking spaces could empower townhome residents to take a self-installation and self-funding approach, particularly with the prospect of potential incentives. Unlike low-rise or high-rise structures with complex parking arrangements and ownership models, townhomes offer a more straightforward setting for residents or townhome owners to independently invest in EVSE infrastructure. The key lies in facilitating a simplified and supportive regulatory framework that aligns with the specific needs of townhome communities. By doing so, public support can be directed towards fostering an environment where residents are not only encouraged but also empowered to embrace EV technology, thereby driving EVSE adoption in the State of Maryland. This targeted approach recognizes the distinct characteristics of townhome parking spaces and highlights the potential for grassroots initiatives to play a pivotal role in advancing the state's electric mobility goals.

One of the stakeholders that responded to the engagement questionnaire, highlighted that the total cost of the equipment and installation is such that the payback period, without any subsidies, could extend beyond 10 years. This renders it an unappealing investment for their real estate development company.

Another concurrent comment was the price of electricity. A stakeholder stated during the feedback period that current commercial tariffs for Multi-Unit Dwellings (MUD's) EVSEs make the cost of electricity unpredictable and unaffordable due to Demand Charges, especially during low utilization. The feedback specified that if a single high-power charger is utilized only once, the refueling cost encompasses both the electricity cost and the demand charge. However, in scenarios with frequent charger usage, the demand charge remains constant (as peak demand remains the same) but can be distributed across all instances of charger usage. This context sheds light on the intricacies of electricity cost dynamics for MUD's EVSEs, providing a clearer understanding of the challenges stakeholders face in managing these costs effectively.

Several solutions could be analyzed to the previous issues raised by stakeholders:

- Encouraging the collaborations between public and private entities to share the costs of EVSE installations.
- Providing infrastructure grants for real estate developers to integrate EVSE into new construction.
- Tax credits for individuals and businesses investing in EVSE installations.
- Regulatory changes that facilitate flexible and cost-effective electricity pricing structures that benefit the grid and consumers.
- Integration of battery storage solutions for EV charging stations. Storing energy during low-demand periods and utilizing it during peak times, reducing reliance on the grid.
- Incentives and subsidies offered to reduce the upfront cost of EVSE installation, making it more attractive and financially feasible.

Incentives

It is important to consider incentives when evaluating costs. Depending on the type of multifamily residential property, a property owner may qualify for various EVSE incentives. For example, the federal, state, and local governments are eager to encourage EV adoption by tapping into funds that will help defray costs. The below incentives are currently available and could assist in reducing upfront charger costs; however, consider these may not be available throughout the future.

Federal incentives include the following:

- **Alternative Fuel Infrastructure Tax Credit** Beginning January 1, 2023, EVs are eligible for a tax credit of 30 percent of the cost of six percent in the case of property subject to depreciation, not to exceed $100,000.
- **Alternative Fuel Vehicle Refueling Property Tax Credit** This EV charger incentive provides steep tax credits for commercial properties that install alternative fueling stations. Depending on the scope of the work, the tax credit of up to 30 percent of the EV charging station purchase and installation costs may be covered.
- **Community Alternative Fuel Infrastructure Grant** State and communities that participate in this program offer grant funds to multifamily properties that provide EV parking spaces for their tenants. Unlike a federally backed loan or tax credit, grant funding reimbursement is directly sent to the property owner.

State incentives include the following:

- **State Carbon Reduction Program** This program provides incentives for EV charging stations to help reduce the state's carbon emissions in the transportation sector. The amount and type of motivation vary by state according to the funding it receives from the federal government each year.
- **State Energy Program Funding** This program also reduces a state's carbon emissions in the transportation sector. The main difference between the two programs is that SEP may receive additional funding for special projects through the U.S. Department of Energy.
- **Electric Vehicle Charging Station Rebate Program** The Maryland Energy Administration offers rebates to individuals, businesses, or state or local government entities for the costs of acquiring and installing qualified EV charging stations. The rebate may cover 50 percent of the costs of acquiring and installing the equipment. Commercial multi-unit dwellings qualify for up to $5,000 per EV charging station.

Local incentives include the following:

- **Alternative Fuel Vehicle and Fueling Infrastructure Grants** This program is funded by the state and administered by local districts. It provides grant money as EV charger incentives to eligible entities, including multifamily properties.
- **EVSE Local Permitting Policies** This incentive is for EV charging stations in expediting construction permitting. Many multifamily property owners have experienced a lengthy permitting process for property improvements. This law expedites the approval process.

Rebates may also be available from local governments, authorities, and utilities. For example, in Vermont, the Vermont Public Power Supply Authority offers $500 rebates for each Level 2 EV charging station installed for the workplace or public use. Utility programs also offer rebates for EV charging stations. There are more than 3,200 local utilities that offer rebates in the United States.

Other innovative, equitable, and flexible models have been recently launched through California's Clean Vehicle Rebate Project. Under this initiative, low-income electric vehicle (EV) drivers qualify to receive a charge card preloaded with $2,000. This amount can be utilized at public charging stations, both within and outside of California, or transferred to charge network applications.

4 Charging Payment Options

There are multiple payment options for property owners and tenants, depending on specific circumstances and factors. Factors to consider include location, user demographics, local regulations, and the level of control and management desired. Offering a mix of payment options allows for more flexibility for both the property owner and the tenants and is more equitable.

When installing EVSE at multifamily units, there are several billing options that property owners may consider. The choice of billing method depends on several factors, such as the property's infrastructure, the number of EVSE stations, local regulations, and the preference of both the property owner and the residents. Providing insight on these options assist policymakers in understanding the potential financial impacts and preferences for such options in future policy development.

Free Charging

Free charging is a residential amenity and a desirable perk to tenants. It has been proven to be a worthwhile investment for several reasons.[14] First, studies show that free charging attracts and retains residents and tenants by providing a desirable amenity. It can set a property apart from competitors, making it more appealing and increasing occupancy rates. Properties offering free EV charging also gain a competitive advantage in the real estate market and enhance property values since properties offering free charging are perceived as more valuable. In addition, free charging generates positive media coverage and enhances the property's public image with the commitment to sustainability, equitable, and environmental responsibility.

While free charging offers advantages, property owners must consider the associated costs, such as electricity, maintenance, and infrastructure installation. To cover upfront costs, some property owners apply for grants. For example, a private developer in New York installed charging stations that were owned and operated by the developer. The use of the equipment is offered as a courtesy to the public, having received the equipment free of cost from New York State Energy Research and Development Authority. They entered an agreement with the equipment supplier not to charge for its use for at least four years. However, cars parked at the station must be charging their vehicle or they will receive a notification and could be towed away. Charging equipment has a greater demand during the weekends. Another example of free charging includes the stations at an amenity location in Maryland. The amenity approached the Baltimore Electric Vehicle Initiative and applied for a grant to install two charging stations at the visitor's parking lot. Given the equipment and installation costs were covered in the grant, the amenity decided to offer free charging and found success with this approach, especially given the power is drawn from the solar panels on the property.

Flat Fee

Flat fee involves a set monthly fee to residents for access to the EVSE station(s). This fee is typically added to the monthly rent or maintenance charges and is independent of the electricity used.

This payment method provides property owners predictable and consistent monthly revenue, allowing for easier financial planning and budgeting given they can anticipate the income generated from the station(s). It also simplifies the billing and administration by eliminating the need to track and bill individual charging sessions or electricity consumption. Flat fee charging is also more convenient for tenants, given they pay a single, consistent monthly fee for charging. There are numerous station providers with flat fee options, such as ChargePoint, SemaConnect, EV Connect, Blink Charging and Webasto Charging Systems.

A real estate development and management firm noted, during the feedback period, that all condo owners are currently paying for the EVSE usage out of their association fees. This has upset a majority of the owners, so they are looking into ways to charge users for the stations. Whereas another real estate management firm has decided to rent each EV space per month for a flat $75.00 given installation costs and billing for usage is very high.

[14] Developing Infrastructure to Charge Electric Vehicles, U.S. Department of Energy https://afdc.energy.gov/fuels/electricity_infrastructure.html

Metered Charging

Metered charging factors in the amount of electricity a tenant consumes while using the EV charging station. Users pay for what they use, and it can be implemented through individual electricity meters for each charging station.

There are several advantages of metered EV charging for property owners, such as recovering the actual cost of electricity used by EV users, setting the rate to include the cost of electricity plus maintenance and profit, and allowing for monitoring peak and off-peak charging to reduce strain on the electrical grid. For example, the two single-connector Level 2 stations installed in a parking garage in Baltimore feature a card reader, which enables the owner to set the price for using the equipment, such as time-of-use pricing. Currently, the stations are priced according to the duration of the charge.[15] Another example with this payment option includes stations located in Canal Park, Washington, D.C. The stations are publicly available and started with free charging, but recently implemented a $2.00 per hour charge during peak hours of 7:00am to 6:30pm. The rest of the day, the price is $1.00 per hour.

During the stakeholder feedback period, a real estate management firm noted that card readers only create complexities and maintenance issues. It was suggested that account activation should be initiated with a bar code/QE code or a phone application. Whereas a real estate developer noted that cellular signal is a major problem with payment processing. If the user does not have cellular service, they are unable to charge their vehicle.

While there are several advantages to metered charging, property owners should be aware of the operational complexities involved, such as managing multiple electricity meters, ensuring accurate billing, and addressing potential user concerns about variable charging costs.

Submetering

Submetering involves installing individual electricity meters for each EV charging station. Residents are billed directly based on their usage, similarly to utilities such as water. There are several benefits to submetering for property owners:

- **Accurate billing**: Submetering ensures that users are billed accurately on the individual electricity consumption. This eliminates the risk of overcharging or undercharging users and enhances bill transparency.
- **Cost recovery**: Property owners can recover the exact cost of electricity used by each user by passing the expenses directly to users, ensuring that the charging infrastructure is financially sustainable.
- **Revenue generation**: Property owners can set pricing that covers electricity costs and potentially generate additional income, which can offset infrastructure installation and maintenance costs.
- **Load management**: Property owners can encourage off-peak charging by adjusting pricing during peak demand periods, which may help balance usage and reduce grid stress.

Despite the benefits of submetering, this method is more complex in implementing, involves additional initial installation and maintenance costs, and it requires more administrative effort.

Third Party Billing

Third-party billing involves partnering with EVSE network providers. The providers offer various billing models, including free charging, pay-per-use, or membership-based systems. The property owner may also receive a portion of the revenue generated from charging fees. There are several benefits to this payment option. The third-party billing reduces the administrative burden on property owners by allowing an external service provider to manage the user accounts, billing, and customer support. This option also provides reduced financial risks for property owners given that the third-party is responsible for the collection process. Several providers even offer revenue-sharing models where the property owners earn a portion of the revenue generated from charging fees, creating a steady income stream.

However, it is important to note that utilizing third-party providers requires property owners to have less control over the operation and management of the EV charging infrastructure and results in less revenue.

