Transportation Funding and EV Fees

Electric vehicles provide many benefits not only to their drivers, but to the communities in which they operate. They have no tailpipe emissions and lower life-cycle greenhouse gas emissions than gasoline vehicles. They can place downward pressure on electricity rates for all ratepayers. However, EVs do not pay gas taxes.

Gas taxes provide a portion of funding for road construction and repair, and states as well as the Federal government have seen these revenues decline in real terms due to increasing fuel economy and failure to adjust these taxes for inflation. As a result, there is a significant gap between gas tax revenues and needed transportation funding. Although EVs are not responsible for this shortfall, some policymakers seek to have EVs make it up through increased registration fees.

In this white paper, Plug In America outlines why increased EV registration fees are not an appropriate solution, and why a fee per unit of electricity used for the vehicles (kilowatt-hour, or kWh) poses challenges. The paper discusses the advantage of a mileage-based user fee (MBUF), examples of MBUF in the U.S., and the benefits of using such a system to implement congestion pricing. Plug In America specifically addresses the impacts on rural and urban drivers, including low-income drivers in each type of area.

Introduction

The Federal government and the states fund highway construction and maintenance partly through taxes on gasoline and diesel fuel. Revenues from fuel taxes were approximately $37 billion at the Federal level,[1] and $48 billion at the state level,[2] in 2018.

Over the years, the revenue has fallen short of what is needed to maintain and construct the roads. Labor and material costs have increased through inflation, but gas taxes at the Federal level and in most states have not seen a corresponding increase. Had the Federal gasoline tax been indexed to inflation, it would have been 31.7 cents per gallon in 2019, rather than 18.4 cents.[3] Given the retail gasoline sales of approximately 134 billion gallons in 2019,[4] a Federal gas tax indexed to inflation would have brought in an additional $17.8 billion, more than matching the estimated annual Federal funding shortfall of $16.0 billion for 2021.[5]

In addition, vehicle mileage efficiency has improved significantly over the past decade. This provides a host of air quality and economic development benefits, but reduces the revenue from gas taxes. Average fleet vehicle fuel economy increased from 18.8 mpg in 1990 to 22.3 mpg in 2017 for all light-duty vehicles (SUVs and pick-up trucks included), with new vehicles in 2017 achieving 39.4 mpg for passenger cars and 28.6 mpg for light trucks.[6]

In addition to the deficit in Federal highway funding, states have their own shortfalls. Taken together, the total shortfall is about $100 billion per year.[7] Estimates of the annual shortfall for some individual states include $650 million for Massachusetts,[8] $232 million for Maine,[9]

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[1] Federal Highway Administration, *Highway Statistics 2017*. Table FE-9, "Federal Highway Trust Fund Receipts Attributable to Highway Users in Each State," online at https://www.fhwa.dot.gov/policyinformation/statistics/2018/fe9.cfm.
[2] Federal Highway Administration, *Highway Statistics 2018*. Table MF-201, "State Motor Fuel Tax Receipts," online at https://www.fhwa.dot.gov/policyinformation/statistics/2018/mf201.cfm.
[3] Kadich, J., "Fixing the Shortfall in Highway Infrastructure Funding," *The Regulatory Review*, August 2019. Online at https://www.theregreview.org/2019/08/21/kadich-fixing-shortfall-highway-infrastructure-funding/.
[4] U.S. Energy Information Administration, *U.S. Total Gasoline, All Sales/Deliveries by Prime Supplier*, accessed February 2020. Online at https://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=PET&s=C100000001&f=M. Estimate made for December 2019.
[5] Congressional Research Service, *Highway and Public Transit Funding Issues*, June 2019. Online at https://fas.org/sgp/crs/misc/IF10495.pdf.
[6] Bureau of Transportation Statistics, *Average Fuel Efficiency of U.S. Light Duty Vehicles*. Online at https://www.bts.gov/content/average-fuel-efficiency-us-light-duty-vehicles.
[7] American Society of Civil Engineers, Failure To Act: Closing The Infrastructure Investment Gap For America's Economic Future, 2016. Online at https://www.infrastructurereportcard.org/wp-content/uploads/2016/10/ASCE-Failure-to-Act-2016-FINAL.pdf. Report finds a $1.1 trillion shortfall in surface transportation funding over the period 2016-2025, so approximately $100 billion per year.
[8] A Better City, *An Update On Transportation Finance*, February 2019. Online at https://www.abettercity.org/assets/images/ABC%20-%20An%20Update%20on%20Transportation%20Finance%202019.pdf. Report finds the state's Highway Division faces a funding gap of $6.5 billion over 10 years.

and $240 million for Vermont.[10] Due to a backlog of deferred maintenance, some states express shortfall as a total funding need, which could be regained over a period of years – here, we are referring to annual needs. Furthermore, these numbers refer specifically to highway funding – gas taxes are also used to support transit systems.

