



PAYING THEIR FAIR SHARE:

The Problem with Michigan's EV Road Funding Fees and Potential Solutions

By James VanSteel and Charles Griffith



ECOLOGYCENTER

Healthy People, Healthy Planet

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ECOLOGY CENTER

Ecology Center is a non-profit environmental advocacy organization established in 1970 in Ann Arbor, Michigan. The Ecology Center develops innovative solutions for healthy people and a healthy planet in four primary areas: Safer Chemicals & Healthy Environments, Clean Energy & Climate Action, Environmental Education and Zero Waste. This work is accomplished through educating consumers to help keep their families healthy and safe, pushing corporations to use clean energy, make safe products, and provide healthy food, providing people with innovative services that promote healthy people and a healthy planet and working with policymakers to establish laws that protect communities and the environment. For more information visit www.ecocenter.org and follow @Ecology_Center

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ecocenter.org/ev-fee-report

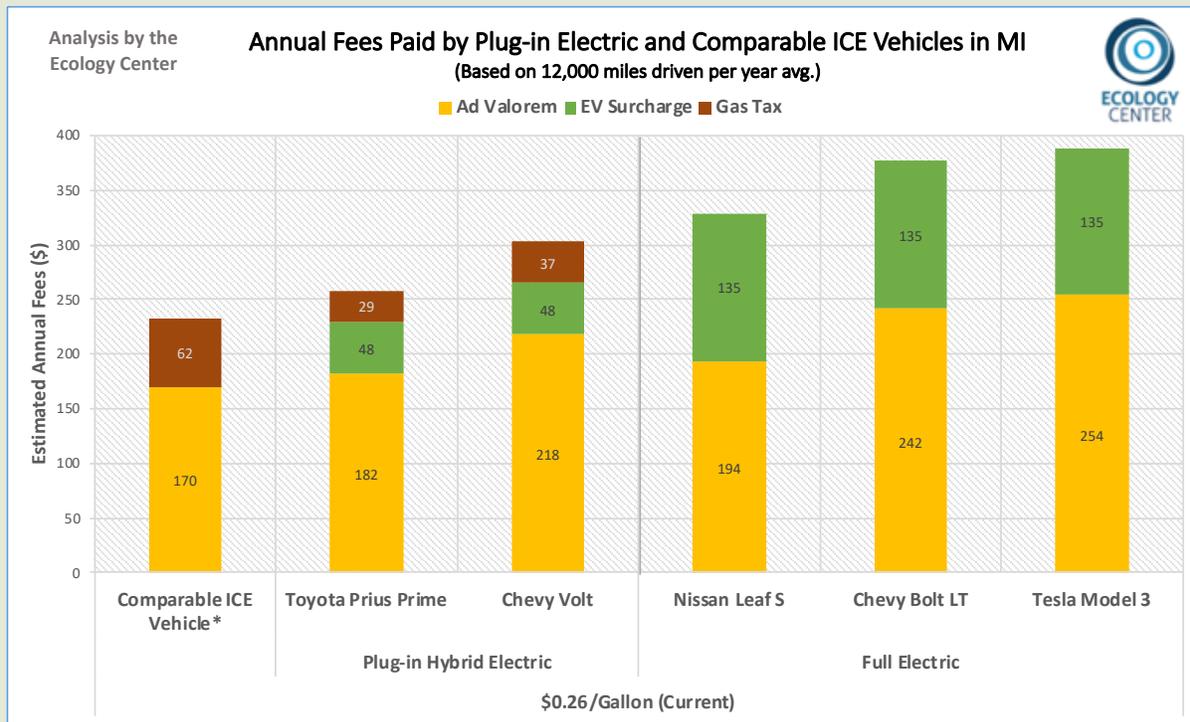
EXECUTIVE SUMMARY

Michigan’s 2015 transportation funding legislation sought to address the state’s road funding woes by raising fuel taxes, vehicle registration fees, and making transfers from the general fund. For plug-in electric vehicle drivers, the law also introduced new annual surcharges on registration fees at \$30 for plug-in hybrid electric vehicles (PHEVs) and \$100 for all-electric EVs. An additional fee is charged to these drivers based on an escalating formula tied to each increase of one cent in the state gas tax above its original \$0.19 level. As of 2017, this means that PHEV drivers pay an additional fee of \$47.50 and EV drivers pay an additional \$135. When combined with the value based (ad valorem) fee that every owner pays when registering their vehicles, plug-in vehicle drivers are now paying between \$300 and \$390 in up-front fees.

The result of these new fees is that PHEVs and EVs pay significantly more in annual transportation-related taxes than comparable gasoline vehicles. As shown in Figures 1 and 2, the most popular plug-in hybrid models pay between \$20 and \$70 more, while full-electric models pay between \$90 and \$160 more than their internal combustion engine (ICE) counterparts. **These fees are as much as 30% higher for PHEVs and 67% higher for EVs than comparable ICE vehicles under today’s transportation taxes.** This disparity will continue to grow if gas taxes are increased beyond current rates.

One reason the fees on electric vehicles are so much higher is that they are based on the fuel taxes that “average” gas-powered vehicles--like the larger and heavier Ford F-150 pickup truck, rated at 25 mpg--pay on an annual basis. However, today’s plug-

FIGURE 1



*Comparable ICE Vehicle: A composite average of five highly fuel-efficient gasoline-powered vehicles including the Ford Fusion Hybrid, Honda Insight EX, and Toyota Camry Hybrid LE.

FIGURE 2 Current Annual Plug-in Vehicle Fees v. Comparable ICE Vehicle

Make & Model	Ad Valorem Regis. Fee	EV - Hybrid Fees*	Est. State Fuel Tax**	Total Annual Fees	Percent/Value Vs. Baseline	
Comparable ICE Vehicle	\$170	None	\$62.40 (50 mpg)	\$232.40		
Chevy Volt (PHEV)	\$218	Hybrid \$30 + \$17.50	\$37.14*** (42 /106 mpge)	\$302.64	+30.22%	+\$70.24
Tesla Model 3 (Electric)	\$254	Electric \$100 + \$35	None (123 mpge)	\$389.00	+67.38%	+\$156.60

* Additional fees based on fuel tax escalator of \$5 x .07c for full electric, and \$2.50 x .07c for hybrid-electric vehicles.

** Based on 12,000 miles/year average mileage, and combined city/highway MPG and MPGe figures from www.fueleconomy.gov.

*** Based on a 50%/50% VMT split using gas and electric respectively.

in vehicles are more similar in size and efficiency to gas-powered cars like the Ford Fusion Hybrid or Honda Insight, which achieve closer to 50 mpg. The other reason EV fees are higher is because plug-in vehicles already pay higher ad valorem registration fees (and sales taxes), due to their higher purchase cost. In this sense, EV owners are being asked to pay twice: once for the higher value of the vehicle compared to gasoline models, and once again for not paying gasoline taxes. A more equitable approach would be for plug-in vehicle fees to be based on the total road funding fees and taxes that comparable gasoline vehicles pay.