Time-Based Charging

Time-based charging allows for grid load management by encouraging EV owners to charge during off-peak hours, which helps distribute electricity demand more evenly throughout the day. Time-based charging also enhances grid stability and

[15] Lessons From Early Deployments of EV Charging Stations. Georgetown Climate Center. www.transportationandclimate.org/sites/default/files/Lessons%20From%20Early%20Deployments%20of%20EV%20Charging%20Stations.pdf

reduces the potential for needing grid infrastructure upgrades. It also provides EV owners with cost savings if they are charging during off-peak hours and offers property owners the ability to take advantage of lower electricity rates. This method is primarily useful for properties with high demand for charging and limited station availability.

Demand Charging

Demand charging from utilities can be a significant cost factor and property owners may choose to pass on these demand charges to users or factor them into the flat fee or metered pricing. This payment option charges EV owners based on the maximum power or demand they draw during a session and is more complex than simple kWh or time-based charging. It requires advanced metering and monitoring capabilities to track real-time power usage. Property owners also set a price per kilowatts that corresponds to the maximum power demand during the charging session. Despite the upfront cost of more complex technology, property owners can potentially earn more revenue with this approach, especially if EVs charge at higher power levels. Property owners may also help manage peak load on the electrical grid by controlling the power demand. This method is beneficial in locations with high EV traffic.

EV User Payment Method

Offering a variety of payment methods for EV owners allows for more flexibility and is more equitable. Credit or debit cards are a widely used payment method and convenient. Mobile applications enable EV owners to find, access, and pay for charging sessions and can link their payment methods for easy payment. Radio-Frequency Identification (RFID) cards are also convenient for EV owners by tapping or scanning the RFID on the charging station to initiate payment. Another option is a prepaid charging card where users can purchase and load a predetermined amount of money to swipe when using an EV charging station. There are also subscription plans where users pay a regular fee for unlimited or discounted charging and the user is typically billed monthly or annually. A less common method is cash. Several charging stations accept cash payments via coin-operated machines, but this is not very common.

During the stakeholder feedback period, an EV company state that from experience, EVSE charging payment experiences should be reliable and match the use dwell time of the driver as well as the intended use case/application. In a residential setting, vehicles will be parked for many hours at a time, making residential charging likely the most preferred and primary mode of charging for the driver. Therefore, charging should be as hassle-free and user-friendly as possible. They recommend providing flexibility for payment mechanisms based on the intended use case and including mobile payment or plug and charge payment options. Both technologies streamline the EV charging process, offering simple, secure ways for drivers to charge their electric vehicles. With plug and charge, drivers simply connect the charging cable to the charge point, and the vehicle instantly begins charging with no additional user steps required. For some multifamily applications, a payment system may not be necessary.

5 Conclusions

Maryland has adopted ambitious EV and EVSE targets and policies to meet the State's clean transportation and climate goals. The Chapter 582 legislation requires all newly constructed housing units in the State that include a separate garage, carport, or driveway for each unit to include an EVSE-installed or EV-ready parking space. This report studied the costs, barriers, and impacts related to legislation.

The report first assessed existing conditions in Maryland to understand EV adoption and EVSE deployment with a focus on multifamily building density and equity mapping. As of 2023, the State was home to 92,722 registered EVs, accounting for approximately 4% of the total 2,270,862 registered passenger vehicles – ranking roughly 12th highest in the Unites States.[16] Maryland has made substantial progress in its EVSE infrastructure to support the EV adoption levels, boasting a network of 860 DCFC ports and 3,903 Level 2 charging ports.[17] Existing EV adoption and EVSE infrastructure is predominately in wealthier counties in the State; however, there is a proportionate amount of EVSE infrastructure sited in EJ communities.

The report then projected future EV conditions to align with the Advanced Clean Cars II Program and the impact of implementing Chapter 582. Advanced Clean Cars II will significantly increase EV adoption to nearly 1,867,000, representing 82% of vehicles on the road, in 2035. Maryland is estimated to need a total of 1,970 DCFC ports and 1,978,865 Level 2 ports to meet this EV demand. Supporting initiatives to encourage EVSE deployment, such as Chapter 582, are essential to provide a seamless transition to electric alternatives.

Chapter 582 is expected to support the deployment of up to 263,930 Level 2 ports if all existing multifamily dwellings installed EVSE infrastructure for 50% of their parking spaces. The infrastructure does come at a steep cost of an estimated $7.4 billion dollars. Various ownership models and payment options are available to ensure this cost is not borne solely by the property owner or tenants, especially as private charging station vendors are encouraged to deploy EVSE infrastructure as they have assurance of revenue generation due to the Advanced Clean Cars II Program. Additionally, numerous funding opportunities are available from the federal and state government. MEA's Electric Vehicle Supply and Equipment Rebate Program would need to offer up nearly $660 million dollars, under its current structure, to meet the demand necessary to incentivize the EVSE ports required to meet multi-family demand. It's important to note that this rebate amount is contingent on all existing buildings aligning with the 50% requirement. Notably, the policy doesn't mandate or propose a specific timeframe for existing buildings to complete charger retrofits, making it an open-ended opportunity. To provide context, the Program has secured $2.5 million in funds approved for FY 2024, showcasing a commitment to fostering electric vehicle infrastructure development.[18]

Local leaders play an important role in to ensure Chapter 582 rollout is successful, some actions that may be considered include:

- Having granular data on EV adoption and EVSE locations publicly available in the Maryland Open Data Portal. Currently, only annual vehicle registrations data is available at the County level. Including information at the Census Tract level will help assess existing and future conditions in further detail to provide more specific policy recommendations.
- Investigate the feasibility of developing an EV program at low-income residential buildings. For example, BlueLA in Los Angeles is an EV carshare program that has station hubs at multifamily facilities. This program has been successful as it mitigates the need for low-income residents to purchase their own EV and can instead rely on a shared network for a low membership cost.[19]
- Continuing to support financial and educational programs for EV and EVSE technology, particularly in EJ communities. Utility and EVSE vendor companies are key stakeholders that could be valuable in implementing these programs to multifamily building owners. Financial programs could be in numerous forms including incentives, EV charging rates, technical assistance offerings, innovative ownership models, or revenue generation models (vehicle to grid). Educational programs should focus on engagement with multifamily residents and developers but also as a workforce development initiative to ensure there is an adequate workforce to properly install the EVSE infrastructure.

Following development of this report there were numerous subsequent analyses that could potentially add further value for local leaders. These analyses include:

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[16] Alternative Fuels Data Center. US Department of Energy. Accessed November 9, 2023. afdc.energy.gov/data/10962

[17] Note this does not include at home charging

[18] Electric Vehicle Supply Equipment Rebate Program, Maryland Energy Administration. energy.maryland.gov/transportation/pages/incentives_evserebate.aspx

[19] BlueLA. Blink Mobility. blinkmobility.com/

- Assess the development pipeline for new multifamily construction buildings to determine where further EVSE infrastructure gaps might exist. The current assessment examines existing building stock due to a lack of publicly available pipeline information.
- Assess ownership models available by utilities, EVSE vendors, local governments, and others to determine which models would be most effective, particularly for low-income residents. Ideal ownership models could then be piloted to test viability.
- Further stakeholder engagement efforts by holding workshops with key stakeholders to discuss policy recommendations to ensure Chapter 582 rollout is successful.

Appendix A: Supplementary Information on EV Building Codes

Maryland

Maryland House Bill 830.[20] Approved by the Governor on May 2023, requires MEA to study the cost and other barriers associated with requiring new and existing multifamily residential buildings to include EVSE-installed or EV-ready parking spaces based on the following assumptions:

- At least 10% of the parking spaces will be required to be EV–ready or EVSE–installed;
- at least 25% of the parking spaces will be required to be EV–ready or EVSE–installed;
- at least 50% of the parking spaces will be required to be EV–ready or EVSE–installed; and
- the parking categories include open air parking lots, underground parking structures, and parking garages.

Howard County EV Readiness.[21] As of 2019, new home construction in Howard County is required to be EV-Ready. New multifamily dwellings are required to have one EV charging station for every 25 residential units.

Washington, D.C.

Washington, D.C. Law 23-194 – Electric Vehicle Readiness Amendment Act of 2020.[22] This act amends the Green Building Act of 2006.

- For building permits issued after January 1, 2022, all new construction or substantial improvement of commercial buildings and multi-unit buildings that have three or more off-road parking spaces shall include EV make-ready infrastructure to accommodate the future installation of an EV charging site at least 20% of the parking spaces.
- By September 30, 2021, the Department of Energy and Environment shall establish incentives for owners of commercial buildings and multi-unit buildings to install electric vehicle make-ready infrastructure at a greater percentage of parking spaces than the 20% minimum required. The Department may establish additional initiatives at any time.

New York

New York State Senate Bill S1736C (2023).[23] This is an act to amend the executive law, in relation to requiring new construction that includes dedicated off-street parking to provide EV charging stations and EV ready parking spaces. Multifamily homes with off-street parking must have 100% of the spaces to be EV ready, with at least 20% of spaces equipped with a Level 2 charging station.

[20] House Bill 830. State of Maryland. mgaleg.maryland.gov/2023RS/Chapters_noln/CH_582_hb0830e.pdf

[21] Electric Vehicles. Live Green Howard. livegreenhoward.com/electric-vehicles/

[22] Electric Vehicle Readiness Amendment Act of 2020. Council of the District of Columbia. code.dccouncil.gov/us/dc/council/laws/23-194#:~:text=%22(a)%20For%20building%20permits,future%20installation%20of%20an%20electric

[23] Senate Bill S1736C. The New York State Senate. www.nysenate.gov/legislation/bills/2023/S1736/amendment/C

New Jersey

New Jersey EVSE Requirements (2021).[24] As a condition of preliminary site plan approval, permit applications involving new multiple unit dwellings with more than five units must comply with the following:

- Immediately: 15% of parking spaces shall be make-ready and 1/3 of those shall have EVSE installed.
- Within 3 years: install EVSE in an additional 1/3 of the original 15%.
- Within 6 years: install EVSE in the final 1/3 of the original 15%.
- Overall, at least 5% of EVSE must be accessible for people with disabilities.
- Applications involving a new garage or parking lot not covered above shall comply with the following:

Table A 1: New Jersey EV Code Requirements

Number Of Parking Spaces	Number Of Make-Ready or EV Charging Stations Required
< 50	1
51-75	2
76-100	3
101-150	4
> 150	4%

Delaware

Delaware Senate Bill No. 103 (2023).[25] This is an act to amend Title 16 of the Delaware Code relating to EV charging infrastructure for residential dwellings.

- At least 5% of the total parking spaces for the multifamily residential dwelling must be EV charging infrastructure parking spaces.
- In addition, at least 10% of the total parking spaces for the multifamily residential dwelling must be EV capable parking spaces.
- At least one EV charging infrastructure parking space must be accessible.

New Castle County Ordinance No. 21-094.[26] This ordinance introduced in 2021 amends the County's Code for EV Parking Requirements:

- 5% of the total available designated parking spaces must be EV charger installed parking spaces.
- 50% of the total available designated parking spaces must EV charger ready parking spaces.
- The builder and the owner of a multifamily residential dwelling development must provide at least one (1) electric vehicle charger installed parking space per building unit in a common use area and available for use by all residents of the multifamily residential dwelling.

