Report on Electric Vehicles

Background

Maryland has a road network with 32,269 miles of federal, state, county, and municipal roads. State routes make up about 5,164 mainline miles maintained by the Maryland Department of Transportation (MDOT).[1] The investment to build, operate, and maintain road networks are quite significant. In 2018, an estimated $1.9 billion was spent on the construction, maintenance, and servicing of highways in Maryland.[2] State revenue sources in Maryland include motor fuel taxes, registration fees, and taxes, tolls, appropriation from general funds, and bond proceeds. Table 1 shows the breakdown of state revenue sources for highways in Maryland:

	Motor Fuel Taxes	Motor-Vehicle and Motor- Carrier Taxes	Road and Crossing Tolls	General Funds	Other state fees	Miscellaneous	Bonds
2014	12%	19%	33%	5%	9%	4%	18%
2015	11%	16%	24%	4%	7%	5%	34%
2016	14%	19%	29%	5%	9%	8%	15%
2017	10%	14%	22%	14%	5%	5%	31%
2018	11%	13%	38%	11%	6%	1%	20%

Table 1: Sources of Maryland highway revenues between 2014 to 2018 (Data from U.S. Department of Transportation: Federal Highway Administration. 2019. Highway Statistics).

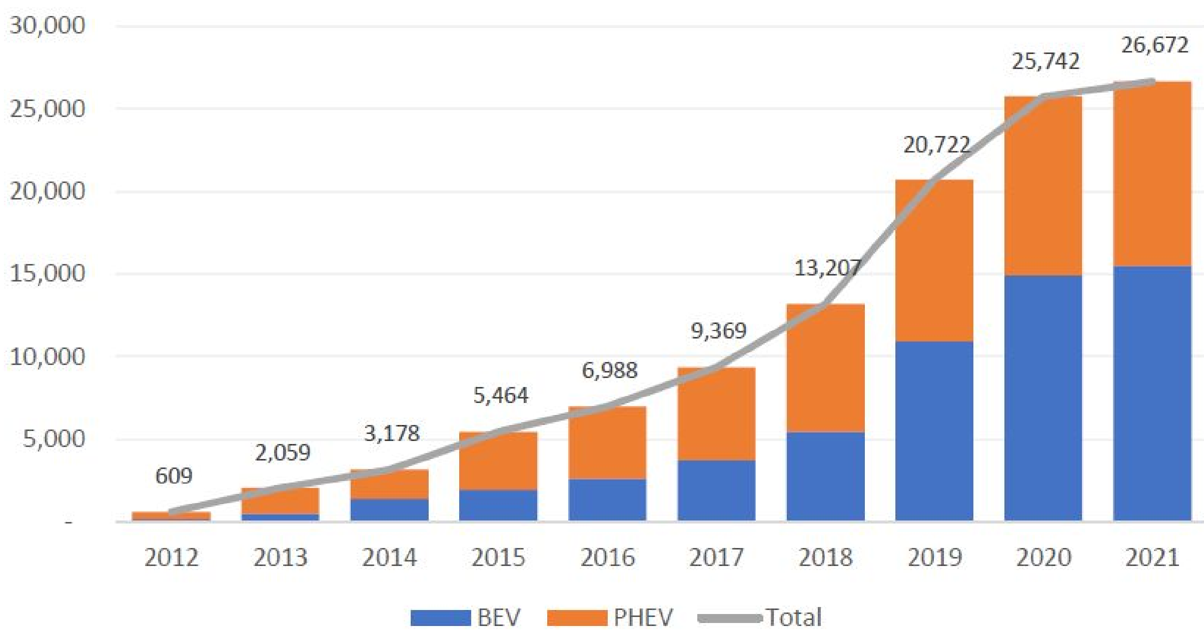
Motor Fuel Taxes made up between 10-14% of total state revenue used by Maryland on highways between 2014 and 2018. Even though electric vehicles (EVs) make up a small

[1] U.S. Department of Transportation: Federal Highway Administration. 2019. Highway Statistics 2018: Public Road Length - 2018, Miles By Ownership, Table HM-10. fhwa.dot.gov/policyinformation/statistics/2018/hm10.cfm.