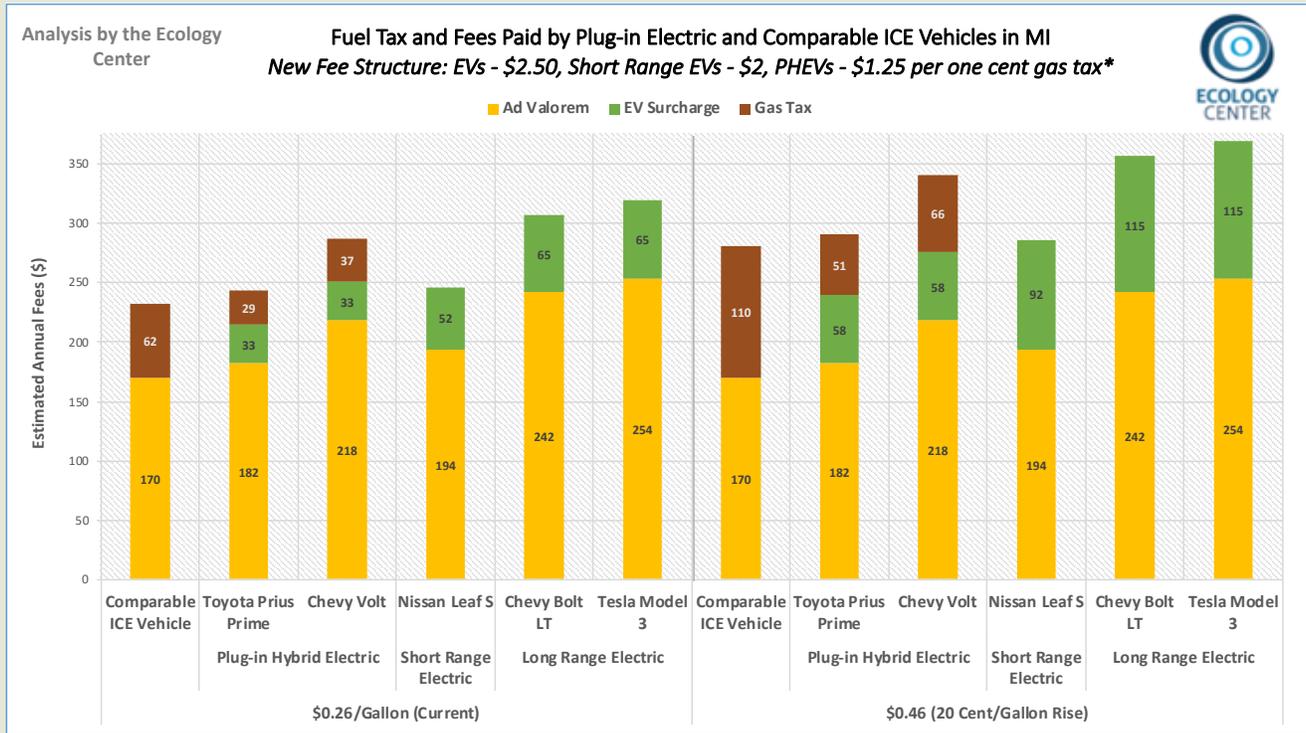
PROPOSED NEW EV FEE STRUCTURE

Plug-in electric vehicles should pay their fair share of transportation system costs, meaning that the additional fees they pay should be lowered to a level comparable with what efficient ICE vehicles pay. The Ecology Center's analysis shown in Figure 3 illustrates what these fees would look like if fixed annual surcharges were eliminated and replaced with escalating plug-in fees set at half the current rate. This new structure would mean drivers of plug-in vehicles would pay an additional fee on each cent in state gas tax of \$1.25 for PHEVs, \$2 for short driving range EVs, and \$2.50 for long range full electric vehicles. While other potential solutions could be applied, this approach

would bring ICE taxes and fees for each kind of plug-in vehicle much closer to parity, both today and under any future gas tax rate. As Michigan's lawmakers debate the best path forward for our transportation system, we should seek real and sustainable funding solutions that don't unfairly penalize this growing market. The plug-in vehicle fees instituted in the 2015 legislation are too high relative to their fair share of system costs, and will diverge even further under higher gas tax rates while providing only a tiny fraction of the state's needed transportation revenue. Instead of further disincentivizing the adoption of this clean transportation technology, lawmakers should revise the EV fee rates in the 2015 legislation to bring them toward parity with more comparable, efficient gas-powered vehicles.

Longer-term, additional solutions will need to be explored to address anticipated increases in vehicle fuel-efficiency overall, as well as reflect the actual mileage that plug-in vehicles travel each year. We suggest applying several key principles to guide future decisions that allow the state to maintain sustainable revenues for maintaining and improving the state's roads and bridges, promote less polluting technologies, and treat all vehicle drivers fairly at the same time.

FIGURE 3



POLICY AND LEGISLATIVE BACKGROUND

Michigan's transportation system is in disrepair with unsustainable state and federal funding systems among the chief causes. The worsening shortfalls in transportation revenue at both levels of government are due primarily to three factors:

1. Fuel taxes have not been indexed to price inflation, meaning the real value of fuel taxes and registration fees collected has declined.
2. All vehicles are becoming more fuel efficient, meaning they purchase less gas and diesel to drive the same or more miles on Michigan's roads and bridges.
3. The cost of road construction and maintenance have risen substantially in recent decades.

These funding shortfalls have been observed in Michigan for decades, but they are not unique to the state. Nearly every other state has observed similar declines in their fuel tax revenues in recent years, as has the federal government whose own fuel tax has remained un-indexed for inflation at \$0.184 per gallon for gas and \$0.244 for diesel since 1993.

To help mitigate some of the effects of this funding shortfall, Michigan passed compromise legislation in 2015 that raised gas and diesel rates to \$0.263 per gallon starting in January 2017, and will begin to index those rates to inflation starting in 2022. This was a \$0.07 increase from the status quo state gasoline tax that existed for 20 years.¹ Registration fees for passenger vehicles and commercial trucks of all fuel types were also increased by 20%. An

additional \$600 million annually is mandated to be appropriated from the state's general fund, even though those funds are not paid directly by transportation system users. For plug-in electric vehicle drivers, the law also introduced new annual surcharges on registration fees at \$30 and \$100 for plug-in hybrid electric vehicles (PHEVs) and all-electric EVs respectively. An additional fee is charged to these drivers based on an escalating formula tied to each increase of \$0.01 in state fuel taxes above its original \$0.19 level. As of 2017, this means that PHEV drivers pay a total of \$47.50 and EV drivers pay a total of \$135 above the value-based fee (ad valorem) that every vehicle owner pays when registering their vehicles.

The new plug-in EV fees were intended to replace the lost revenue from fuel taxes that are partially or completely avoided by plug-in vehicle owners. But are the surcharges set at a fair level? Unfortunately, a fair estimation of what EV/PHEV owners ought to be paying toward the state's transportation system was never completed. This report seeks to provide such an analysis, and will show that EV/PHEV owners actually pay far more than comparable vehicles to support the state's transportation infrastructure. It will also show that EV owners could end up paying an increasingly unfair amount in the future if gas taxes are increased.

¹<https://crcmich.org/almanac/historic-motor-fuel-tax-revenues/>

WHY CURRENT PLUG-IN VEHICLE FEES ARE UNFAIR

The fixed surcharges and escalating fees for plug-in vehicles in Michigan's law are based on some questionable assumptions about their impact on transportation funding. First, the law assumes that since these vehicles pay less or no tax on gasoline, they do not contribute their fair share toward fixing roads. This is not truly the case, as PHEV and EV owners actually pay more than comparable vehicles in value-based registration fees, as well as in sales taxes, due to the higher cost of battery technology. To a large degree, these higher registration fees already make up for any lost gasoline tax revenue. Furthermore, PHEVs and EVs currently represent only about 0.59% of vehicles on the road, with the vast majority of those being plug-in hybrid cars that pay the same fuel taxes on a portion of their driving as ICE vehicles.² Even with potential increases in these fees their revenue contribution would be negligible for the foreseeable future, doing little to alleviate the state's transportation funding shortfalls.³

Second, the amount of fuel tax that these fees are meant to compensate for is grounded in the average state-wide fuel economy of around 25 mpg. However, today's plug-in vehicles are much lighter, smaller, and more efficient than the statewide average, which for example includes popular trucks and SUVs. EVs and PHEVs ought to be paying taxes that are comparable to efficient gas-powered models achieving much better fuel economy and causing less damage to Michigan's roads and bridges.