Massachusetts

City of Boston EV Readiness Policy (2019).[27] This policy requires that all new development projects subjected to the Boston Transportation Department's Transportation Access Plan Agreement (TAPA) approval and/or the Article 80 Large Project Review must equip 25% of their total parking spaces to be EVSE-Installed and the remaining 75% of the total spaces to be EV-Ready.

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[24] EVSE Requirements for New Multi-Unit Dwellings. New Jersey Department of Environmental Protection. dep.nj.gov/wp-content/uploads/drivegreen/pdf/mud-toolkit/evse-requirements-for-new-mud-construction.pdf

[25] Senate Bill No.103. State of Delaware. legis.delaware.gov/BillDetail/130282

[26] Ordinance No.21-094. Newcastle County. www.newcastlede.gov/DocumentCenter/View/43614/21-094

[27] EV Readiness Policy (2019). City of Boston. www.boston.gov/sites/default/files/file/2020/03/EV%20Readiness%20Policy%20For%20New%20Developments%20%287%29.pdf

California

California Green Building Code.[28] The new version of the statewide Green Building Standards Code (2022 CALGreen) calls for the following EV multifamily dwellings residential requirements:

Table A 2: California EV Code Requirements

2022 CALGreen Mandatory Provisions	2022 CALGreen Tier 1 Voluntary Provisions	2022 CALGreen Tier 2 Voluntary Provisions
NEW CONSTRUCTION • 10% of parking spaces to be EV Capable • 25% of parking spaces require EV Ready • 5% of parking spaces in buildings with 20 + units • Spaces identified on plans EXISTING BUILDINGS (Multifamily only) • 10% of new added parking spaces to be EV Capable • 10% of altered spaces to be EV Capable	NEW CONSTRUCTION • 35% of parking spaces require EV Ready • Projects with 20+ units must offer 10% of total parking spaces with EVSE	NEW CONSTRUCTION • 40% of parking spaces require EV Ready • Projects with 20+ units must offer 15% of total parking spaces with EVSE

Illinois

Chicago EV Chargers Ordinance (2020).[29]

- The Chicago City Council approved an ordinance requiring new construction of residential and commercial buildings of certain sizes to ensure at least 20% of any supplied parking spaces are ready for EV charging equipment to be installed.
- The new rules apply to residential buildings with five or more units and commercial buildings with 30 or more parking spaces.

Public Act 103-0053 (2023).[30] Starting in early 2024 all new residential buildings in Illinois with onsite parking, including single-family homes, are required to be built with infrastructure to facilitate the future installation of EV charging equipment.

- All building permits issued 24 months after the effective date of this Act shall require a new construction large multifamily residence that qualifies as an affordable housing development to have the following, unless additional requirements are required under a subsequently adopted building code:
  - For permits issued 24 months after the effective date of this Act, a minimum of 40% EV-capable parking spaces.
  - For permits issued 5 years after the effective date of this Act, a minimum of 50% EV-capable parking spaces.
  - For permits issued 10 years after the effective date of this Act, a minimum of 70% EV-capable parking spaces.

[28] 2022 CALGreen. State of California localenergycodes.com/download/965/file_path/fieldList/CALGreen%202022%20EV%20Charging%20Requirements.pdf
[29] Chicago City Council Approves Ordinance to Increase Chicago's Electric Vehicle Readiness Citywide. City of Chicago. www.chicago.gov/city/en/depts/cdot/provdrs/conservation_outreachgreenprograms/news/2020/april/chicago-city-council--approves-ordinance-to-increase-chicago-s-e.html
[30] Chicago City Council Approves Ordinance to Continue Support for Electric Vehicles in Chicago. City of Chicago. www.chicago.gov/city/en/depts/bldgs/provdrs/bldg_code/news/2023/september/ev_charging.html

Oregon

Oregon House Bill 2180 (2021) EV Parking Infrastructure Implementation.[31] This bill establishes standards for EV infrastructure, which newly constructed building types, and their associated parking, have to comply with the requirements, and sets a minimum percentage of parking spaces that must have EV parking infrastructure installed at time of construction.

- This rule amends the Oregon Structural Specialty Code to require certain buildings to install EV charging infrastructure at a minimum of 20% of the parking spaces, or the minimum percentage required by local government, in accordance with the requirements of ORS 455.417.
- This rule only applies to newly constructed buildings and newly constructed parking areas located on the site and serving the following building types (excluding townhouses):
    - Commercial buildings under private ownership;
    - Multifamily residential buildings with five or more residential dwelling units; and
    - Mixed-use buildings consisting of privately owned commercial space and five or more residential dwelling units.
- The calculation of the minimum number of parking spaces required to have EV charging infrastructure is determined by the following methods:
    - No less than 20% of the spaces in the parking area for the building; or
    - When a local jurisdiction has increased the minimum required percentage of spaces to be provided with EV charging station infrastructure through a land use process, the number of spaces will be determined by the local process.

Additional Jurisdictions

The Southwest Energy Efficiency Project (SWEEP) has created a list of the local governments that have adopted various approaches to EV-integrated building codes, as part of their 2020 Adoption Toolkit.[32] SWEEP is a public interest nonprofit organization advancing energy efficiency, beneficial electrification, and clean transportation in Arizona, Colorado, Nevada, New Mexico, Utah, and Wyoming. Table A3 shows the EV infrastructure code provisions for Multifamily dwellings that are currently implemented across several jurisdictions in North America. This table is a subset (2019 forward) of the SWEEP's original summary, which supplements the findings presented in Table A3.

Table A 3: Other Jurisdiction EV Code Requirements

Municipality	Year	Process Type	Multifamily Requirements
Orlando, FL	2021	Land Development Code	20% EV-Capable
Avon, CO	2021	IECC / IRC	5% EV-Installed, 10% EV-Ready 15% EV-Capable (7+ spaces)
St. Louis, MO	2021	IBC / IRC	2% EV-Installed 5% EV-Ready (increases to 10% in 2025)
Madison, WI	2021	Zoning Code	2% EV-Installed 10% EV-Ready (increases by 10% every 5 years)
Summit County, CO	2020	Green Code	5% EV-Installed 10% EV-Ready, 40% EV-Capable (10+ spaces)
Dillon, CO	2020	Green Code	5% EV-Installed 10% EV-Ready 40% EV-Capable (10+ spaces)
Breckenridge, CO	2020	Green Code	5% EV-Installed 10% EV-Ready 40% EV-Capable (10+ spaces)

[31] HB 2180. Oregon Building Codes Division. www.oregon.gov/bcd/laws-rules/Documents/20220701-hb2180-evcharging-pr.pdf

[32] Current Approach to EV-Integrated Codes. ICC. codes.iccsafe.org/content/ICCEVBCSGGR2021P1/current-approaches-to-ev-integrated-codes#ICCEVBCSGGR2021P1_Ch02_Sec4

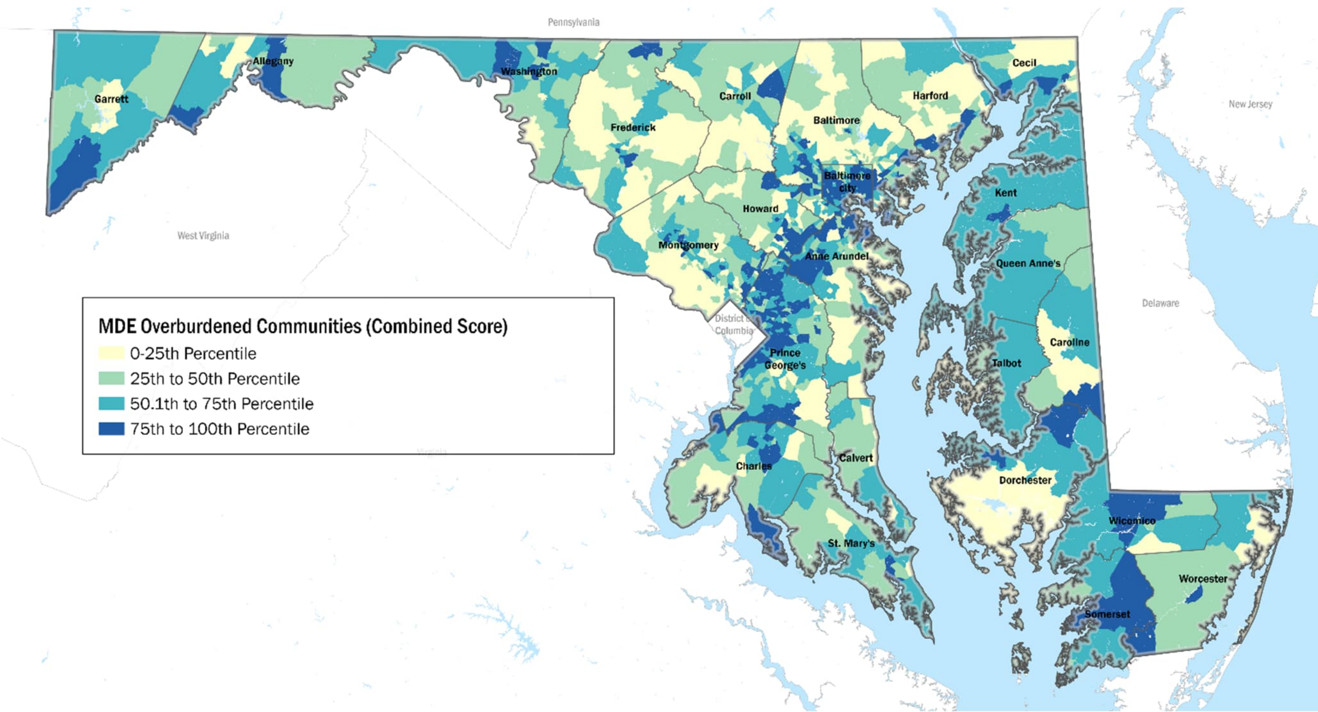
Frisco, CO	2020	Green Code	5% EV-Installed 10% EV-Ready 40% EV-Capable (10+ spaces)
Salt Lake City, UT	2020	Zoning Code	1 EV-installed per 25 spaces (>5,000sf)
Denver, CO	2020	IECC / IRC	5% EV-Installed 15% EV-Ready 80% EV-Capable
Honolulu, HI	2020	IECC / IRC	25% EV-Ready (8+ spaces)
Lakewood, CO	2019	Zoning Ordinance	2% EV-Installed 18% EV-Capable (10+ spaces)
Flagstaff, AZ	2019	IBC / IRC	3% EV-Ready
Seattle, WA	2019	Land Use Code	100% EV-Ready up to 6 spaces, 20% for parking lots with 7+ spaces
Golden, CO	2019	Zoning Code	1 EV-Installed Space per 15 parking spaces 15% EV-Capable
San Jose, CA	2019	Reach/Green Code	10% EV-Installed 20% EV-Ready 70% EV-Capable
Fort Collins, CO	2019	NEC/IRC	10% EV-Capable
Vancouver, BC	2019	BC Building Code	100% EV-Ready

Appendix B: Supplementary Equity Mapping

To assess the distribution of these overburdened communities throughout the state, a composite overburdened community score was mapped using the MDE environmental screening tool, expressed as a state-wide percentile. This score provides an indication of the extent to which an existing charging network is available across the state in relation to areas with equity concerns. Figure B1 displays the distribution of overburdened communities state-wide.