[2] U.S. Department of Transportation Federal Highway Administration. 2020. *Highway Statistics 2018: State Disbursements for Highways - 2018 1/* fhwa.dot.gov/policyinformation/statistics/2018/.

percentage of Maryland's vehicle fleet, large-scale EV adoption poses a serious challenge for revenue generation. This is because it would result in a decline in state revenue from motor fuel taxes. EVs are made up of two main types, battery EVs, which run on batteries charged by electricity, and plug-in hybrid electric vehicles (PHEV), which run on both gasoline and electricity. Figure 1 shows the number of registered EVs in Maryland between 2012 and 2018. Between 2012 and 2018, registered vehicles grew from 609 to 15,074.

Maryland has committed to a goal of 600,000 ZEVs registered by 2030 and anticipates there will be 300,000 ZEVs registered by 2025. As of June 30, 2020, Maryland has over 25,700 EVs registered. To support these EVs, Maryland's EV infrastructure consists of 21 alternative fuel corridors (AFCs) and more than 700 publicly available charging stations with over 2,100 chargers.



NOTE: FY 2021 numbers are as of September 30, 2020. (FY 2021 closes June 30, 2021).

Figure 1: EV sales in Maryland (Source: Zero Emission Electric Vehicle Infrastructure Council, 2020).[3]

Figure 1 demonstrates a steady increase in EV adoption rates in Maryland between 2012 and 2018. This increased adoption is supported not only by state incentives and laws designed to reduce the upfront and operational costs of EVs, but also through improvements and reduced costs to electric vehicle supply equipment (EVSE). Additionally, increased sales send long term investment signals to the market and further increase awareness for consumers.

[3] Zero Emission Electric Vehicle Infrastructure Council, (2020), 2020 annual report

Under the state's Greenhouse Gas Emission Reduction Act, Maryland has committed to reducing greenhouse gas emissions by 40% from 2006 levels by 2030. Part of that plan is the transition of the public transportation fleet to clean energy and the promotion of zero-emission vehicles (ZEV). Maryland is part of a Multi-State ZEV Memorandum of Understanding (MOU) signed by 10 states committed to having at least 3.3 million ZEVs by 2025. On July 14, 2020, an MOU governing medium and heavy-duty vehicles was signed by 15 states. The signatory states commit to 30% of all new medium and heavy-duty vehicle sales in their jurisdiction zero-emission vehicles by 2030, and 100% by 2050.

To reduce the upfront costs of ZEVs, Maryland also offered a one-time excise tax credit for qualifying electric or fuel cell vehicles. This credit was effective between July 1, 2017, through June 30, 2020, up to a maximum of $3,000. An individual could apply to receive an excise tax credit whether they own or lease the new vehicle. Business entities qualify for tax credits for up to 10 vehicles. The qualifying vehicle must not have a purchase price exceeding $63,000. Funding for the tax credit program concluded in June 2020.

In 2019, Maryland's Public Service Commission (PSC) approved a five-year electric vehicle charging infrastructure pilot program. Utilities in Maryland offer rebates to residential consumers to reduce the cost of installing EVSE at home. For commercial charging sites, PSC approved a demand charge credit for specific use cases.

Also, the state operates a rebate program designed to expand the state's electric vehicle infrastructure. It provides funding assistance to residents, businesses, and governments to acquire and install qualified electric vehicle charging stations. Individual applicants are eligible for a 40% rebate up to $700, while commercial applicants were eligible for a 40% rebate up to $4,000. An EVSE is eligible for state rebates if the rebates are applied for six months after the equipment or install expenses are incurred. The program has had a $1.2 million funding cap each year from FY18 to FY20. Funding was raised to $1.8 million for the FY21. Revenue generation from EVs will provide additional resources to expand incentive programs for ZEVs.

As referenced before, as Maryland continues to provide incentives to support EV adoption, it could potentially affect revenue from motor fuel taxes. Maryland is committed to having 600,000 ZEVs registered by 2030, and 300,000 ZEVs registered by 2025. This report explores the revenue potential of EVs, especially from the use of electricity for charging. It reviews other policy options for revenue generation from EVs and the steps taken by other states to generate revenue from EVs. An increase in revenue generation from EVs can make up for the future loss of revenue from gas taxes and provide resources to expand on existing EV incentives.