Third, these fixed fees are based on an assumption that plug-in vehicle drivers all travel the same average distance on the state's roads. Just like with drivers of gas-

powered vehicles, not everyone drives the same distance, so a fixed fee overcharges many who drive fewer than 12,000 miles each year. Furthermore, studies show that drivers of some EV models travel measurably fewer miles than conventional vehicles, in particular those with batteries that have more limited range.⁴

These assumptions work to create a misleading reference point for the amount of tax revenue lost from plug-in vehicles in the state. To create a fair model for electric vehicle fees, we must start with a better-informed reference point.

REGISTRATION FEES ALREADY CAPTURE REVENUE FROM THE VALUE OF ELECTRIC DRIVETRAINS

One common argument in support of additional registration surcharges on plug-in cars is that drivers of these vehicles pay little or nothing toward the construction and maintenance costs of the state's transportation system through fuel taxes. This perspective, however, completely overlooks the fact that PHEVs/ EVs already pay more than gas-powered cars in registration fees even without a surcharge. Despite their similar size, weight, and design features, plug-in vehicles pay more than their counterparts in ad valorem fees which go directly to the state transportation fund.

Currently, ad valorem registration fees are the largest single portion of annual transportation taxes that drivers pay in Michigan, surpassing the revenue from gasoline taxes for most of the last 15 years.^{5,6} These fees correspond to the Manufacturer Suggested Retail Price (MSRP) and are based on a schedule that groups vehicles by each thousand dollars of value, taking into account its model year and sale date.⁷ For example, a new internal combustion

²<https://evadoption.com/ev-market-share/ev-market-share-state/>

³<https://www.bridgemi.com/michigan-environment-watch/electric-car-fees-michigan-would-soar-under-whitmers-roads-plan>

⁴Many early EV models have ranges closer to 80 miles on a charge, making it more difficult to accumulate 12,000 miles per year.

⁵https://www.house.mi.gov/hfa/PDF/Revenue_Forecast/Source_and_Distribution_Aug2018.pdf, Page 16

⁶<http://house.michigan.gov/hfa/PDF/Transportation/VehicleRegistrationTaxes.pdf>, Page 3

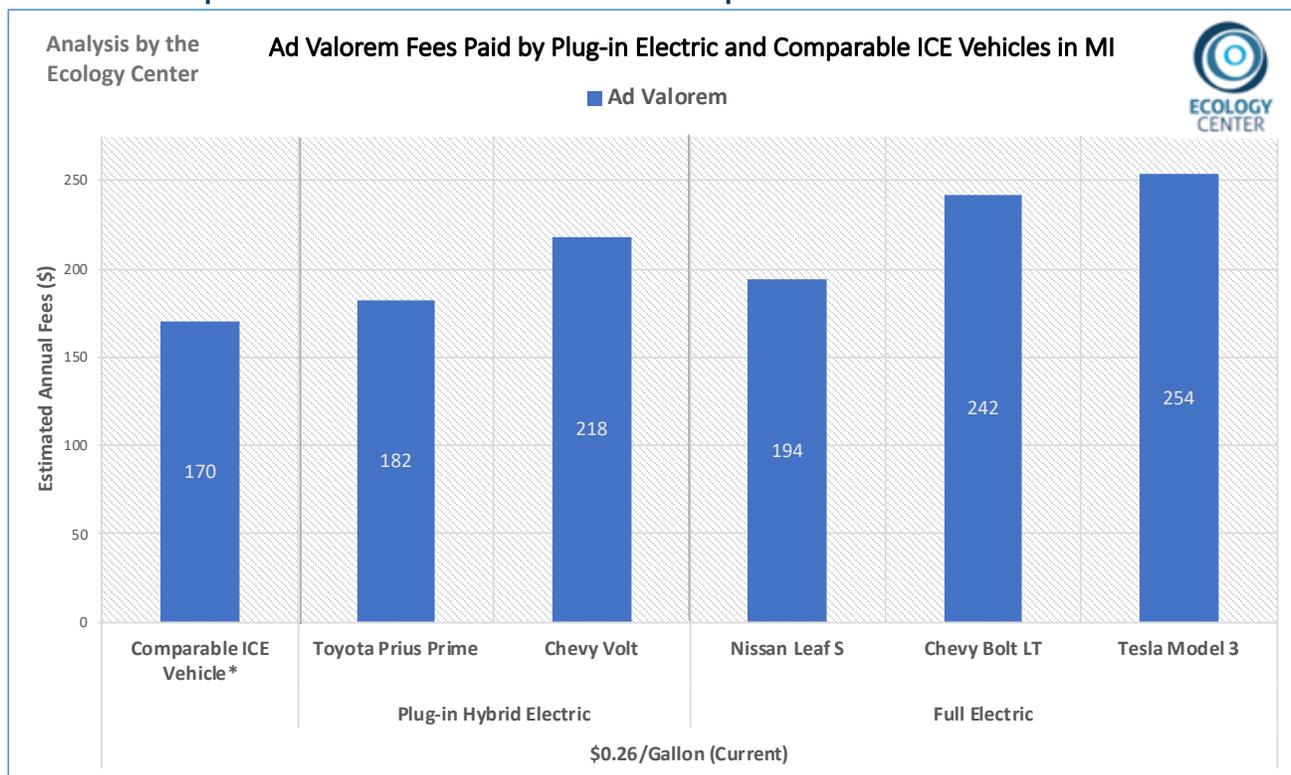
engine (ICE) vehicle valued at \$25,500 paying the fee for a six month registration would owe \$85 dollars and would have to renew their registration after those six months for a period dependent on the owner’s date of birth. The state provides an online tool for calculating these fees that takes the relevant variables into account including value, vehicle type, drivetrain technology, and other factors.⁸

New, fuel efficient gas-powered cars that have an average MSRP in this same range pay around \$170 annually in ad valorem fees. Depending on the make and model, plug-in hybrid electric cars are somewhat more expensive ranging from the high \$20,000s to mid \$30,000s in average MSRP. These vehicles average closer to \$200 in annual ad valorem fees. This added expense is generally derived from the cost of the hybrid engine technology and not from better design or luxury trim additions. Likewise, all-electric vehicles are listed at even higher average prices than PHEVs, falling in the range of mid to upper \$30,000s newly purchased. (The Nissan Leaf S is somewhat of an outlier,

largely because of its shorter range at \$30,000.) These EVs pay \$230 or more in ad valorem fees annually, averaging greater than \$60 more in transportation taxes paid than even highly efficient gasoline vehicles.

Vehicle MSRPs vary widely, with higher-tier luxury vehicles commanding higher prices and resulting ad valorem fees because of their attractive design, quality materials, sophisticated digital interfaces, or advanced performance options. Purchasers of PHEVs and EVs are paying more in retail price and sales tax for vehicles that use battery technology so they can reduce or avoid the total cost of petroleum fuels, not to avoid the relatively small percentage of that cost associated with fuel taxes. This means that drivers of these plug-in vehicles already make up for the perceived difference in transportation taxes through their higher registration fees. Figure 1 below shows that for all of the more popular EV and PHEV models, they already pay more than a comparable gasoline vehicle owner *even before* any EV surcharges are assessed.