Census tracts that fall above the 75th percentile on a state-wide basis are classified as overburdened communities, signifying a heightened need for targeted environmental equity initiatives.

Figure B 1: Overburdened Communities from MDE EJ Screening Tool



To calculate the percentage of the population residing in overburdened communities for each county, AECOM defined this percentage based on the population of census tracts where the combined overburdened score surpasses the 75th percentile state-wide. The total number of existing charging ports (including Level 2 and DC Fast chargers) within both the county as a whole and those chargers falling within a defined overburdened community were calculated.

The results of this analysis are displayed in Table B1. Various counties, including Anne Arundel (486 ports), Montgomery (857 ports), and Baltimore (458 ports), have less than 25% of their overall EV infrastructure located in overburdened communities. Specifically, Talbot County is notable, as it has 86.3% of its population residing in overburdened communities, yet no existing charging infrastructure is present within those areas.

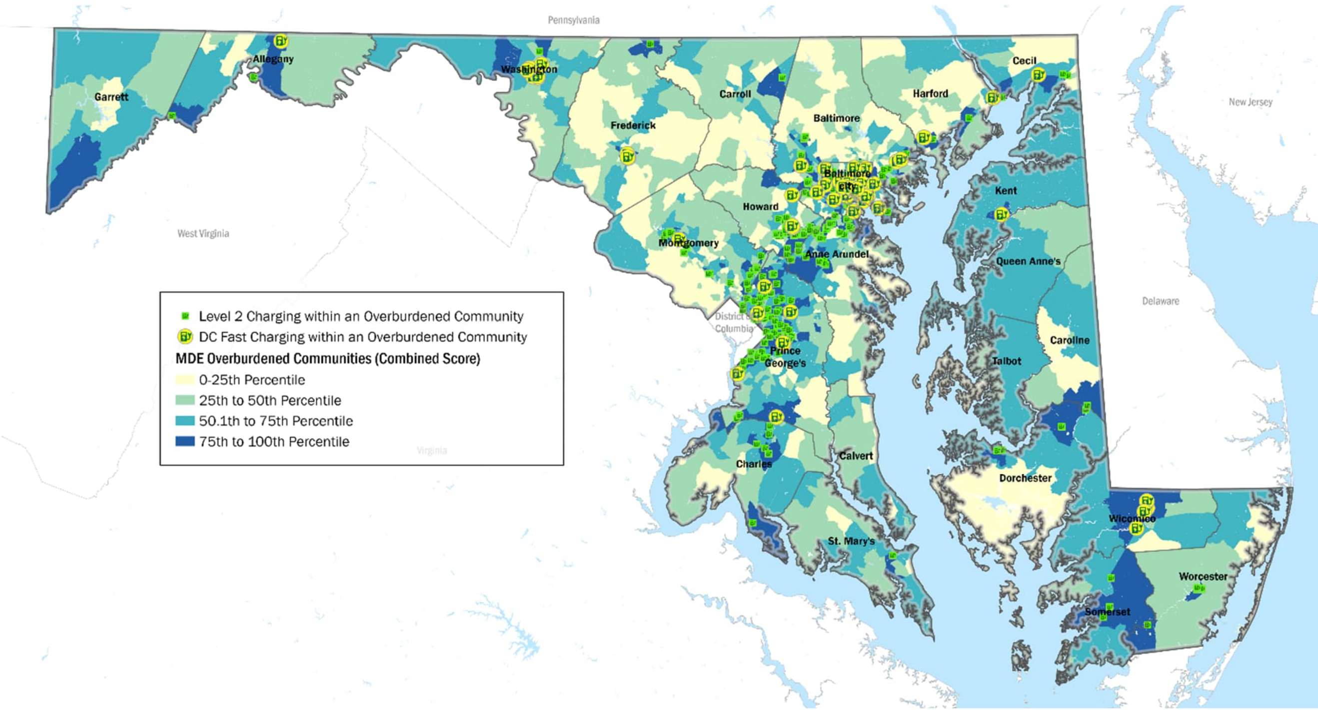
Conversely, several counties, including Kent (13 ports), Wicomico (35 ports), and Baltimore city (484 ports), have more than 50% of their public EV charging facilities located within overburdened communities, signifying a concentrated effort to address equity concerns in these regions.

Table B 1:Population in an Overburdened Community and EVSE Infrastructure, by County

County	Total Population	Overburdened Community Population (75-100th percentile)	Percentage Population within an Overburdened Community (75-100th percentile)	Charging Ports	Charging Ports in Overburdened Communities	Percentage of Charging Ports in Overburdened Communities
Allegany	71,002	7,873	11.1%	54	7	13.0%
Anne Arundel	575,421	111,270	19.3%	486	114	23.5%
Baltimore	828,193	200,482	24.2%	458	100	21.8%
Calvert	92,094	0	0.0%	40	0	0.0%
Caroline	33,260	4,416	13.3%	15	5	33.3%
Carroll	168,233	6,659	4.0%	75	4	5.3%
Cecil	102,889	15,516	15.1%	47	7	14.9%
Charles	161,448	45,763	28.3%	84	16	19.0%
Dorchester	31,994	14,352	44.9%	32	10	31.3%
Frederick	255,955	19,314	7.5%	150	40	26.7%
Garrett	29,155	5,801	19.9%	33	0	0.0%
Harford	253,736	43,537	17.2%	185	24	13.0%
Howard	322,407	86,994	27.0%	410	182	44.4%
Kent	19,456	5,765	29.6%	22	13	59.1%
Montgomery	1,047,661	153,865	14.7%	857	126	14.7%
Prince George's	910,551	424,489	46.6%	652	330	50.6%
Queen Anne's	50,163	0	0.0%	52	0	0.0%
St. Mary's	113,182	10,990	9.7%	72	2	2.8%
Somerset	25,699	13,690	53.3%	9	7	77.8%
Talbot	37,087	31,991	86.3%	30	0	0.0%
Washington	150,575	0	0.0%	100	45	45.0%
Wicomico	103,222	55,176	53.5%	55	35	63.6%
Worcester	51,967	7,353	14.1%	83	15	18.1%
Baltimore City	602,274	429,460	71.3%	762	484	63.5%
Total	**6,037,624**	**1,694,756**	**28.1%**	**4,763**	**1,566**	**32.9%**

Figure B2 illustrates the dispersion of publicly accessible charging infrastructure within overburdened communities. There is a total of 1,566 charging ports, including both Level 2 and DC fast chargers, located within the most heavily overburdened communities. These charging facilities are distributed across 537 Level 2 charging sites and 69 DC fast charging sites.

Figure B 2: EVSE within Overburdened Communities



Multifamily Buildings within Overburdened Communities

To understand the distribution of multifamily residential housing across the state, particularly in relation to overburdened communities, a comparison between the counts of multifamily units within the county and within those communities is displayed in Table B2.

Multifamily parcels were identified using a state-wide parcel dataset provided by the Maryland Open Data Portal. Within this dataset, any property categorized as having a residential land use and a unit count of more than two were considered multifamily properties.

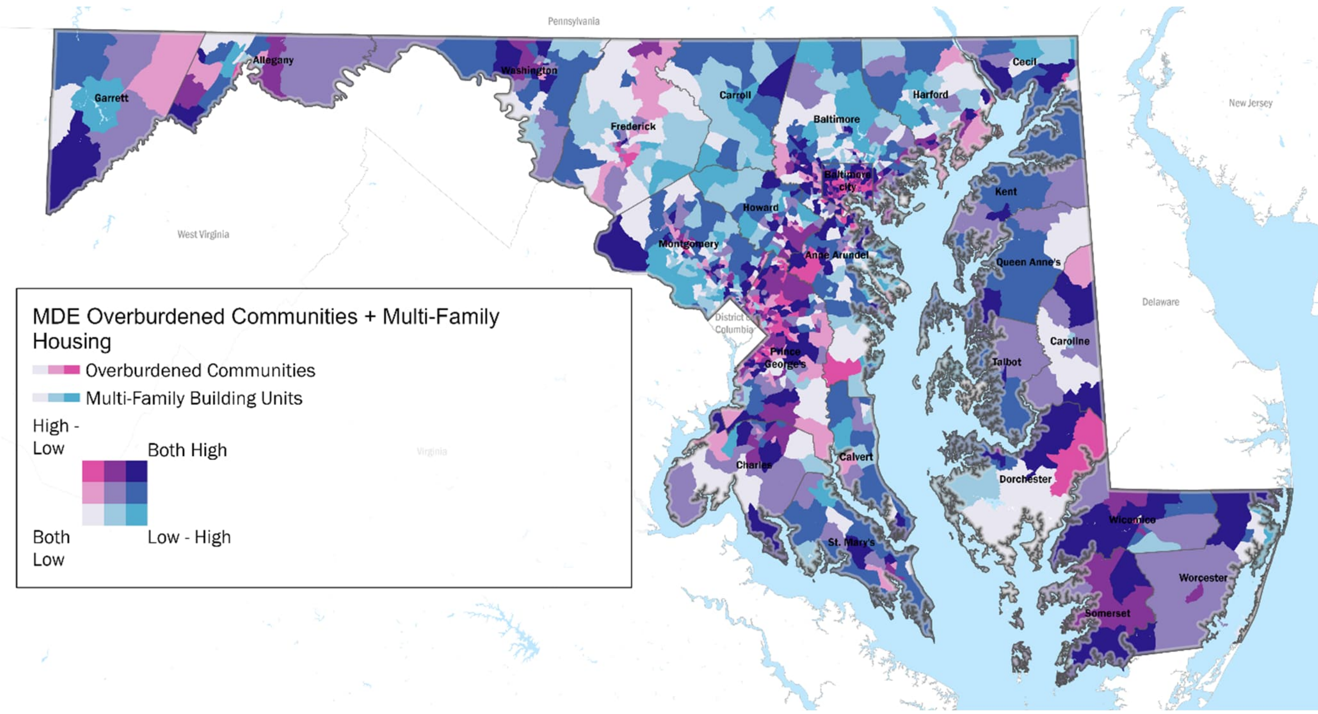
The quantity and geographic distribution of these multifamily housing units within overburdened communities showcase the diversity among counties across the state. There are 14 counties with a percentage of multifamily housing within overburdened communities that falls below the state-wide average of 43.6%. Prince George (50,854) and Baltimore City (48,759) have the highest number of multifamily housing units within the county and specifically overburdened communities.