Transportation Revenue Policy Options

Some of the available policy options to address the motor fuel tax loss from the growing use of EVs include motor fuel taxes, carbon pricing, mileage-based user fees, EV fees, and charging fees. Some of these policy options have been utilized in the U.S., while others are still evolving.

Motor Fuel Taxes:

An approach taken in other states, to address the shortfall in motor fuel taxes, has been to simply raise the same motor fuel tax. While this may not be the best approach, especially under certain economic constraints, these taxes are already in existence in all 50 states (including Washington D.C.) and these taxes are levied by the federal government. Certain jurisdictions may find this approach more palatable given the tax structure is already in place. It should be noted, Maryland is one of eight states to have adopted a variable-rate tax design since 2013. A variable-rate tax structure allows tax rates to adjust based on gas prices, inflation, vehicle fuel efficiency, and other factors. In total, 22 states in the U.S. have variable tax structures, while others, including the federal government, have fixed tax rates despite inflation and vehicle efficiency improvements.[4] These differences in tax structures can have major impacts on both revenues and consumers in their respective jurisdictions. The Hogan administration has successfully reduced taxes and fees for the average Maryland resident and has rejected any tax increases. As part of a broader portfolio, a sustainable motor fuel tax is key to addressing transportation revenue challenges for the maintenance of critical infrastructure. Figure 2 shows the states with variable-rate gasoline rates in the U.S.

[4] Institute of taxation and economic policy, (2019), Most Americans Live in States with Variable-Rate Gas Taxes.

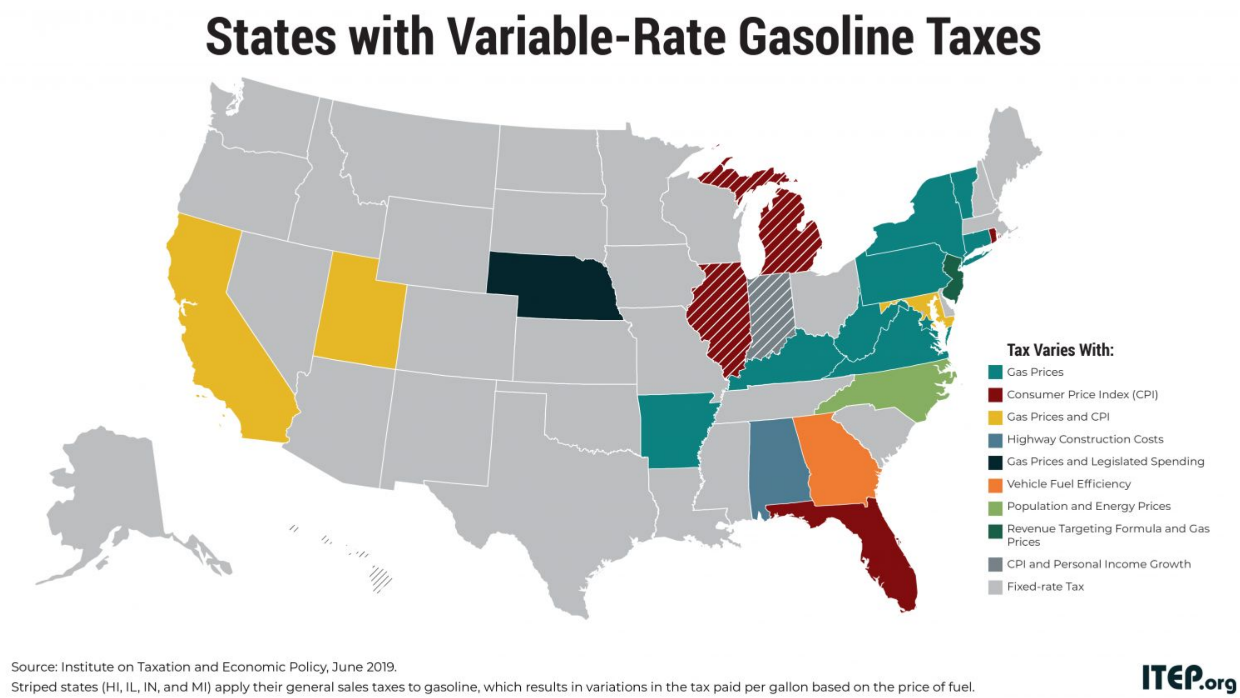


Figure 2: States with variable and fixed rate gasoline taxes in the U.S. (Source: Institute of taxation and economic policy, 2019).