FIGURE 1 Comparison of Ad Valorem Fees for EV and Comparable ICE Vehicles



⁷https://www.michigan.gov/documents/Ad_Valorem_Fees_74801_7.pdf

⁸https://dsvsvsvc.sos.state.mi.us/TAP/_/#1

A BETTER COMPARISON VEHICLE

Another problem with the EVs fees is that they assume EV owners should be taxed based on what a 25 mpg vehicle pays. The surcharge and escalating fee that EVs pay today total at \$135, somewhat more than the \$125 an average 25 mpg ICE vehicle pays to the state in fuel taxes annually. For comparison, a compact class 2019 Chevy Bolt pays \$377 in total annual transportation taxes under today’s law while a full-sized truck, the Ford F-150 XL, pays approximately \$313 (see Figure 2). These are very different vehicles in terms of size, weight, and efficiency but under the law’s assumptions the Bolt must pay \$64.20 more in taxes towards the state’s transportation system than the F-150. That large difference today would increase even further under the current fee escalation structure if gasoline taxes were to be raised.

Rather than paying the same as larger, heavier, and relatively inefficient gas-powered vehicles like the F-150 pickup truck, midsize and compact PHEVs and EVs ought to pay taxes comparable to smaller, lighter, and more efficient gas-powered vehicles like the Ford

Fusion Hybrid or Honda Insight. Several 2019 model year gasoline powered vehicles achieve more than 50 miles per gallon in estimated fuel economy, but because these are not plug-in hybrid or full electric vehicles they are also not charged the additional surcharges and escalating fees and pay on average only \$232 in annual transportation taxes.

To compare current PHEV and EV models equitably with ICE vehicles on the roads today, our analysis proposes to use a composite average of five fuel-efficient midsize cars as a baseline. The vehicles included in the composite figure are all fuel-efficient 2019 model year, midsize, mid-trim vehicles: The Toyota Prius L Eco (56 mpg), Kia Niro LX (49 mpg), Honda Insight EX (52 mpg), Ford Fusion Hybrid SE (42 mpg), and the Toyota Camry Hybrid LE (52 mpg). Their average fuel economy is 50 mpg and their average MSRP is \$25,557. Figure 3 below represents what new fuel-efficient vehicles are paying in registration and gas taxes under current Michigan law and therefore provides a much fairer point of comparison for what similar EVs and PHEVs should pay.

FIGURE 2 Annual Transportation Fees Paid by 2019 Chevy Bolt and Ford F-150

Make	Model* (2019)	Fuel Type	MSRP	Ad Valorem Regis. Fee	EV and Hybrid Fees***	Est. State Fuel Tax** (12,000 miles/year avg.)	Total Annual Fees (+ fuel tax)
Ford	F-150 XL	Gas	\$28,155	\$188	None	\$124.80	\$312.80
Chevy	Bolt	Electric	\$37,495	\$242	\$100 + \$35	None	\$377.00

FIGURE 3 Fuel Efficient Gas-Powered Models Included in the Composite

Make	Model* (2019)	Fuel Type	MSRP	Ad Valorem Regis. Fee	EV and Hybrid Fees	Est. State Fuel Tax** (12,000 miles/ year avg.)	Total Annual Fees (+ fuel tax)
Toyota	Prius L Eco	Hybrid	\$23,770	\$158.00	None	\$55.71	\$213.71
Kia	Niro LX	Hybrid	\$23,900	\$158.00	None	\$63.67	\$221.67
Honda	Insight EX	Hybrid	\$24,160	\$164.00	None	\$60	\$224.00
Ford	Fusion Hybrid SE	Hybrid	\$27,555	\$182.00	None	\$72.26	\$254.26
Toyota	Camry Hybrid LE	Hybrid	\$28,400	\$188.00	None	\$60	\$248.00
Representative Gas Vehicle				\$170	None	\$62.40	\$232.40

* Comparative gasoline models are mid-trim level, similar to base electric and plug-in hybrid models.
 ** Based on combined city/highway figures from www.fueleconomy.gov.

FEES MAY REFLECT HIGHER MILES TRAVELED THAN THE AVERAGE EV DRIVER

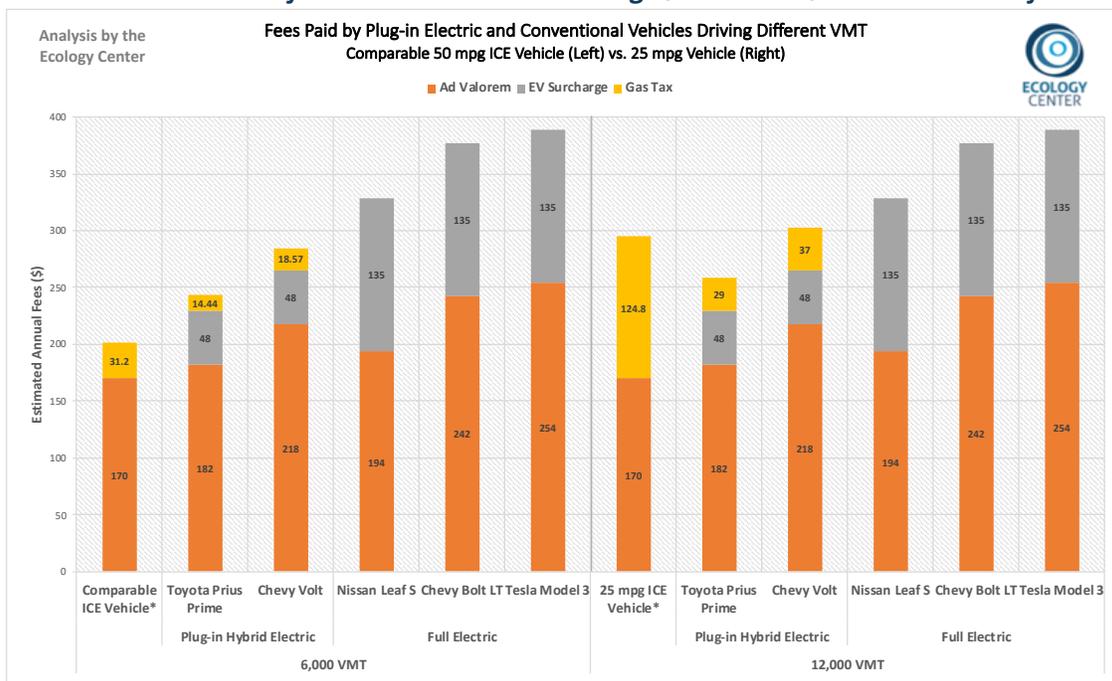
Not only do current EV/PHEV fees over-compensate for the amount of fuel taxes paid by comparable vehicles, they also build in an assumption that all EV/PHEV drivers travel the same number of miles each year. This unfairly penalizes those EV owners who drive significantly fewer miles, which may be the case for several reasons. Many vehicle owners, and especially EV drivers, use their cars primarily for short daily commutes to and from work. In addition, studies have shown that senior drivers travel substantially fewer annual miles than the average, as they generally no longer work and the geographic scope of their lives becomes smaller.⁹ A fixed annual fee is an inflexible approach that charges these drivers more than their share of transportation system costs.