Table B 2: Multifamily Residential Units in Overburdened Communities, By County

County	Multifamily Residential Units	Multifamily Residential Units within an Overburdened Community	Percentage Multifamily Residential Units within an Overburdened Community
Allegany	4,782	185	3.9%
Anne Arundel	41,932	8,664	20.7%
Baltimore	78,607	34,408	43.8%
Calvert	1,717	0	0.0%
Caroline	1,629	522	32.0%
Carroll	5,881	138	2.4%
Cecil	5,283	1,194	22.6%
Charles	6,994	3,477	49.7%
Dorchester	1,302	651	50.0%
Frederick	8,880	1,316	14.8%
Garrett	1,436	340	23.7%
Harford	8,407	3,391	40.3%
Howard	22,748	8,822	38.8%
Kent	1,141	604	52.9%
Montgomery	68,933	19,836	28.8%
Prince George's	83,383	50,854	61.0%
Queen Anne's	1,137	0	0.0%
St. Mary's	7,035	1,521	21.6%
Somerset	1,077	700	65.0%
Talbot	3,124	0	0.0%
Washington	13,678	4,803	35.1%
Wicomico	9,236	6,023	65.2%
Worcester	3,444	739	21.5%
Baltimore city	70,051	48,759	69.6%
Total	451,836	196,948	43.6%

The presence of multifamily housing in overburdened communities across the state is shown in Figure B3 where a state-wide bivariate thematic map that shows the range of both multifamily housing units and overburdened communities.

Figure B 3: Overburdened Communities and Density of Multifamily Housing



Underserved Communities

Underserved communities reflect the socioeconomic and demographic challenges that may existing within that community. State law defines underserved communities as "any census tract in which, according to the most recent U.S. census bureau survey:

- at least 25% of the residents qualify as low-income
- at least 50% of the residents identify as nonwhite
- at least 15% of the residents have limited English proficiency

Census tracts meeting these criteria are depicted in Figure B4. To determine the percentage of the population residing in underserved communities for each county, AECOM defined this percentage based on the population of the census tracts that have been categorized as unserved.

Subsequently, the total number of existing charging ports (comprising both Level 2 and DC Fast chargers) was summarized for each county, distinguishing between those within underserved communities and those in other areas. The outcomes of this analysis are presented in Table B3. Notably, certain counties lack charging infrastructure within underserved communities. For instance, Anne Arundel County has only 70 charging ports, with just 14.4% of its charging infrastructure located in underserved communities, despite 26.1% of the county's population residing in such areas. In contrast, 85.2% of Garrett County's population resides in underserved communities, while only 39.4% of its charging infrastructure is situated within these underserved areas. The distribution of charging infrastructure within underserved communities is displayed in figure B5.

Figure B 4: State-wide Map of Underserved Communities

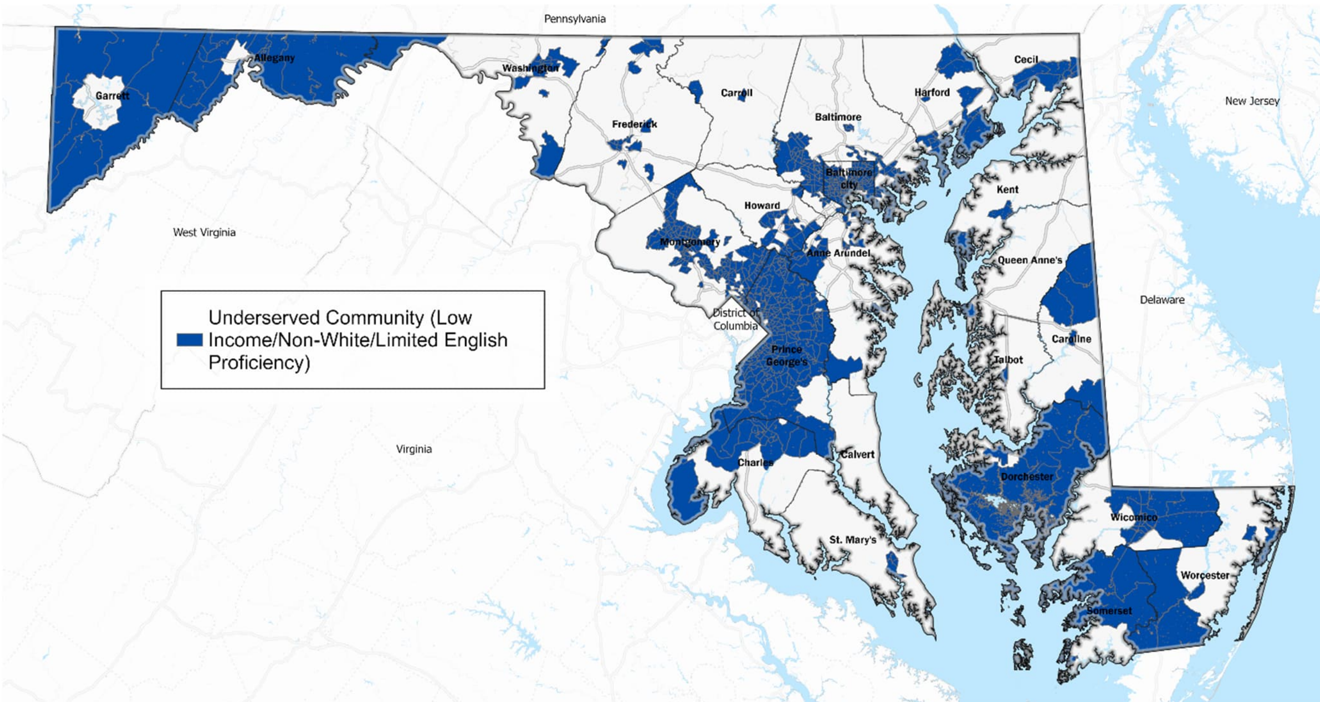
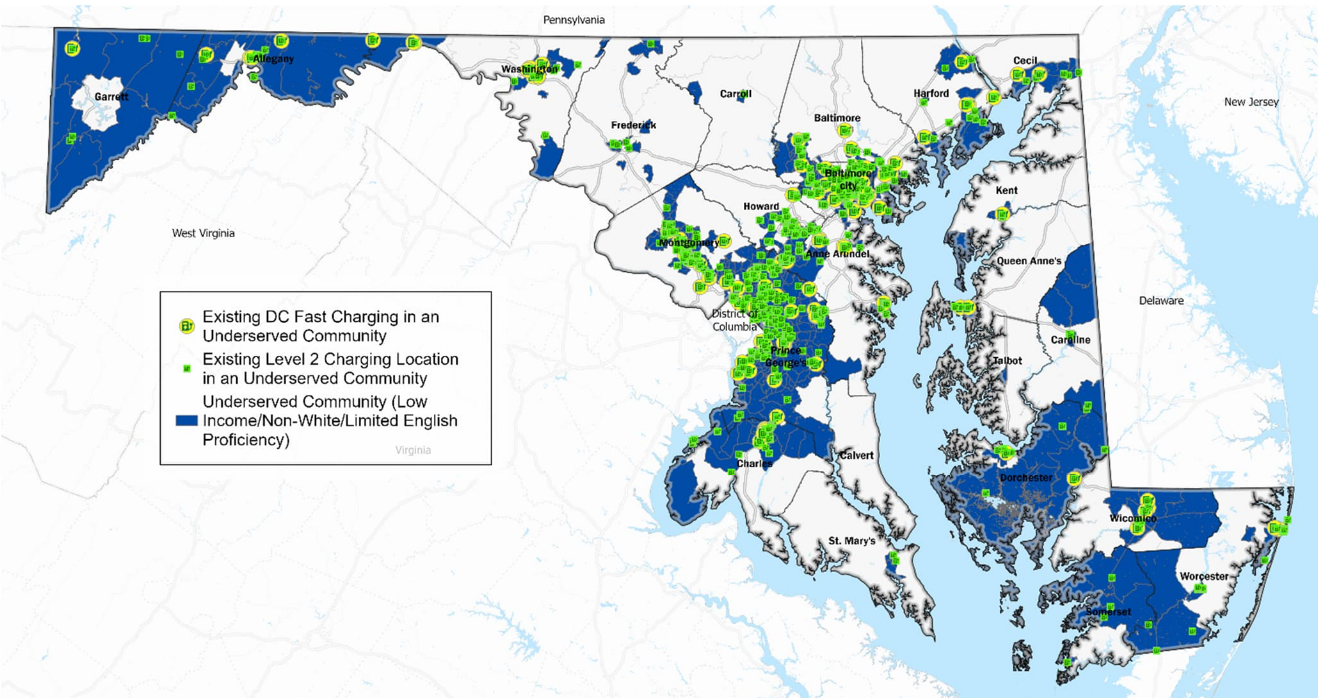


Table B 3: Population in an Underserved Community and EVSE Infrastructure, by County

County	Total Populatio n	Population within an Underserved Community	Percentage Population within an Undeserved Community	Charging Ports in Underserved Communities	Percentage of Charging Ports in Underserved Communities
Allegany	71,002	62,542	88.1%	46	85.2%
Anne Arundel	575,421	150,077	26.1%	70	14.4%
Baltimore	828,193	428,367	51.7%	242	52.8%
Calvert	92,094	0	0.0%	0	0.0%
Caroline	33,260	21,194	63.7%	15	100.0%
Carroll	168,233	7,879	4.7%	4	5.3%
Cecil	102,889	33,354	32.4%	40	85.1%
Charles	161,448	117,473	72.8%	70	83.3%
Dorchester	31,994	27,922	87.3%	32	100.0%
Frederick	255,955	57,233	22.4%	14	9.3%
Garrett	29,155	24,854	85.2%	13	39.4%
Harford	253,736	62,335	24.6%	80	43.2%
Howard	322,407	145,541	45.1%	229	55.9%
Kent	19,456	8,455	43.5%	13	59.1%
Montgomery	1,047,661	642,261	61.3%	530	61.8%
Prince George's	910,551	895,624	98.4%	648	99.4%
Queen Anne's	50,163	4,080	8.1%	27	51.9%

St. Mary's	113,182	14,587	12.9%	4	5.6%
Somerset	25,699	21,757	84.7%	9	100.0%
Talbot	37,087	9,102	24.5%	0	0.0%
Washington	150,575	62,769	41.7%	54	54.0%
Wicomico	103,222	80,300	77.8%	55	100.0%
Worcester	51,967	20,307	39.1%	55	66.3%
Baltimore city	602,274	509,459	84.6%	572	75.1%
Total	**6,037,624**	**3,407,473**	**56.4%**	**2,822**	**59.2%**

Figure B 5: State-wide Map of EVSE in an Underserved Community



Multifamily Residential within Underserved Communities

The number of multifamily residential units was summarized by county using the same methodology as described for overburdened communities. State-wide over 75.1% of multifamily residential units are within underserved communities. There are 5 counties that have more than 90% of their multifamily residential units in underserved communities: Allegany (93.2%), Dorchester (91.2%), Prince George's (99.6%), Somerset (93.4%), and Wicomico (94.0%). The presence of multifamily housing in underserved communities across the state is shown in Figure B6 where a state-wide bivariate thematic map that shows the range of both multifamily housing units and underserved communities.