Clearly, there is a need to increase revenues.
Other sources of funding exist, such as road tolls and vehicle registration fees. Tolling on the Interstate system is limited to those roads that had tolls in place before the passage of the Interstate Highway Act in 1956, although recent changes have allowed other roads to implement tolling for expansion or bridge repair. Both the Obama Administration and Trump Administration have proposed allowing an expansion of tolling on Interstate highways. Tolling presents the opportunity for congestion pricing (discussed below).

Should EVs face increased fees to make up for lost gas tax revenue?

Some policymakers have suggested increasing fees on electric vehicles to make up for the transportation funding shortfall. Battery electric vehicles (BEVs) do not pay any gas tax, but plug-in hybrid electric vehicles (PHEVs) do – and both still use the roads. In the long term, as these vehicles gain market share, they will need to contribute to the maintenance of roadways. Most often, the suggested fee is an increased registration fee that is above the fee level that gasoline vehicles pay.

In the near term, levying additional fees on EVs will discourage their adoption in the early-market stage, while providing only a miniscule portion of the highway funds needed, at considerable cost to states. There are other alternatives. For the following reasons, Plug In America believes that increased fees on EVs to support highways should be delayed until the vehicles reach 15% of new vehicle sales.

- *EVs are not responsible for the funding shortfall and cannot solve it.* The U.S. has approximately 1.4 million EVs on the road. Applying a registration fee of $100 per year to each would generate $140 million per year, covering 0.14% of the $100 billion funding shortfall.

- *EVs allow cities and states to meet air quality attainment standards.* Cities that do not meet the federal ambient air quality standards can have their transportation funding restricted or withheld until the city submits a State Implementation Plan (SIP) to meet the air quality standards. EVs provide a net reduction in many categories of pollutant emissions even when considering the generation of electricity to charge them. These reduced emissions not only help with air quality attainment, but also reduce public health impacts and therefore provide an economic benefit to society.

- *EVs do pay their fair share.* EVs pay taxes that may support road construction and maintenance, as well as other taxes that support other goals. Since EVs generally cost more than their conventional counterparts, they pay higher sales taxes (in states with sales tax) and higher municipal excise taxes. An analysis by the Acadia Center showed that, in Massachusetts, these impacts result in EVs contributing more to state and local revenues than comparable gasoline vehicles.[11] In fact, the analysis found that EVs currently pay about 20% more to state programs than average conventional sedans over their lifetime through higher sales and excise taxes. In addition, EVs pay taxes and fees on electricity that serve a variety of public purposes, such as low-income home weatherization programs.

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[9] Maine Department of Transportation, *State Capital Transportation Funding Annual Shortfall*, 2019. Online at https://legislature.maine.gov/doc/3433.
[10] Vermont Agency of Transportation, *Vermont Transportation Funding Options*, January 2016. Online at https://legislature.vermont.gov/assets/Legislative-Reports/Sec-10-Funding-Study-Report-final.pdf.
[11] Acadia Center, *Electric Vehicles and State Funds*, March 2018. Online at https://acadiacenter.org/wp-content/uploads/2018/03/Acadia-Center_EVs-and-MA-State-Funds.pdf.

- *The proposed fees in many states are excessive.* The average *state* gas tax in the U.S. in 2017 was $0.276 per gallon of gasoline, and $0.273 per gallon of diesel fuel.[12] The average new light-duty car in the U.S. (most EVs are light-duty cars) had a fuel economy of 39.4 mpg in 2017. At an average of 11,467 miles per year,[13] a gasoline-powered car would use about 291 gallons of gasoline per year and pay about $80 in state gas taxes. If the registration fee were intended to compensate for the lack of gas tax revenue garnered from electric vehicles, this would be an appropriate level. Some analyses include the Federal gas tax as well, reasoning that the Federal gas taxes paid are in part returned to the state through highway funds. Under such a calculation, the comparable conventional vehicle would pay about $134 per year. However, having the states attempt to recoup lost Federal gas tax revenue could lead to double-taxation if the Federal government implements its own plan to recoup the lost revenue. We consider the state tax level more appropriate. Currently, 20 states have EV registration fees, ranging from $50 to $200. A fee of $200 is far above that paid by a comparable conventional vehicle even combining state and Federal gas taxes.