As shown for comparison in Figure 4, an inefficient gas-powered vehicle rated at 25 mpg driving 12,000 miles per year would pay an estimated \$125 in fuel taxes under today's rates as shown on the right side of the graph below. While this is still lower than the surcharge assessed to EV drivers, the two taxes are roughly equivalent. But when comparing

what fees would be fair for EV drivers based on what efficient gas-powered cars rated at 50 mpg pay, the estimated fuel tax is cut in half. Further, drivers such as retirees who travel fewer miles than the average are also penalized by the law's assumption of the number of miles they drive. As seen on the left side of the graph, a driver in a fuel-efficient gas vehicle that drives only 6,000 miles annually should pay half the fuel taxes that similar efficient cars driving the average mileage do in response to this changed behavior. As a result, EV drivers in this same low mileage category paying \$135 in annual surcharges and escalating fees are assessed taxes *more than four times higher* than what would be fair given their road usage. Further escalation of these fees would only exacerbate this inequity.

Another reason to revise the 2015 transportation legislation surrounding PHEV/ EV surcharges is the differing driving behavior typical among PHEV/EV owners themselves. EVs that use a 20 - 45 kWh battery can travel between 60 and 160 miles continuously, while those with a larger capacity like the Chevy Bolt at 60 kWh can travel 230 miles or further on one charge.¹⁰

FIGURE 4 Fees Paid by ICE and EV Drivers Traveling 6,000 and 12,000 VMT Annually



⁹<https://www.fhwa.dot.gov/ohim/onh00/bar8.htm>
¹⁰<https://insideevs.com/reviews/344001/compare-evs/>

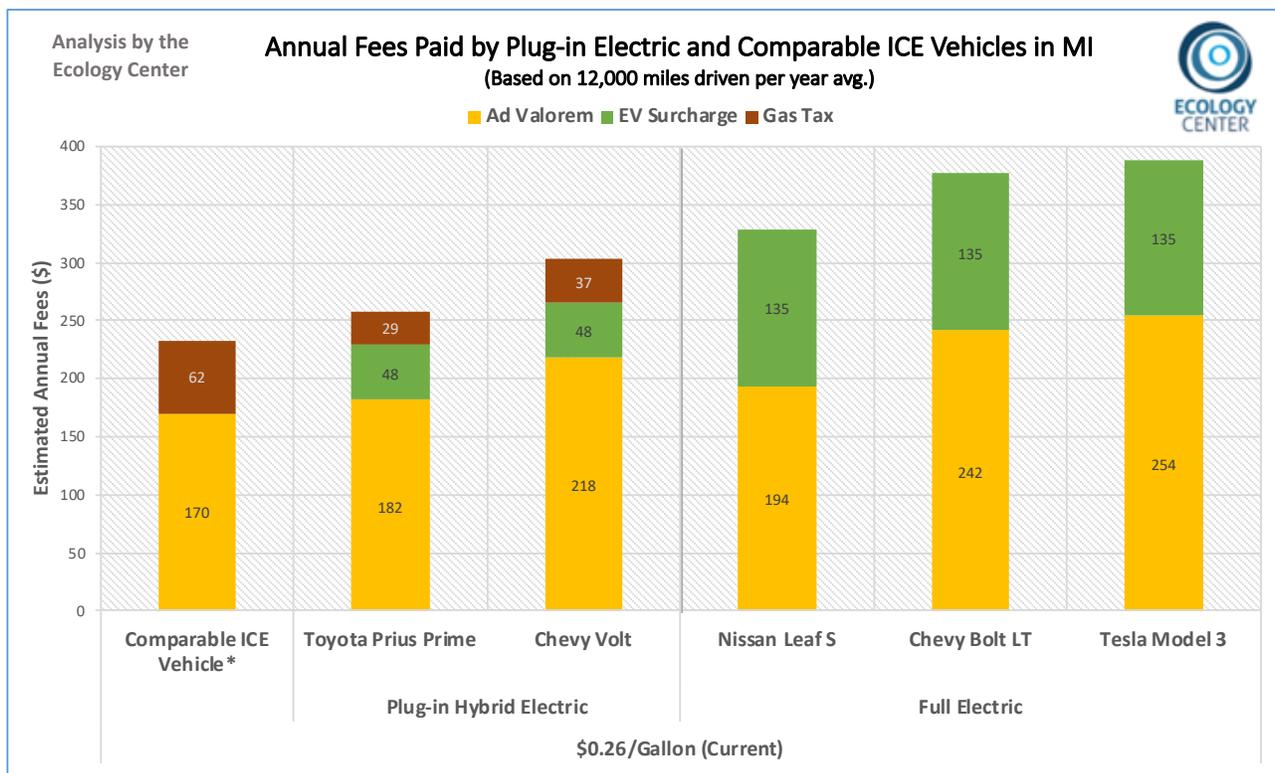
EVs with a smaller battery capacity and therefore a shorter driving range tend to drive fewer annual miles than the average.¹¹ With a more limited range before needing to charge again, shorter range EVs are used more for daily commutes and intra-regional travel rather than the longer distances that 200+ mile range EVs can drive. Older EVs with these shorter ranges and contemporary models designed to travel closer to 100 miles on a charge rather than 200 or more are constrained by their range and thus travel fewer annual miles. Fixed fees assuming 12,000 annual VMT are unfair to EV drivers who travel fewer miles than the average, just as they would be for ICE vehicle drivers.

ELECTRIC VEHICLE FEES WILL BE EVEN MORE UNFAIR WITH A GAS TAX INCREASE
 Under the current law’s plug-in fee structure, PHEVs and EVs pay much more in annual transportation-related taxes than comparable efficient gas-powered vehicles. As shown in Figures 5 and 6, the most popular plug-in hybrid models are paying between \$20 and

\$70 more, and full-electric models between \$90 and \$160 more, than their efficient ICE counterparts. These represent annual transportation fees that are as much as 30% higher for PHEVs and 67% higher for EVs than comparable gas-power vehicles under today’s fuel tax scenario.

A substantial increase in Michigan’s fuel taxes would greatly exacerbate the already large disparity between what PHEVs/EVs pay and what their fair share of transportation system costs should be. Figure 7 demonstrates that a hypothetical increase in the gas tax of 20 cents would escalate what these drivers pay far beyond what their counterparts would pay toward road construction and maintenance. Given the limited number of PHEVs/EVs on Michigan’s roads, this disparity in annual fees would do little to address the state’s transportation funding needs, but could significantly discourage the adoption of vehicles that global automakers are now investing billions of dollars to develop.¹²

FIGURE 5 Annual Fees for EVs and Comparable ICE Vehicles



¹¹<https://avt.inl.gov/sites/default/files/pdf/presentations/HybridSymposium2015CarlsonShirk.pdf>

¹²<https://escholarship.org/uc/item/62f72449>

FIGURE 6 Plug-in Vehicle Fees v. Baseline Vehicle Under Current Tax Scenario

Make & Model	Ad Valorem Regis. Fee	EV and Hybrid Fees*	Est. State Fuel Tax** (12,000 miles/year avg.)	Total Annual Fees	Percent/Value Vs. Baseline	
Comparable ICE Vehicle	\$170	None	\$62.40 (50 mpg)	\$232.40		
Toyota Prius Prime Plus (PHEV)	\$182	Hybrid \$30 + \$17.50	\$28.89*** (54 mpg/133 MPGe)	\$258.39	+11.18%	+\$25.99
Chevy Volt (PHEV)	\$218	Hybrid \$30 + \$17.50	\$37.14*** (42 mpg/106 MPGe)	\$302.64	+30.22%	+\$70.24
Nissan Leaf S (Electric)	\$194	Electric \$100 + \$35	None (108 MPGe)	\$329	+41.57%	+\$96.60
Chevy Bolt LT (Electric)	\$242	Electric \$100 + \$35	None (119 MPGe)	\$377	+62.22%	+\$144.60
Tesla Model 3 (Electric)	\$254	Electric \$100 + \$35	None (123 MPGe) ¹³	\$389	+67.38%	+\$156.60