Figure B 6: Density of Multifamily Housing in an Underserved Community

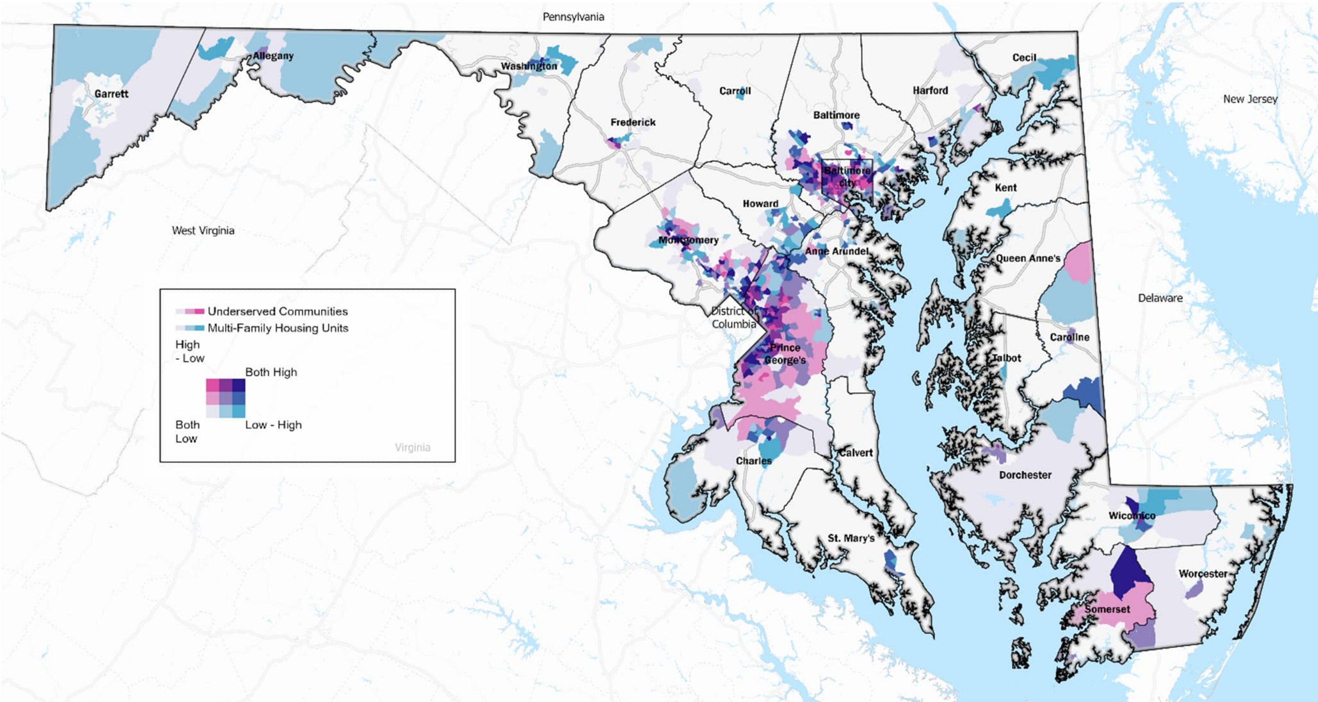


Table B 4: Multifamily Units in Underserved Communities, By County

County	Multifamily Residential Units	Multifamily Residential Units within an Underserved Community	Percentage Multifamily Residential Units within an Underserved Community
Allegany	4,782	4,458	93.2%
Anne Arundel	41,932	14,345	34.2%
Baltimore	78,607	58,626	74.6%
Calvert	1,717	0	0.0%
Caroline	1,629	1,408	86.4%
Carroll	5,881	947	16.1%
Cecil	5,283	2,971	56.2%
Charles	6,994	5,889	84.2%
Dorchester	1,302	1,187	91.2%
Frederick	8,880	4,677	52.7%
Garrett	1,436	1,160	80.8%
Harford	8,407	3,590	42.7%
Howard	22,748	15,690	69.0%
Kent	1,141	786	68.9%
Montgomery	68,933	54,188	78.6%
Prince George's	83,383	83,049	99.6%
Queen Anne's	1,137	276	24.3%

St. Mary's	7,035	2,231	31.7%
Somerset	1,077	1,006	93.4%
Talbot	3,124	1,503	48.1%
Washington	13,678	9,259	67.7%
Wicomico	9,236	8,683	94.0%
Worcester	3,444	2,502	72.6%
Baltimore city	70,051	60,771	86.8%
Total	451,836	339,199	75.1%

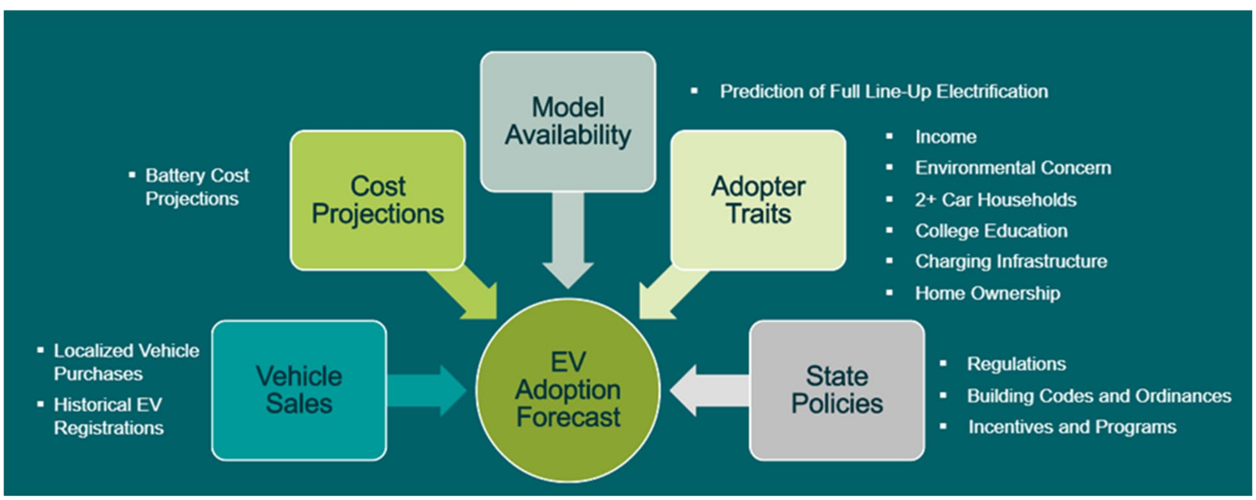
Appendix C: EV Adoption Forecast

Assessment's Methodology

Maryland's EV adoption forecast utilized U.S. Census data, state policy information, vehicle manufacturer announcement, and industry papers to gather available inputs to perform the assessment, as shown in Figure C1. The assessment was based on historical EV adoption in the United States and localized data inputs to calculate annual EV sales. The inputs for each year are updated to account for changes in the EV landscape such as cost declines due to improvements in battery manufacturing, increases in EV model availability, and deployment of charging infrastructure. Results from the tool provide information on EV sales per year, total EV adoption, and public EV infrastructure needed to support EV adoption levels. The following assumptions were made to perform the assessment:

- There is no consensus on specific number of Level 2 and DCFC ports needed to meet EV adoption projections; however, research papers target public charging infrastructure ratio of 4 DCFC ports per 1000 EVs on the road and 60 Level 2 port per 1000 EVs on the road.
- Vehicle sales are highly volatile based on economic condition. It is assumed that there will be a constant number of total vehicles on the road and vehicle sales per year throughout 2050.
- Due to a high degree of uncertainty in forecasting state demographics, it is assumed they remain consistent from 2020 to 2050.
- Numerous vehicle manufacturers have made commitments to achieving fully electric line-ups in the future. It is assumed that all manufacturers will have fully electric line-ups by 2040 due to internal goals, consumer demand, and national policies.
- Based on battery cost projections, EVs will achieve cost parity with internal combustion engines by 2025.
- IT is difficult to obtain information on the breakdown of registered EVs at the zip code level. For this forecast it is assumed each zip code has the same EV adoption percentage across Maryland.
- The model also assumes that EVs are replaced every 8 years. Therefore, a percentage of sales every year replaces EV sales from 8 years ago.

Figure C 1: EV Adoption Methodology



Appendix D: Basis of Estimate & Assumptions

The purpose of this Costing Procedure and Assumptions Appendix is to offer clarity on the systematic steps involved in identifying expenses for a specific project. It serves as a valuable resource for acquiring a nuanced understanding of the methodologies essential for effective cost management. Within this appendix, readers will find a thorough exploration of the key components that form a robust costing procedure. This encompasses, among other aspects, the identification of direct and indirect costs, allocation methodologies, and considerations related to overhead expenses.

Type and Relative Accuracy of Estimate

- This estimate is defined as an AACE Class V estimate which has a typical accuracy range of +/-50%. AECOM consults AACE International Recommended Practice No. 18R-97.
- Contingency for this estimate represents the general uncertainty in the estimate.

Direct Cost Basis

- Labor
  - Labor cost for Maryland was set at $124.84/hr all-in for craft which includes base wage rates and fringes.
- Material
  - Tagged equipment were priced based on using recent PO's from projects or recent budgetary quotes from suppliers/vendors.
  - Bulk Commodities are priced based on historical resources.
- Subcontractors
  - The estimate is based on using a general contractor with subcontractors as needed hired by the general contractor.

Indirect Cost Basis

- Contractor's Field Staffing is based on 10 to 1 craft to staff ratio.
- Craft Labor Related Expenses – included (drug testing, safety meetings, down time, training, material handling, etc.)
- Temporary Facilities & Services – Temporary facilities are not required.
- Construction Equipment – Included (misc. equipment, service and repair, fuel, mobilization & demobilization)
- Small Tools & Consumables – Included at $1.25 per hour.
- Scaffolding – Not Included
- Craft Per Diem – Excluded
- Start Up Support (Craft Labor) – Included at 1% of direct craft man-hours.

Home Office Services Basis

- Engineering support services are excluded in this estimate, assume to be included in a separate contract.

Summary Markup Basis

- Freight – Included at 6% of all materials and equipment.
- Insurance – Included at 1%
- Taxes – Included at 9%
- Contingency – Included at 20%
- Escalation – Excluded
- Fee - Excluded

Miscellaneous

- Hazardous material handling or disposal is not included.
- Disposal of demolished materials is included.
- Estimate has excluded all underground obstructions and relocation of obstructions.
- The estimate includes conduit.
- The estimate is based on all underground conduit to be direct buried.
- The estimate has included 3rd party electrical testing of all equipment.
- The estimate excludes any spare parts for commissioning and operation. Spare parts will be purchased by owner, if required.

- The estimate has excluded lightning protection, CCTV, Security, lighting, receptacles & Communication systems.
- The estimate excludes any additional materials or equipment not listed above.

Townhomes

- Defined as multifamily dwellings with less than 3 stories.
- The estimate covers wall-mounted Level 2 charger, no foundation is required or included.
- The estimate excludes bollards.
- The estimate assumes that a client-provided power source is situated no more than 150 feet from the charging station location, impacting the cost estimate accordingly.
- The estimate assumes that the charging cable is run in conduit above ground for a maximum distance of 150 feet, influencing the overall cost calculation.
- The estimate includes the cost of a new electrical panel but excludes any additional electrical work.
- The estimated costs are based on the installation of a single charging station per site. Additional units may incur different costs.