Carbon Pricing:

Carbon pricing is a market-based mechanism that creates financial incentives to reduce greenhouse gas (GHG) emissions. The aim is to put a price on carbon emissions so that the costs of climate impacts and the opportunities for low-carbon energy options are better reflected in our production and consumption choices. Carbon pricing programs can be implemented through legislative or regulatory action at the local, state or national level. There are two ways to put a price on carbon: cap-and-trade programs and carbon pricing schemes.

Under a cap-and-trade program, laws or regulations limit or ‘cap’ carbon emissions from particular sectors of the economy, such as electricity generation or transportation, or from the whole economy. Allowances, or permits to emit carbon are issued to match the cap. For example, if the cap was 10,000 tons of carbon, there would be 10,000 one-ton allowances. Typically, a declining emissions cap is then issued to reduce emissions over time. These programs can generate revenue for reinvestment.

Maryland is currently participating in the Regional Greenhouse Gas Initiative, which is a cap-and-trade program focusing on fossil-fuel-fired electric power generators.

Maryland is also currently participating in an effort to design and analyze a similar, regional, program as part of the Transportation and Climate Initiative (TCI), which would set a cap on gasoline and diesel fuel and utilize some of the revenue generated to reduce GHG emissions from the transportation sector. This effort is still underway. Figure 3 illustrates states that have participated in, are investigating, or are actively participating in cap-and-trade programs.

With a carbon price, laws or regulations are enacted that establish a fee per ton of carbon emissions from a sector or the whole economy. Owners of emissions sources subject to the price on carbon, would be required to pay an amount equivalent to the per-ton fee times their total emissions. Those who can cut emissions cost-effectively would reduce their payments. Those subject to the pricing mechanism would have an incentive to lower their emissions, by transitioning to cleaner energy and using energy more efficiently. A rising price on carbon would help ensure a decline in emissions over time. If such a program were implemented, it would require thorough study and review of the economic and business impacts to the state, and would need to be carefully designed to support low-to-moderate-income households that may be impacted. Similar schemes take some of the carbon pricing revenues and recycle them into lower income households as compensation.