- *Plug-in hybrid vehicles may use gas or electricity.* It is important to distinguish between those PHEVs that are basically functioning like BEVs and those that are basically functioning like internal combustion engine (ICE) vehicles. It is not reasonable to assess a high registration fee on a PHEV on the *assumption* that it will not pay much in gas tax.

- *Developing a new fee or tax carries a cost.* There are administrative and legal expenses associated with developing a new regulation such as an increased registration fee for EVs. For this reason, some states with low EV penetration have decided to delay implementing an EV registration fee, as the cost of changing procedures would exceed the revenue gained from the fee.

- *EV costs will decline through economies of scale, and that scale is achieved by growing EV sales now; slowing EV adoption through fees is counterproductive.* Members of the public, policymakers, environmental groups, and other stakeholders often want to know when EV costs will decline to make the vehicles more widely affordable. The truth is that costs *have* been declining with economies of scale. This is most dramatically seen with the reductions in Tesla prices from the Roadster to the Model S to the Model 3, but is also seen in the prices of lithium-ion batteries. Most automakers have focused on utilizing this cost reduction to put more batteries in the vehicles and keep prices relatively constant, so that range reaches 200 to 300 miles. Now that such range is commonplace, future cost reductions in lithium-ion batteries should go towards reducing vehicle prices rather than increasing range. Cost reductions happen through selling more EVs. **Increasing the price of an EV in the near term slows adoption and slows the pace of cost reductions.**

Road Fees on Electricity

Would it be better to collect a per-kWh fee on the electricity used to charge electric vehicles? This could be dedicated to transportation funding and would be analogous to the per-gallon tax on gasoline. However, in Vermont, where such a solution was proposed, the utilities testified that the implementation is not simple. Most charging occurs at home, and it

[12] Federal Highway Administration, *Highway Statistics 2017.* Table MF-205, "State Motor-Fuel Tax Rates," online at https://www.fhwa.dot.gov/policyinformation/statistics/2017/mf205.cfm.
[13] Passenger car VMT were 2.22 trillion miles in 2017, with 193,672,370 such vehicles. From Bureau of Transportation Statistics, Tables 1-35 (https://www.bts.gov/content/us-vehicle-miles) and 1-11 (https://www.bts.gov/content/number-us-aircraft-vehicles-vessels-and-other-conveyances).

is not always clear how much of a homeowners' consumption is due to the electric vehicle. The utilities could monitor the usage from dedicated smart EV chargers that have an embedded meter, but there is no fundamental reason why an EV driver must have such a device; many drivers plug their EVs into regular 120V outlets to charge.

There are algorithms to disaggregate the household load into EV charging and all other uses, but the process of employing such an algorithm carries its own costs, estimated by the utilities at about three to four cents per kWh. That value represents software costs and the utility staff time required to establish and verify the system. Furthermore, the utilities noted that they only had the capabilities to identify Level 2 charging, so charging in a 120V outlet would not be identifiable.

Any effort to assess such a fee on electricity used for EV charging requires the driver's cooperation, either through installing a smart EV charger or honestly reporting the electricity used. Such reporting could happen through a new process, which again would have its own implementation costs, or through the existing annual registration process. But rather than report kWh used at vehicle registration, why not just report vehicle-miles traveled for all vehicles?

A Proposed Solution

Since all vehicles are using the road and contributing to the wear and tear on the roads, Plug In America supports the development of a road usage charge program.

If the economic benefits of EVs in reduced pollution are not already accounted for through EV rebates or other such programs, then a road usage charge program provides an opportunity to do so and properly compensate EVs for the public good they provide. Plug In America does not seek double-counting of these benefits, so if they are already calculated in the value of an EV rebate we recognize it would be inappropriate to reflect it in a reduced road usage charge. But if there is no EV rebate or tax credit, then electric miles driven should face a lower fee than gas miles driven. This would reward those citizens who are also providing clean air benefits by driving EVs.

Vehicle weight is a significant determinant of damage to roads, but the non-linear impact of vehicle weight on road wear means that it is largely heavy-duty vehicles causing this damage; such impacts should be addressed by fees specific to the freight sector.

A Mileage-Based User Fee (MBUF) provides a sustainable revenue source even if the transportation system changes to feature greater use of ride-sharing and car-sharing services. A funding mechanism based on vehicle registration fees would see diminishing revenue in such a case.