Low-Rise Building

- Defined as multifamily dwellings 3 or 4 stories.
- The estimate includes the provision of a 2' x 2' x 1.3' thick precast concrete foundation for the pedestal mounted Level 2 charging station, ensuring a stable and durable base.
- The estimate encompasses the cost of one protective bollard for the charging station, contributing to station security and longevity.
- The estimate assumes that the power source is situated within a maximum distance of 200 feet from the charging station location, which directly affects the cost calculation.
- The estimate is based on the installation of the charging cable underground, taking into account the associated costs and labor.
- The estimate assumes that the trenching for cable and conduit is performed in grass or dirt terrain, not concrete, impacting the excavation requirements and, consequently, the overall estimate.
- The estimate assumes that the cable and conduit trench will measure 2 feet in width, 2 feet in depth, and extend up to 200 feet in length, factoring in the necessary construction effort.
- It is assumed that two new electrical panels are required.
- The estimated costs are based on the installation of one charging station per site. Installation of multiple stations may incur different costs, and customization may be necessary depending on the specific project requirements.

High-Rise Building

- Defined as multifamily dwellings with 5 or more stories.
- The estimate covers the provision of a 2' x 2' x 1.3' thick precast concrete foundation for the pedestal mounted Level 2 charging station, ensuring a sturdy and stable base.
- The estimate includes the cost of one bollard for the protection of the charging station, contributing to its safety and longevity.
- The estimate assumes that the power source is situated within a maximum distance of 200 feet from the charging station location, directly influencing the cost assessment.
- The estimate is based on the installation of the charging cable underground, with considerations for the associated costs and labor.
- It is assumed that the trenching will be performed in concrete terrain, impacting excavation requirements and, consequently, the overall cost.
- The estimate takes into account a cable and conduit trench that measures 0.5 feet in width, 2 feet in depth, and extends up to 200 feet in length, factoring in the necessary construction effort.
- The estimate assumes the replacement of concrete with a thickness of 6" and a strength of 4000 PSI.
- It is assumed that two new electrical panels are required.
- The estimated costs are based on the installation of a single charging station per site. The installation of multiple stations may result in different cost considerations, depending on the specific project requirements.

Structured Parking

- The estimate encompasses the provision of a 2' x 2' x 1.3' thick precast concrete foundations for the Level 2 charging stations, ensuring the stability and durability of each foundation.
- The estimate includes the cost of one bollard for the protection of the charging station, contributing to its safety and longevity.
- The estimate assumes that the power source is located within a maximum distance of 200 feet from the charging station location, directly influencing the cost assessment.
- The estimate is based on the underground installation of the charging cables, with due consideration for the associated costs and labor.
- Trenching is assumed to take place in concrete terrain, affecting excavation requirements and, consequently, the overall cost.
- The estimate includes a cable and conduit trench measuring 0.5 feet in width, 2 feet in depth, and extending up to 200 feet in length, taking into account the necessary construction effort.
- The estimate assumes the replacement concrete to be 6” thick and possess a strength of 4000 PSI.
- It is assumed that two new electrical panels are required.
- The estimated costs are based on the installation of a single charging station per site. The installation of multiple stations may result in different cost considerations, depending on the specific project requirements.

Multifamily New Construction

- The estimate encompasses the provision of a 2' x 2' x 1.3' thick precast concrete foundations for the Level 2 charging stations, ensuring the stability and durability of each foundation.
- Each of these foundations is equipped with two bollards for added protection, contributing to the safety and longevity of the charging stations.
- The estimate assumes that the power source is located within a maximum distance of 200 feet from the charging station location, directly influencing the cost calculation.
- The estimate excludes the cost of trenching for cable and conduit, assuming that this aspect of the installation will be handled by others, potentially impacting overall project expenses.
- It is assumed that two new electrical panels are required.
- The estimated costs are based on the installation of a single charging station per site. The installation of multiple stations may result in different cost considerations, depending on the specific project requirements

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Appendix E: Summary of Stakeholder Feedback by Topic

A diverse group of 20 stakeholders were engaged to inform the study. Stakeholders included six participants from Multifamily condominiums, two from non-profit organizations, eight from real estate developers, and four from Energy Services companies. The deliberate inclusion of representatives from these varied sectors adds depth and richness to the feedback, ensuring a well-rounded perspective on the subject matter. The feedback received not only highlights the unique challenges and perspectives within each sector but also contributes significantly to a comprehensive understanding of the issues under consideration. The varied insights provided by key stakeholders play a pivotal role in shaping a holistic and nuanced view, thereby enhancing the report's overall credibility and relevance.

Historical EV Adoption

What is the state of the market in low-income, underserved, and overburdened communities?

> Real Estate Developer: Can only speak to Baltimore. Electric vehicles and often, any motorized vehicles, are cost prohibitive for this population. [SIC]
>
> Real Estate Developer: there are very few people living in affordable housing communities that own or can afford an electric vehicle. [SIC]

What else does MEA need to know about the current state of the market and projects involving multifamily EVSE installations, particularly in low-income, underserved, and overburdened communities?

> Energy Services Provider: We have invested in multifamily (MUD) EVSE deployment because renters and MUD tenants are a critical part of the broad transition to electric vehicles. Roughly 80% of EV charging happens overnight at home, but access to home charging is very challenging for the majority of renters and apartment-dwellers. In Maryland, about one in three homes are occupied by renters and most of those units are in MUDs. Providing EV charging access to those currently living in MUDs can help the state reach its decarbonization goals and advance transportation electrification.
>
> We have deployed 52 Direct Current Fast Charging (DCFC) sites with 447 connectors and over 154 Level-2 AC chargers in Maryland. This represents a small portion of the total EV charging infrastructure required to serve expected EV adoption. In light of Maryland's recent adoption of the Advanced Clean Cars II regulation, which will require all new light-duty vehicles sold in the state to be zero emission by 2035, the number of new electric vehicle registrations is expected jump dramatically in the coming years. As the electric vehicle market expands beyond early adopters to mainstream consumers, states must consider developing charging infrastructure solutions for households without consistent access to overnight home charging. The ability to charge an EV overnight is additionally important for MUD tenants who are rural, low-income, or in disadvantaged communities, who typically have longer commutes and drive older EVs with shorter ranges.
>
> Buildings constructed today have a lifespan of 50 or more years and buildings that have not been properly future proofed to support EV charging will face much greater retrofit costs. Requiring future proofing in new buildings to support EV charging is a key tool to accelerate the EV adoption and lower the future cost to transition out of combustion engine vehicles. [SIC]

EVSE Locations and Equity mapping

What unique challenges do contractors face with these projects?

> Non-Profit Organization: Generally speaking, unless a permitting authority requires developers to install EVSE, this infrastructure is generally being installed in higher-end buildings during and after construction. There are many challenges, including that many developers are not long-term operators of the properties and may not recover the cost of the chargers when they sell the property.
>
> Developers are also unfamiliar with the hardware and software and may not want to take on the risk of making a wrong decision (the risk is more significant even than many realize, because some hardware is locked to a single network provider and can never be ported to a different network; this is why we advocate for the right of consumers (which includes developers in this case) to port their chargers to more than one network). [SIC]
>
> Non-Profit Organization: Other options being seen in the region and promoted by MUD property managements: EV car sharing. Example: such as https://www.cityridgedc.com using EnvoyThere https://www.envoythere.com/ and others using

https://www.whipev.com/ (being observed in newer rental properties - some with significant (1/2 of a garage floor) charger installations. [SIC]

What percentage or number of EVSE spaces per total parking spaces are currently being planned for?

Real Estate Developer: 10%-15% of total spaces [SIC]

Real Estate Developer: 6% [SIC]

Real Estate Developer: We are adding EV spaces as needed to existing apartments. We are planning for 20+ % of new apartment spaces to be EV when needed. [SIC]

Energy Services Provider: 5-10 percent is what we see most often, though ambitious owners with thoughts towards the future often aim closer to 20% [SIC]

Energy Services Provider: Typically, 10% to 25% with EVSE ready requirements on the lower end, and EV Ready and EV Capable toward the higher end. [SIC]

EV Adoption Forecast and EVSE Needs

What unique challenges do contractors face with these projects?

Multifamily Condominiums: The greatest obstacles contractors faced were laying down conduits across the parking lot from a transformer to a commercial service dedicated to the EVSEs. Trenching would be the greatest technical challenge.

Another challenge would be educated contractors to future proof the installation by laying down conduits for future expansion in the trenches already prepared. Contractors are simply refusing to build out for the future expansion, instead they are trying talk their clients to build the infrastructure for the current scope of work. [SIC]

Are there any specific difficulties installing charging infrastructure in open air parking lots, underground parking structure, and parking garages?

Multifamily Condominiums: The ceiling height in our underground parking lots is only about 10 feet. This means that smoke from an EV battery fire, which would be extremely toxic, would be tightly confined. Currently, this is a primary basis for owners' opposition to installing EV charging in our garages. EV charging is seen as a serious safety hazard.

The cost is also a concern among owners. We probably will need a major upgrade in our electric service from Pepco. We are developing plans to install a few charging stations in our outside visitor's lot, but the number of spaces will not suffice if EV's become widely adopted. We do not have land available to expand our outdoor parking. [SIC]

Are there any specific difficulties installing charging infrastructure in open air parking lots, underground parking structure, and parking garages?

Multifamily Condominiums: Location of the transformer to the load center (aka breakers) is challenging since the distance typically cannot be longer than 100 feet. Then there are physical challenges to lay down the conduits whether its drilling thru walls and ceilings or trenching under the parking lots or sidewalks.

All EVSE installations should have their dedicated electrical service (aka meter). One needs to plan for infrastructure as if 100% cars are EVs. How many EVSEs does the site need? 1 EVSE per 25 units is WRONG! The correct approach is to have EVSE or make-ready for all parking stalls. Home EV charging is a passive activity when cars are parked. Putting an arbitrary requirement of 1 EVSE per 25 units makes home charging active activity forcing EV owners and residents to constantly move cars around. [SIC]

Are there any specific difficulties installing charging infrastructure in open air parking lots, underground parking structure, and parking garages?

Non-Profit Organization: The biggest obstacles are access to power and, for residential locations, whether a charger is dedicated to a single driver. In many multifamily properties the parking is owned by the community association and individual unit owners are not permitted to reserve individual parking spaces or install chargers in common areas (such as townhouse parking lots). This is somewhat reminiscent of the days when residents were not permitted to install satellite dishes, although EV charging is more complicated because property bylaws often prohibit individual owners from installing personal property in common areas or reserving spaces for their exclusive use. A legislative solution is probably required to solve this problem. [SIC]

What else does MEA need to know about the current state of the market and projects involving multifamily EVSE installations, particularly in low-income, underserved, and overburdened communities?