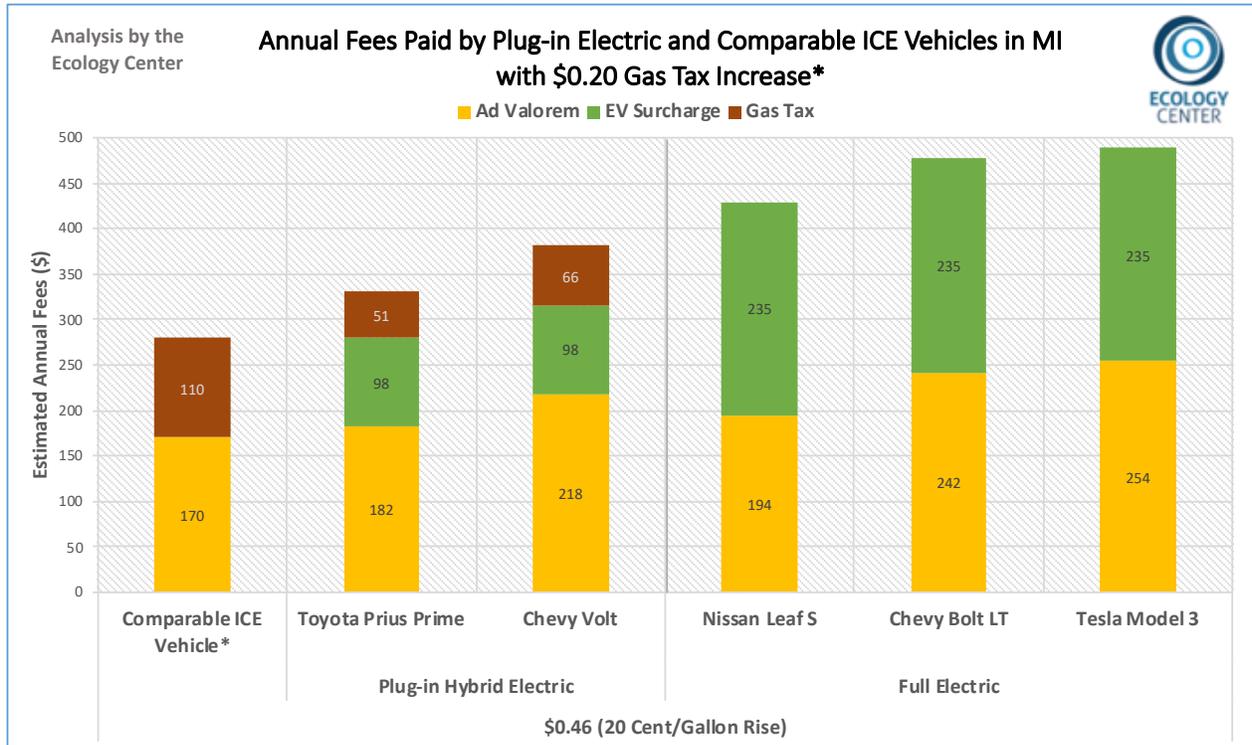
* Additional fees based on fuel tax escalator of \$5 x .07c for full electric, and \$2.50 x .07c for hybrid-electric vehicles.

** Based on combined city/highway MPG and MPGe figures from www.fueleconomy.gov.

*** Based on a 50%/50% VMT split using gas and electric respectively. Different vehicle makes and models, individual driver behavior, and urban/rural locations lead to widely varying splits - this figure is intended to capture a plausible split without favoring any particular scenario.

¹³ Based on 2019 Tesla Model 3 Mid Range

FIGURE 7 Annual Fees for EV's and Comparable Vehicles with \$0.20 Gas Tax Increase



*Based on 12,000 annual VMT average.

POTENTIAL SOLUTIONS

Laid out below are several potential solutions for revising Michigan’s road funding law to correct the disproportionate charges for plug-in vehicles and to move toward a fairer and more sustainable fee structure.

FREEZE PHEV AND EV FEES AT THEIR CURRENT RATES

One simple step that Michigan lawmakers could take is to ensure that the additional fees that plug-in vehicles pay today are not further escalated if state fuel taxes are increased. Since the total annual fees that EVs and PHEVs pay today are already disproportionately high, it is vital that these fees don’t escalate any higher relative to ICE vehicles with potential gas tax hikes. While EV/PHEV drivers already pay far more than their fair share under today’s fuel taxes, the escalator formulas enacted through the state’s 2015 transportation legislation will only serve to increase this disparity. Beginning in 2022, the fuel tax at that time

will be indexed to inflation (or capped at a 5% increase, whichever is least) meaning that regardless of whether the tax is legislatively changed, the taxes that all drivers pay will likely go up each year.

As lawmakers consider whether to raise fuel taxes to address the transportation funding shortfall, they should consider how doing so will have disparate impacts on different vehicle owners. The escalation rates in law today would cause plug-in vehicle fees to rise even more quickly than fuel taxes would, widening the difference between what these vehicles ought to be paying toward the transportation system and what they actually pay. For example, if Michigan’s fuel tax rate were to be raised by only a modest \$0.10 per gallon, the current escalator rates would mean that PHEVs would pay between \$30 and \$90 more in annual fees than comparable ICE vehicles, and EVs would pay between \$120 and \$180 more annually compared to those same ICE taxes.

FIGURE 8 Plug-in Vehicle Fees v. Baseline Vehicle Under a \$0.10 Gas Tax Increase

Make & Model	Ad Valorem Regis. Fee	EV and Hybrid Fees*	Est. State Fuel Tax** (12,000 miles/year avg.)	Total Annual Fees w/ \$0.10 Gas Tax Inc.	Percent/Value Vs. Baseline	
Comparable ICE Vehicle	\$170	None	\$86.40 (50 mpg)	\$256.40		
Toyota Prius Prime Plus (PHEV)	\$182	Hybrid \$30 + \$42.50	\$40.00*** (54 mpg/133 MPGe)	\$294.50	+14.86%	+\$31.10
Chevy Volt (PHEV)	\$218	Hybrid \$30 + \$42.50	\$51.43*** (42 mpg/106 MPGe)	\$341.93	+33.36%	+\$85.53
Nissan Leaf S (Electric)	\$194	Electric \$100 + \$85	None (108 MPGe)	\$379	+47.82%	+\$122.60
Chevy Bolt LT (Electric)	\$242	Electric \$100 + \$85	None (119 MPGe)	\$427	+66.54%	+\$170.60
Tesla Model 3 (Electric)	\$254	Electric \$100 + \$85	None (123 MPGe)	\$439	+71.22%	+\$182.60

* Additional fees based on fuel tax escalator of \$5 x .07c for full electric, and \$2.50 x .07c for hybrid-electric vehicles.

** Based on combined city/highway MPG and MPGe figures from www.fueleconomy.gov.

*** Based on a 50%/50% VMT split using gas and electric respectively. Different vehicle makes and models, individual driver behavior, and urban/rural locations lead to widely varying splits - this figure is intended to capture a plausible split without favoring any particular scenario.

Freezing PHEV/EV fees at their current nominal levels would avoid additional harm resulting from potential gas tax increases and would maintain the transportation system revenue that these vehicles provide today above and beyond their fair share. However, this approach would do little to better align fees under today’s tax circumstances, or if lawmakers choose to fund roads by other means than adjusting fuel tax rates. Such a measure should be implemented only as a temporary fix while the state studies alternative fee structures and policy options for securing a more equitable and sustainable transportation funding system. Figure 9. below shows estimated annual transportation fees paid by plug-in electric and ICE vehicles with a frozen escalator and a \$0.20 gas tax hike.