MBUF Pilots

A MBUF may also be referred to as a Vehicle-Miles Travelled (VMT) program or a Road User Charge (RUC).[14]

Numerous early pilots focused on technological demonstration, as in the Minnesota Road Use Test, the California Road Charge pilot, and the I-95 Corridor Coalition MBUF Pilot. These used "shadow billing," with simulated bills showing what drivers would have paid under a MBUF.

Oregon has gone beyond the other efforts to implement a more substantial pilot program called OReGO. This program uses with volunteer enrollment and a variety of technology options to track distance traveled. Participants using gas vehicles (including plug-in hybrids) receive a credit for fuel taxes paid, as they are instead paying a vehicle-mile fee to support the transportation system.

[14] U.S. Department of Transportation Federal Highway Administration, *Vehicle Miles Travelled (VMT) Fees*. Online at: https://www.fhwa.dot.gov/ipd/tolling_and_pricing/defined/vmt.aspx.

Pilots show that the technology exists and is reliable and that driver comfort with the approach increases with experience.

One interesting finding is that these pilots all use GPS systems, such as through smart phones or vehicle-connected devices, rather than simply tallying the annual miles driven. This is in part because the MBUF replaces *state* fuel taxes and contributes to *state* transportation funding. If the driver goes out of state, they are not using the roads of their home state, and their home state cannot give them a credit on fuel taxes paid to a neighboring state. Therefore, it is important to only track the mileage that occurs within the state with the MBUF. Using GPS also allows for varying the MBUF rates such that all vehicle-miles are not equal. A state could increase the fees on certain roads to manage congestion or limit driving on roads with higher repair costs.

Concerns for Rural and Low-Income Drivers

Proposals for a MBUF often raise concerns about rural and low-income drivers, and the disproportionate impact such a MBUF may have on these driver classes. However, it is important to note that the gas tax is already regressive, imposing a greater income burden on rural and low-income drivers than affluent ones. A RAND Corporation report concludes that a well-designed MBUF will not have a disproportionate impact on the above two demographics. The analysis notes that rural drivers would pay slightly less on average with a flat per mile fee when compared to the gas tax.[15] Although rural drivers travel greater distances than urban drivers, they also tend to drive vehicles that are older and less fuel-efficient, meaning they pay more gas tax than urban drivers.[16] For low-income drivers, the gas tax is income regressive and will become more regressive as more drivers switch to driving EVs.[7] Low-income drivers in urban areas might face higher fees in the form of rush hour surcharges, but MBUF revenue could be used to offset equity concerns. Low-income drivers could pay nothing if certain income qualifications are met.[17]

Impact on rural drivers:

- A MBUF seems to be a slight improvement for rural drivers because they tend to drive older, less efficient vehicles that use more gas, and therefore the driver pays more in gas taxes.[18]

Impact on low-income rural drivers:

- Drivers who are both rural and low-income will likely not fare as well under a MBUF, but would likely not be any worse off than they are paying for the gas tax. A MBUF can be designed with exemptions for low-income earners. This also highlights the need to expand public transit to outlying areas so these residents can earn credits that would offset the cost of driving long distances when needed.

Impact on urban drivers:

- Urban drivers would be better off under a MBUF than the gas tax because they will drive fewer miles, particularly if there is no congestion pricing in place.

Impact on low-income urban drivers:

- Low-income urban drivers would likely fare better under a MBUF with no congestion pricing. However, with congestion pricing in place, these drivers would likely fare worse. However, low-income urban drivers have greater access to transit

[15] The RAND Corporation, *Mileage-Based User Fees For transportation Funding: A Primer for State and Local Decisionmakers*. Online at: https://www.rand.org/content/dam/rand/pubs/tools/TL100/TL104/RAND_TL104.pdf
[16] Mileage Based User Fee Alliance, *5 Myths: Misconceptions of Mileage-Based User Fees*. Online at: http://www.mbufa.org/myth.html
[17] Information Technology and Information Foundation, *A Policymaker's Guide to Road Usage Charges*, April 2019. Online at: https://itif.org/publications/2019/04/22/policymakers-guide-road-user-charges
[18] The RAND Corporation, *Mileage-Based User Fees For transportation Funding: A Primer for State and Local Decisionmakers*. Online at: https://www.rand.org/content/dam/rand/pubs/tools/TL100/TL104/RAND_TL104.pdf

options than do rural residents. Exemptions for certain income levels or reduced mileage pricing could reduce the burden for these low-income urban drivers. In addition, a program could be implemented that allows for any driver to earn credits to apply to their MBUF by taking public transit, biking or walking.