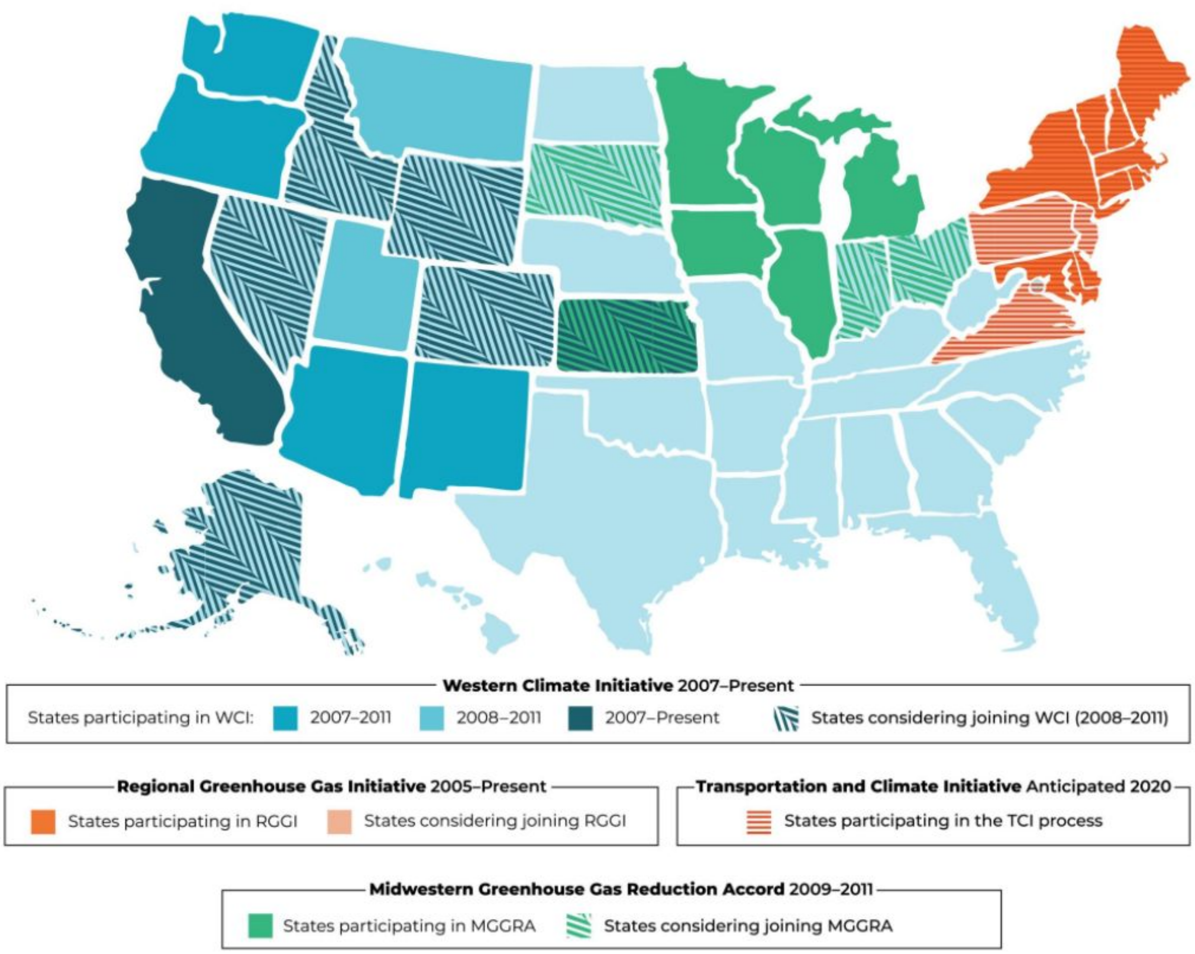


Figure 3 States that have participated in, are investigating, or are actively participating in cap-and-trade programs.[5]

Mileage-Based User Fees

Mileage-Based User Fees (MBUF) or Vehicle Miles Travelled (VMT) serves as an alternative to the gas tax and involves a rate per mile driven. Several states in the U.S. are in the process of testing or implementing this program. The Oregon Department of Transportation carried out a 12-month pilot study in 2006/2007.[6] It passed a law in 2013 to establish the first mileage-based revenue program in the U.S. called OReGO. Oregon launched OReGO in 2015 as a voluntary road use charge program where participants pay for the miles they drive, and taxes paid for buying gas are credited to their accounts. Starting January 2020, EV owners registered to the program would not have to pay the extra registration fees for EVs.[7] The Eastern Transportation Coalition (formally the I-95 Corridor Coalition) launched a passenger vehicle pilot in 2018 to understand how an MBUF would work on the East Coast. The study focused on Delaware and Pennsylvania in conjunction with the Delaware Department of Transportation (DelDOT) and the Pennsylvania Department of Transportation. It involved 155 participants. An expanded study was carried out in 2019 involving 900 participants to understand how to manage out-of-state mileage, interoperability with tolling, and value-added benefits. A third study on MBUF started in the summer of 2020 includes North Carolina, New Jersey, and Virginia.[8]

The Washington State Transportation Commission in December 2019 adopted recommendations on how the state can gradually transition from gas taxes to a road usage charge system. These recommendations were based on a 12-month road-usage charge pilot program carried out by the Washington State Department of Transportation. The final report and recommendations were sent to the state legislature in January 2020.[9]

California and Colorado also completed reports on road-usage charges based on road charge pilots established in those states. California Road Charge Pilot was a 9-month pilot launched in 2016 and involved 5,000 volunteer drivers across California. Colorado's pilot involved 150 volunteer participants. Figure 4 shows a chart by the Oregon Department of Transportation, showing each state and where they are in implementing road-usage charges.

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[5] Retrieved from: climate-xchange.org/2019/12/12/cap-and-trade-ambition-renewed-in-2019-after-a-decade-of-decline/

[6] Sorensen, P., Ecola , L., & Wachs, M. (2012). Mileage-Based User Fees for Transportation Funding: A Primer for State and Local Decision-makers. RAND Corporation.

[7] Oregon Department of Transportation, (2020), OReGO: Oregon's Road Usage Charge Program, retrieved from: oregon.gov/ODOT/Programs/Pages/OReGO.aspx.