ADJUST THE FORMULA FOR FIXED CHARGES AND ESCALATING RATES

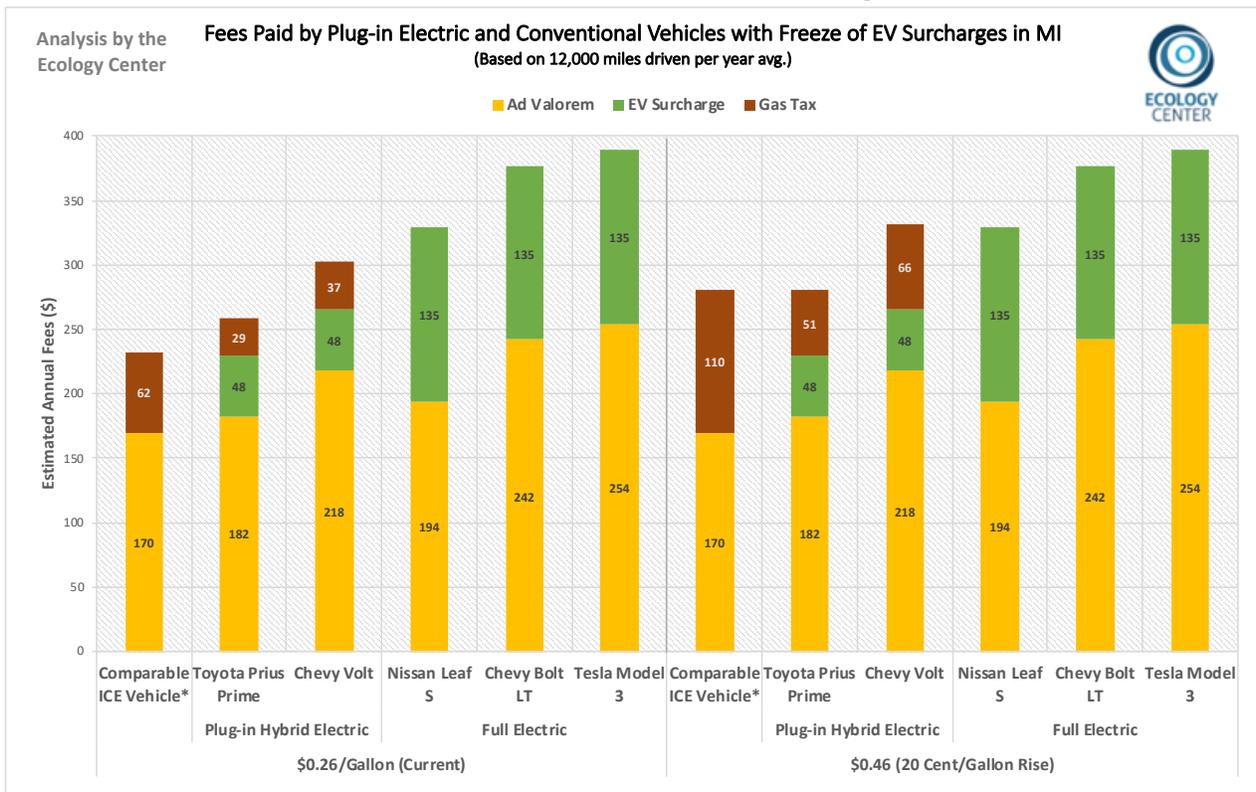
An intermediate option to address these disparities would be to go a step further than freezing the escalation of fees by setting them at lower, more equitable levels. Using the better comparison gas-powered vehicle described

above, both fixed surcharges and escalating fees could be set at levels that would both be closer to parity today as well as under various increases in the state gas tax.

Adjusting the plug-in fee formulas could take either of two approaches: 1) Aligning the total transportation-related fees that plug-in drivers pay including ad valorem fees, as well as potential increases, with those paid by comparable ICE vehicles, or 2) Aligning EV surcharges only, as well as potential increases to those surcharges, with the fees paid by comparable ICE vehicles. While the former would better address the large disparity in transportation taxes between gas-powered and plug-in vehicles, the latter would also be an improvement without having to revisit how ad valorem fees are assessed and thus easier to implement.

A comparable ICE vehicle pays around \$170 in ad valorem registration fees and \$62 in fuel taxes for a total average of \$232 when driving 12,000 miles annually. For PHEVs and long range EVs, additional plug-in fees should be

FIGURE 9 Fees for EVs and ICE Vehicles with Gas Tax Rise and Surcharge Freeze



roughly equal to \$62 under today's state fuel tax of \$0.26 per gallon. With equity between comparable vehicles in mind, it's clear that the \$100 fixed charge assessed to all-electric vehicles even before the fuel tax escalator is included is much higher than it ought to be, and the escalator rates for both EVs and PHEVs are much higher than they should be as well.

Under current law, plug-in vehicles weighing over 8,000 pounds are assessed higher fixed annual surcharges -- \$100 for PHEVs and \$200 for EVs -- than vehicles lighter than 8,000 lbs. While higher fees for heavier vehicles are justified based on their greater contribution to road wear and tear, the level of such fees for these vehicles have similar built-in assumptions and should be reconsidered as well.

CREATE DIFFERENTIATED FEES FOR PLUG-IN VEHICLES WITH DISTINCT RANGES

Data on millions of VMT traveled across several PHEV and EV models analyzed by Idaho National Laboratory demonstrates that a smaller capacity battery in EVs corresponds with fewer than average annual miles traveled. Drivers of EV models like the 2015 Honda Fit EV, Ford Focus EV, and Nissan Leaf averaged closer to 9,000 annual VMT in contrast to the assumption that all EVs travel Michigan's state average of 12,000 miles.¹⁴ The study's analysis found that EVs with shorter ranges traveled about 20% - 25% fewer annual VMT than their extended range gas/electric counterparts like the Chevy Volt.¹⁵

Current law draws a distinction between hybrid vehicles with battery capacity lesser and greater than 4 kWh. The former, like the vehicles included in our composite comparable vehicle pay only the ad valorem and fuel taxes, while the latter are assessed the \$30 surcharge and \$2.50 per additional cent fuel tax increase which are typically plug-in hybrids. This distinction, while somewhat arbitrary, does reflect operational and behavioral differences between drivers with some limited all electric range (PHEVs) and hybrid engine assist technology that mostly improves ICE efficiency. Following this precedent, a new fee structure should include a subcategory for smaller battery capacity EVs to be assessed a differentiated fee. Plug-in fees should be based on reasonable estimates of what their fair share of transportation system revenue ought to be.

All-electric vehicle models available today and sold in the recent past are self-organized into broad ranges for battery size, clustering between 20 - 45 kWh and 60+ kWh capacities.¹⁶ Corresponding with the observed differences in annual miles traveled, EVs with a battery capacity between 20 and 45 kWh ought to pay approximately 80% of the escalator rate that long range EVs do.