The Role of Congestion Pricing

Congestion pricing can provide a source of funding for transportation systems and serve a role in traffic management. This approach charges drivers a fee to access a certain stretch of roadway or to access a "cordon" such as a downtown/central business district. That price is higher during peak commuting hours and possibly quite low at off-peak hours. Likewise, the price is generally higher for busy arterial roadways and nonexistent for certain residential surface streets. It sends a signal to drivers about the congestion level of a road and promotes alternative modes of transportation or adjustments to the time of the trip.[19]

Drivers are primarily only cognizant of the time it takes to get from point A to point B, but are not aware of how one additional vehicle on the road contributes to commute times for other drivers, criteria air pollutants, and wear and tear of roadways. Congestion pricing is an economic tool designed to account for all these factors and to increase the efficiency of road use by giving drivers a closer reflection of the impact of a trip on the transportation system as a whole, i.e. the full social cost.[20]

A statewide MBUF program employing GPS can include congestion pricing by charging more for travel on certain roads at specific time. Congestion pricing can also be implemented on a stand-alone basis, without a statewide MBUF program. The Federal Highway Administration notes three main types of congestion pricing approaches:[21]

- Variably priced lanes, including High Occupancy Toll lanes, are specific stretches of highway that vary the tolls in real time. The toll applies to those using the lane with a single-occupancy vehicle, while high-occupancy vehicles can use the lane without paying a toll, and non-toll lanes are available on the same highway but may be more congested.
- Variable pricing on entire facilities, such as for toll roads and bridges.
- Cordon charges to drive within or into a congested area. Such charges are used in some European cities, and will be implemented for parts of New York City in 2021.

Congestion Pricing Impacts

Impact on rural drivers:

- Depending on where they drive, rural drivers might not pay very much under a congestion pricing plan. If most of the driving takes place in low-traffic areas away from town and city centers, the burden should be low. On the other hand, these drivers could just as easily face fees if they commute from a rural area to an urban one for work.

Impact on low-income rural drivers:

- Low-income rural drivers may not be impacted much if the driving occurs on rural roads, but theses drivers could be impacted more if the driver is commuting to work in an urban setting. Ideally, the revenue from congestion pricing would be used to

[19] Transit Center, *Congestion Pricing Will Succeed If...,* April 2019. Online at: https://transitcenter.org/congestion-pricing-will-succeed-if/
[20] Curbed NY, *Congestion Pricing in NYC, Explained,* March 2019. Online at: https://ny.curbed.com/2018/3/14/17117204/new-york-congestion-pricing-cuomo-subway-uber
[21] U.S. Department of Transportation Federal Highway Administration, *Congestion Pricing: Examples Around the U.S.,* March 2020. Online at: https://ops.fhwa.dot.gov/congestionpricing/resources/examples_us.htm

expand "express" public transit to these outlying areas, which would allow rural residents to rely less on personal vehicle use.

Impact on urban drivers:

- Urban drivers will likely face a higher burden under a congestion charge than their rural counterparts since more of the roads these drivers use on a regular basis will be subject to a congestion price. At the same time, access to transit is typically much easier for urban dwellers than rural ones; these drivers will have the option to take public transit, walk, or bike for trips that do not absolutely require personal vehicle use.

Impact on low-income urban drivers:

- Low-income urban drivers would face the highest burden under a congestion charge. Exemptions for certain income levels or reduced congestion pricing could reduce the burden for these low-income urban drivers. In addition, the funding from congestion pricing could be used to expand public transit programs, expand bike lanes, and create "car free" walking zones.

Conclusion

Transportation funding shortfalls are not the fault of EVs, and EVs should not be required to bear the burden of these shortfalls with punitive fees. Hindering EV adoption now through excessive fees will impair states' ability to meet carbon goals, air quality attainment goals, and will delay the benefits that EVs provide to all Americans.

When EV sales reach a reasonable share of new vehicle sales in a state, such as 15%, it is appropriate to implement some sort of road usage charge so that EVs contribute to road construction and maintenance. We suggest that the best approach is to implement a mileage-based usage fee that uses GPS (with appropriate privacy protections) to enact congestion pricing. We strongly suggest that states conduct pilots in mileage-based user fees, learn from the existing pilots, and scope out key corridors and highways to target for congestion management. We also suggest that states consider transportation funding in the context of an additional possible transition to shared autonomous EVs.

In the near term, should EV sales reach 15% in a state before the state is ready to implement a mileage-based user fee, we acknowledge that an increased registration fee may allow EVs to contribute to transportation funding. In no case should such an additional fee be greater than the state fuel tax that would be paid by a comparable gasoline vehicle.

Questions? Contact us here.