[8] I95 Coalition. (2018). Passenger Vehicles and MBUF. Retrieved from I95 Coalition: i95coalitionmbuf.org/passenger-vehicles.

[9] Washington State Transportation Commission. (2020). Washington Road Usage Charge Pilot Project & Assessment. Retrieved from WA RUC: waroadusagecharge.org/.

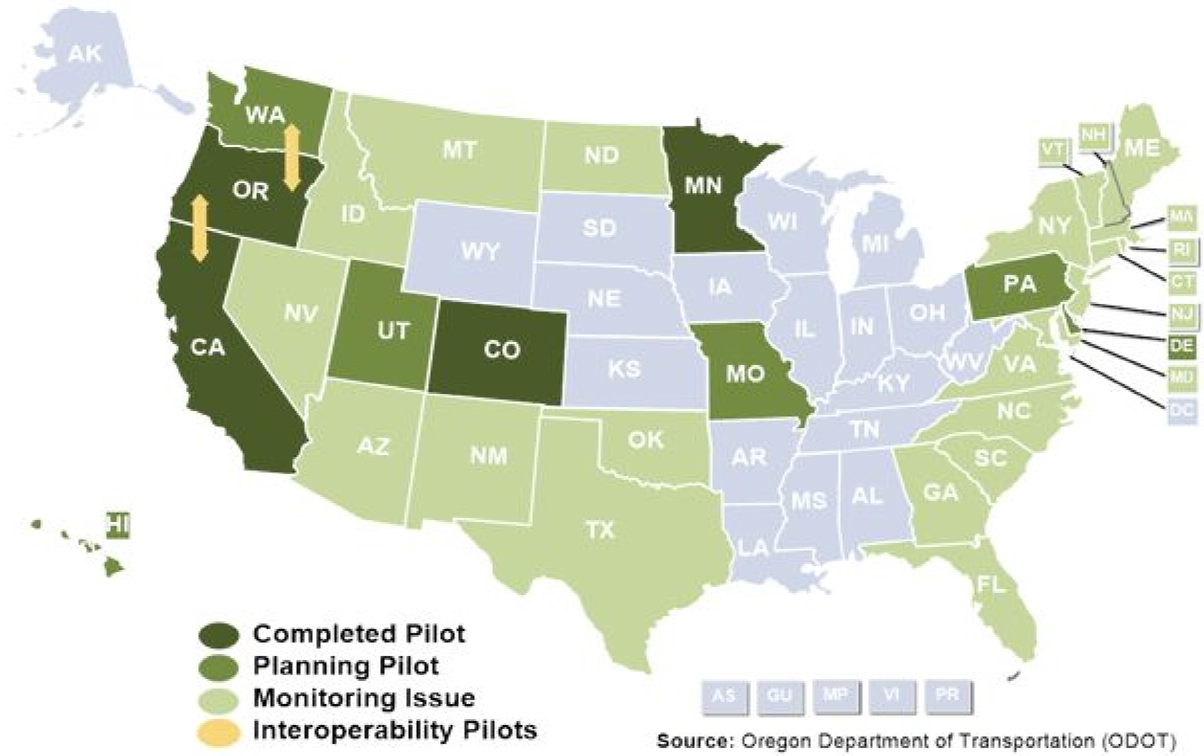

Figure 4 Stage in MBUF implementation in US states (Source: Oregon Department of Transportation).

Electric Vehicle Registration Fees

Over 20 states have existing or proposed fees on EVs. These fees range from $50 to $200 per year. These fees can have a significant impact on the affordability and accessibility of EVs. Figure 5 shows the EV fees for each state. These fees could also conflict with the broad goals of state government policies designed to encourage the adoption of ZEVs. The fees for EVs are in addition to general registration fees.