Real Estate Developer: BGE capacity long term is in the number 1 issue. ALL new buildings should have a plan to be able to add more capacity in the years ahead. For now, 10% of spaces is MORE than enough capacity. [SIC]

How should MEA support the deployment of EVSE installations at multifamily units, particularly in low-income underserved, and overburdened communities?

Real Estate Developer: Broker discussions with utility companies, offer incentives to multifamily building owners for retrofit and new construction, offer direct benefits to underserved communities. Partnerships with ride sharing and vehicle leasing companies in exchange for market entry. [SIC]

Please provide a brief description of your organization, if applicable. Also, describe your interest in the Multifamily EVSE deployment. If you are the owner or operator of a multifamily property, please tell us about your property including number of units, number of parking spaces, type of spaces, and if you currently offer EV charging to your renters or homeowners.

Energy Service Company: Powered by the Blink network, we offer multiple flexible business models that fit each specific location's requirements while providing much-needed infrastructure for growing EV driver demand:

- Host Owned: Allows the host to be the owner and operator of the EV charging station.
- Hybrid-Owned: Blink covers the cost of equipment, operations, and administration, and the host makes the site EV charger ready (for select locations). Revenue is shared between Blink and the site host.
- Blink Owned: Blink provides the installation, equipment, operations, and administration while sharing the revenue with the host (for select locations).
- Blink as a Service: Blink's subscription program provides a host location with an EV charging station with low fixed monthly costs and the control of ownership while Blink handles the operations and administration.

Over many years, Blink has worked with leading property owners and operators to install EV chargers at multifamily residences across Maryland. [SIC]

What are the current gaps in the market related to EVSE installations on multifamily developments?

Energy Service Company: Residents of multifamily buildings often have numerous logistical, financial, and infrastructure barriers to access EV charging at home. Renters in apartment complexes are further challenged if the property owner is not motivated to install EV charging.

In comparison to residents in single family homes, residents of MUDs face a myriad of barriers in installing EV charging. MUD residents, particularly renters, are unlikely to have the authority to retrofit parking spaces to install charging equipment. When retrofitting to provide EV charging is possible, some MUDs lack the necessary existing electrical infrastructure to support adding EV charging or electrical upgrades necessary are cost prohibitive. Moreover, many renters may not have dedicated parking spots, making it difficult to charge their EVs conveniently.

To the degree low-income residents may be less likely to be single family homeowners (SFH), EV rates are sometimes difficult to have fit into the MUD context due to a couple of factors that are not present in the SFH residential or public DCFC context. MUD sites are more likely to be sub-metered under the building owner's master meter and it is unlikely that there is a simple solution to cordon off chargers in a garage on a separate meter, along with a separate utility rate. Since MUD parking spaces are most likely on the larger building's electricity system rather than a renters specific electrical panel -- typically any arrangement made to pay for the electricity would have to be routed through the building owner/manager and adds an additional layer of complexity that is unlikely to be a priority for MUD property owners. In the context of public DCFC, which many renters rely on for their charging needs, dedicated EV charging rates can be useful as it makes those stations more likely to be built and the stations that are currently operating more likely to remain self-sustaining. Ideally the benefit of EV rates for public DCFC would be passed along to MUD customers either through, lower rates, better operation, and/or more stations in the territory. [SIC]

Are there any other considerations MEA should know about this effort?

Energy Service Company: EV Parking space requirements vary by location. For example, Washington, D.C. requires that "For building permits issued after January 1, 2022, all new construction or substantial improvement of commercial buildings and multi-unit buildings that have 3 or more automobile off-road parking spaces shall include electric vehicle make-ready infrastructure to accommodate the future installation of an electric vehicle charging site at least 20% of the parking spaces." King County, WA requires new multifamily apartments to have 10% EVSE parking spaces while another 25% of parking spaces must be EV Ready.

For a location with a single Level 2 charger, certain considerations must be taken into account and are subject to an on-site evaluation. Existing conduit and breaker systems may need to be doubled, and a thorough assessment of the electrical panel's capacity is necessary. The type of installation dictates additional steps, such as concrete work for the pad mount transformer, extra trenching, ensuring compliance with the Americans with Disabilities Act (ADA), and restriping. Depending on the site's requirements, there might be further trenching and pavement repair, with costs escalating based on the extent of modifications needed. [SIC]

EVSE Cost Estimates

What else does MEA need to know about the current state of the market and projects involving multifamily EVSE installations, particularly in low-income, underserved, and overburdened communities?

Multifamily Condominiums: MEA needs to work with Maryland Public Service Commission, PCS and the electric utilities to provided new electric tariffs dedicated to EVSEs. Current commercial tariffs for MUD's EVSEs make the cost of electricity unpredictable and unaffordable due to Demand Charges, especially during low utilization (aka low load factor).

At the very least all MUD EVSE installations should be under residential tariff since these EVSE installations are for home charging. Residents charging EVs at single family dwellings are under residential tariff (fixed cost per kWh and not subject to Demand Charges). [SIC]

What are the current gaps in the market related to EVSE installations on multifamily developments?

Multifamily Condominiums: Cost of electricity for EVSEs on multifamily developments is unpredictable and unaffordable due to Commercial Tariff structure. Commercial service is subject to expensive Demand Charges at low utilization. The cost of unit of electricity could be above $0.40 per kWh.

MUD EVSE electrical service must be under residential with fixed cost of electricity per kWh and without expensive peak Demand Charges. [SIC]

If utilities offered (or continued to offer) dedicated EV charging rates what barriers, if any, do you face in taking advantage of those rates?

Multifamily Condominiums:

Utilities DO NOT offer dedicated EV charging rates. Utilities' charging rates at their EVSE sites are subsidized by all rate-payers.

Utilities have registered $582,000 in losses on the the cost of electricity alone. Utilities dispense/sell electricity at their EVSE sites (Level-2 and DCFC) below the market value.

See the August 2023 Joint Utilities EVSE Pilot Semi-Annual reports filed with the Maryalnd Public Service Commission, Case No. 9478 ML 304384, ML 304387, ML 304393, ML 304779. [SIC]

What else does the MEA need to know about payment options for EV users to charge at an EVSE-installed parking space in both new-construction and retrofitted multifamily residential buildings?

Multifamily Condominiums:

Price signals at the MUS EVSE must be strong and below what DCFC offer.

Cost of electricity at $0.43\kWh is equivalent gasoline at $3.50\gal

To preserve the grid home charging on Level-2 must less expansive than charging at DCFC.

1 EV charging at 250kW DCFC is equivalent to 38 EVs charging at 6.6kW Level-2

1 EV charging at 250kW DCFC is equivalent to 25 EVs charging at 10kW Level-2

If cost at Level-2 is more expensive than at DCFC , then EV owner would be incentivized to charge at DCFC and create 6.25-9.5MW demand on the grid instead of manageable 250kW when charging on Level-2. [SIC]

What are the current gaps in the market related to EVSE installations on multifamily developments?

Real Estate Developer: The cost of the equipment and installation and infrastructure is such that the payback period (without any subsidy) could be in excess of 10 years. This is way too long.

Lack of available rebates or tax credits in Maryland for these types of programs. [SIC]

What unique challenges do contractors face with these projects?

Energy Service Company:

• It is essential to reduce installation costs, ease permitting reviews and interconnection processes, and streamline applications and timelines for providing power.

• Operational costs which are primarily demand charges and tariffs can inhibit increased EVSE utilization.

• Batteries for storage: reduce (a) installation costs, (b) reduce permit costs, and reduce (c) high tariff barriers to charge batteries for storage.

• Lack of cellular connectivity for networked chargers in underground parking garages is a concern for multifamily housing.

• Bottom line: utilities and government need to provide make ready solutions so private sector companies do not have to fully pay for upgrading electrical infrastructure.

For a Level 2 charging station installation, the initial step involves conducting a thorough site evaluation to assess the availability of an adequate power supply within the building premises. The electrical power supply requirements are specific to each site, and any necessary power upgrades are determined based on the site's needs. If the existing building infrastructure is not capable of supporting the charging station, Blink recommends a service upgrade and coordinates with the utility company to obtain the necessary permits for the upgrade. The construction and design of the charging station location entail the use of various materials, including wiring, conduit, and trenching equipment for underground wiring if required. Concrete work might be necessary in some cases, along with the installation of parking station stencils and signage designating the areas as exclusive for electric vehicle (EV) parking. Blink provides the mounting hardware required for the installation. [SIC]

How do these barriers affect cost?

Energy Service Company: In 2019, Energy Solutions analyzed the costs of installing infrastructure supporting the future installation of charging stations during certain scenarios of additions or alterations for existing developments. The results show that it is 4 to 6 times more expensive to install EV capable infrastructure as a stand-alone retrofit to an existing building than to add the infrastructure during additions or alterations. The analysis shows that it is much less costly to install charging-supportive infrastructure specifically when adding new parking, when repaving existing parking, during “gut” rehabilitations, and when making panel capacity upgrades.

Lastly, if the cost of electricity is a concern, MEA should investigate programs that support low-income customers, such as offering lower utility rates for charging during times when the grid is underutilized and excess renewable power is available. Other innovative and flexible models have been recently launched through California's Clean Vehicle Rebate Project, in which low-income EV drivers are eligible to receive a charge card loaded with $2,000 worth of funds which can be used at public charging stations (inside and outside of CA) or transferred into charge network apps. [SIC]

Payment Options

What considerations are there for including the cost of electricity as part of rent, condominium fees, or homeowner's association fees?

Multifamily condominiums: Right now, all owners are paying for the usage out of their association fees which has upset a majority of our owners, so we are looking at ways to be able to charge users for the stations. [SIC]

Are there any specific payment options, particularly in low-income, underserved, and overburdened communities?

Non-Profit Organization: Card readers etc. only create complexity and maintenance issues. Accounts activated with bar codes/ QR codes or apps is the best approach. Best: vehicle connected account system - no apps

With a solar canopy/battery backup system, could charging be free? [SIC]

Real Estate Developer: Cellular signal is a major problem as this is how the payments get processed (no signal = no charging) [SIC]

Are there any specific payment options, particularly in low-income, underserved, and overburdened communities?

Real Estate Developer: We rent each EV space per month for $75 and provide all the electricity for no additional cost. Installation costs are very high if you want to bill for usage. That is why we charge a flat amount. [SIC]

What else does the MEA need to know about payment options for EV users to charge at an EVSE-installed parking space in both new-construction and retrofitted multifamily residential buildings?

Energy Service Company: EV charging payment experiences should be reliable and match the use dwell time of the driver as well as the intended use case/application. In a residential setting, vehicles will be parked for many hours at a time, making residential charging likely the most preferred and primary mode of charging for the driver. Therefore, charging should be as hassle-free and user-friendly as possible. We recommend providing flexibility for payment mechanisms based on the intended use case and including mobile payment or plug and charge payment options. Both technologies streamline the EV charging process, offering simple, secure ways for drivers to charge their electric vehicles. With plug and charge, the model used at Tesla operated charging stations, drivers simply connect the charging cable to the charge point, and the vehicle instantly begins charging with no additional user steps required. For some multifamily applications, a payment system may not be necessary. [SIC]