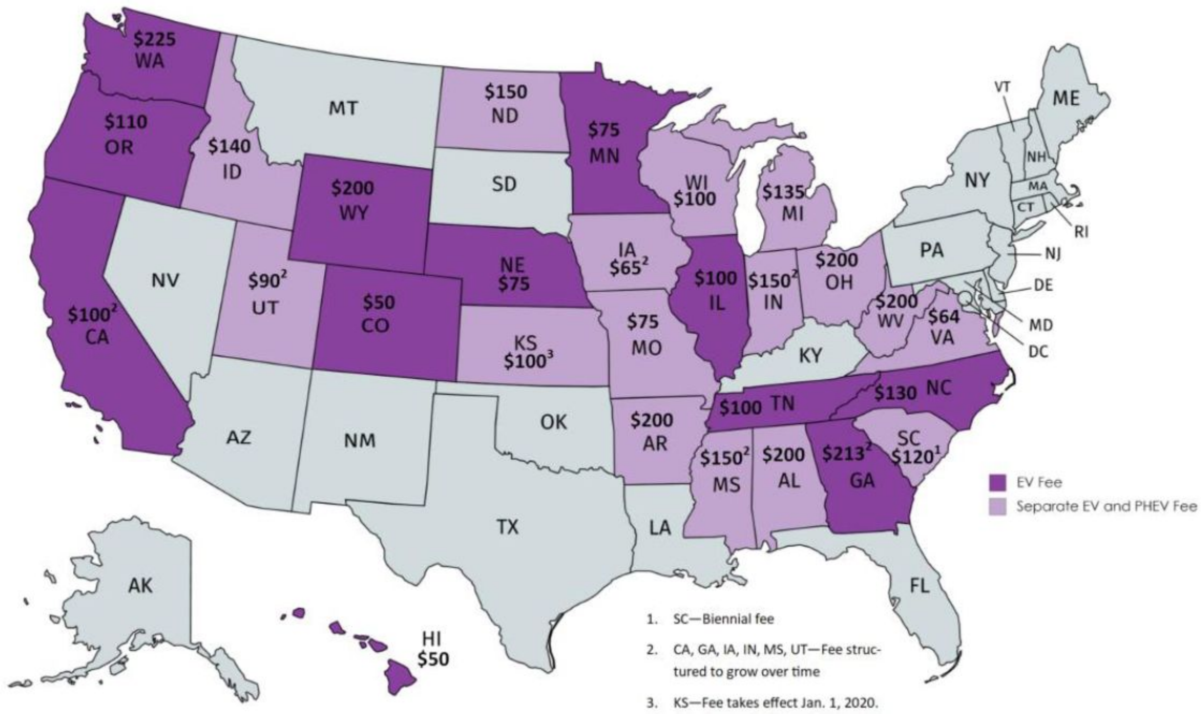

Figure 5: Existing and Proposed EV fees in the US (Source: National Governors Association).[10]

Charging Fees

A possible approach to increasing transportation revenue from EVs are charging fees based on the kilowatt-hours consumed by the vehicle. This approach would involve EV sub-metering equipment and in-vehicle technology to measure electricity consumption. With submetering, the electricity used in charging EVs can be measured separately from the general electricity use. Submetering allows consumers to enjoy special fees for EV charging without the additional cost of obtaining a utility-grade meter. Utilities can use a different rate from the standard rate for electricity used by EVs. The rates at which EVs are charged can contribute to government revenue for highway maintenance and ZEV initiatives. Availability of Time-of-Use (TOU) rates will also create incentives for demand response participation. The integration of demand response and TOU capabilities into EVs would enable consumers to charge their vehicles during off-peak periods to reduce the electricity costs from charging.

The California Public Utilities Commission introduced a submetering pilot program for residential and commercial PHEVs. It was designed to improve consumer choice, incentivize the use of energy during off-peak periods, and avoid the need to upgrade electrical infrastructure. The pilot consisted of two phases. In both phases, the consumer installed a home charging

[10] Rogotzke, M., Eucalitto, G., & Gander, S. (2019). Transportation Electrification: States Rev Up. Washington DC: National Governors Association Center for Best Practices.

system, signed up with a third-party submeter provider, and signed a service agreement with the third-party provider and their respective investor-owned utility (IOU). The third-party provider, known as Submeter Meter Data Management Agents, sends electricity usage data to the IOUs. Phase 1 started in 2014, and the report was produced in 2016. Over 200 participants enrolled in the first phase of the pilot across the territories of three large IOUs, namely Pacific Gas & Electric, Southern California Edison, and San Diego Gas & Electric.[11] Phase 2 of the pilot started in early 2017 and the final report was produced in late 2018. It involved over 400 participants.[12]

The pilot program studied the accuracy of submeters used to measure the electricity usage of EVs. It sought to understand the experiences of consumers involved in the pilot program and assess the factors that would influence the adoption of submetering by EV owners. The pilot program concluded that submetering via a third-party is not yet a viable technology for full-scale deployment, due to the lack of accuracy of submeters. None of the submeters met with the accuracy standards set in the pilot. Apart from lack of accuracy, third party providers were sometimes late in providing data to the utilities, resulting in late bills or bills with no data of EV usage. The pilot estimates that it would cost an average of $1,266 to install a charging station with a submeter without the pilot incentive. This estimate is less than the average cost of installing a second utility-scale meter to the consumer of $1,640 without a charging station and $2,723 with a charging station. The additional cost paid by the consumer could serve as a disincentive to adopting submeters. The pilot identifies the opportunity for lower electricity costs and availability of incentive payments toward EVSE as the key motivations for consumers enrolled in the program. It is estimated that $3-4.5 million per utility would be needed to update billing systems for the entire State of California.

In Maryland, submetering can enable us to collect information on EV electricity consumption and utilize it to collect revenue. However, the extra costs to consumers of purchasing submetering equipment can serve as a disincentive to adopting EVs. These extra costs could also act against the state policy objectives of encouraging ZEVs. More detailed studies are required to understand how the adoption of submetering would work in Maryland and how such measures will affect the state policy objectives and the adoption rate of EVs.

Policy Considerations for Charging Fees

The implementation of charging fees for EVs in Maryland still requires further study, not only to understand the approach's benefits and drawbacks, but also to ensure our ability to accurately measure electricity usage for fee accrual. These fees could lead to additional consumer costs through the resulting purchase and installation of home electrical infrastructure, such as

[11] Cook, J., Churchwell, C., Lemarchand, A., & Sullivan, M. (2016). California Statewide PEV Submetering Pilot – Phase 1 Report. California Public Utilities Commission. Nexant, Inc.
[12] Sullivan, M., Bell, E. T., Cain, N. L., & Cummings, T. (2019). California Statewide PEV Submetering Pilot – Phase 2 Report. California Public Utilities Commission. Nexant Inc.

submeters, and could potentially hinder state efforts to promote EV adoption and the economic viability of EVSE.

Not only is further study necessary for charging fees, but the other options need further review as well. Policy alternatives such as mileage-based user fees are relatively new in the U.S. and have not been applied widely. Concerns have been raised over its potential impact on privacy and possibly higher administrative costs compared to other policy approaches.[13]

Electricity registration fees should be administratively easier to implement, but do not come without their drawbacks as well. Registration fees are levied on an annual or biennial basis and paid as a single lump-sum. These fees could present a challenge for low-income households who might be unable to afford additional lump-sum payments for EV registration.[14] An option of payments spread out over time could potentially make this option easier for low-income households, but the broader impacts of this approach would still need to be studied.

Conclusion

As a signatory to the multi-state ZEV MOUs, Maryland has committed to a goal of 600,000 ZEVs registered by 2030. As of June 30, 2020, Maryland has over 25,700 EVs registered and installed more than 700 publicly available charging stations with over 2,100 chargers. Furthermore, through our greenhouse gas reduction goals, continued reduction of airborne pollutants throughout the state, and a desire to decarbonize transportation in Maryland, the state will see increasing numbers of ZEVs on the roads.

In order to address motor fuel tax loss from the growing use of EVs, the potential options available include, but are not limited to, motor fuel taxes, mileage-based user fees, carbon pricing, electric vehicle fees, and charging fees, as discussed in this document. Incentives offered by the state to support increasing use of ZEVs can be offset by a tax structure, which can disincentivize the purchase of EVs. The Maryland Energy Administration looked to other states throughout the U.S. to determine what pilots have been undertaken, what programs are in place in various states, and how they would compare with Maryland's current transportation taxes. As more EVs utilize Maryland's road networks, it will be important to set up a fair transportation revenue source that does not reduce the desire of consumers to purchase EVs, while at the same time safeguarding Maryland's residents from undue financial burdens. All of these options would need further study in the Maryland-specific context, but they do provide a good starting point for exploring our options to address these issues.

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[13] Varn, J., Eucalitto, G., & Gander, S. (2020, February). Planning for state transportation revenue in a coming era of electric vehicles. Washington, DC: National Governors Association Center for Best Practices.

[14] Ibid.