¹⁴<https://avt.inl.gov/sites/default/files/pdf/presentations/HybridSymposium2015CarlsonShirk.pdf> Page 9

¹⁵<https://avt.inl.gov/sites/default/files/pdf/EVProj/eVMTMay2014.pdf>

¹⁶<https://insideevs.com/reviews/344001/compare-evs/>

POLICY RECOMMENDATIONS

A NEW FORMULA FOR PLUG-IN FEES WOULD BE THE MOST EQUITABLE OPTION

The preferred solution to the EV fee problem would be to create a fee that is fair no matter what the gas tax rate is at the time. Any new formula for assessing plug-in registration fees should therefore apply to both the base fee levels as well as the rate of escalation that comparable ICE vehicles are assessed for any increase in the gas tax. Based on our analysis, rather than setting fees at \$5 and \$2.50 for each additional \$0.01 in gas tax for EVs and PHEVs respectively, those rates should be cut in half to \$2.50 and \$1.25, respectively. These new escalator rates should be implemented in tandem with the elimination of the current fixed surcharges of \$100 and \$30 for EVs and PHEVs.

In addition, full EVs with a smaller battery capacity under 45 kWhs should be assessed an escalating fee set at approximately 80% of the full EV rate to reflect their lower annual VMT.

In current law, the fee escalator increases by a set amount for each cent the gas tax rises above its previous status quo of \$0.19 per gallon. For greater simplicity, fee escalation should be tied directly to the total gas tax rather than bifurcating the calculation. For example, rather than PHEVs paying \$2.50 for every cent of increase above \$0.19 (\$0.07 as of 2017), the escalator should be based on the total \$0.26 rate.

Current PHEV Surcharges:

\$30 fixed fee + ($\2.50×7) = \$47.50

Proposed PHEV Surcharge: $\$1.25 \times 26 = \32.50

Current EV Surcharges:

\$100 fixed fee + ($\5.00×7) = \$135

Proposed EV Surcharge: $\$2.50 \times 26 = \65

Current Short Range EV Surcharges:

\$100 fixed fee + ($\5.00×7) = \$135

Proposed Short-Range EV Surcharges:

$\$2.00 \times 26 = \52

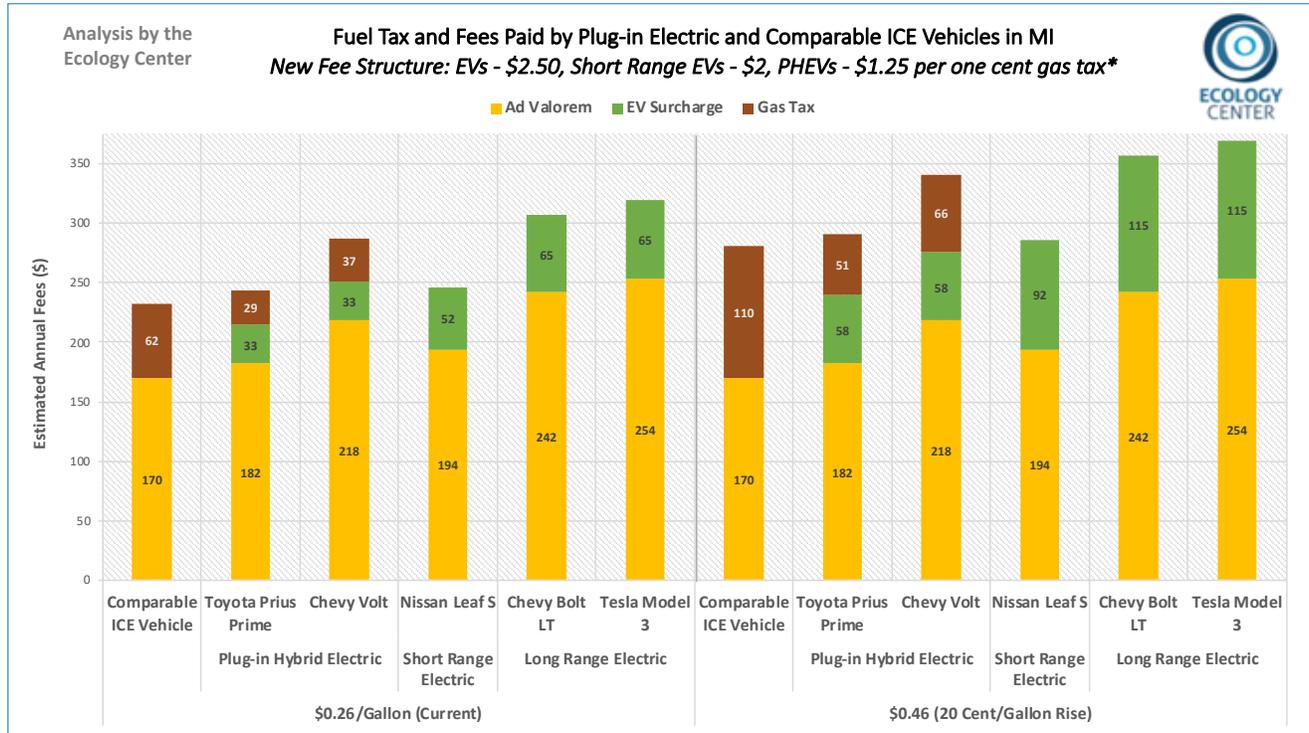
This method is more straightforward to compute and more directly ties fuel and registration fee revenues to one another. Since PHEVs also pay fuel taxes for at least some portion of their miles driven, it is appropriate that the new escalation fee be based on 50% gas, 50% electric VMT split as suggested in this report's analyses.

The proposed escalating fee rates would be very equitable today as well as across different tax increase scenarios when compared with contemporary fuel-efficient gas cars. The rate of increase in plug-in fees would be much better aligned and justified when compared with what fuel-efficient gas cars pay at each potential gas tax level. As shown in Figure 10, both today's plug-in fees and fees under a significant increase in the gas tax would be comparable to the amount of gas tax paid by similar ICE vehicles, rather than much higher as is currently the case. Short-range EVs would pay slightly less based on the lower VMT that such vehicles are capable of.

With the battery capacity precedent already established for PHEV’s (over 4 kWh), the escalator fees and battery capacity subcategories could be extended more continuously for even larger capacity/heavier plug-in vehicles. At a minimum, the current registration surcharges and fee escalators for

PHEVs/EVs over 8,000 pounds (\$100 PHEVs and \$200 EVs) should likely be reduced by half as well. As the variety of plug-in models continues to expand, and especially with the market growth of medium and heavy-duty EVs, additional EV subcategories with their own VMT and weight assumptions may be appropriate.¹⁷

FIGURE 10 Fees Paid by EVs and ICE Vehicles Under New Fee Structure



¹⁷<https://www.energy.gov/eere/vehicles/articles/fotw-1093-august-5-2019-model-year-2018-electric-drive-vehicle-models-were>

A LONGER TERM SOLUTION IS STILL NEEDED FOR SUSTAINABILITY

While a more reasonable and equitable fee structure would go a long way to alleviating the disparity in taxes described above, several problems remain with the underlying system of relying on both fuel taxes and registration fees as the foundation for transportation funding. As gas-powered vehicles become increasingly fuel-efficient in coming years, even Michigan drivers of internal combustion vehicles will purchase less gas and diesel per capita. So even with equitable fees for EVs, the state's total volume of taxable fuel will continue to decline.¹⁸ Increases in VMT haven't been and likely won't be enough to offset the revenue losses from these gains in efficiency coupled with the increased market share of PHEVs and EVs. As described previously, fixed registration fees are also not ideal for funding state or federal transportation systems because they are based on unfair assumptions about what an "average vehicle" should pay at the time the legislation is adopted, and are not based on actual road usage.

Instead, transportation fees should be more easily adaptable to changing transportation and technology trends as well as being responsive to the road usage of individual drivers and different kinds of vehicles. A sustainable future revenue structure for transportation system funding needs to be guided by a few key principles as well as responsive to emerging trends in technology and mobility. Below are a few of the suggested principles and technology/ mobility trends that should be taken into consideration.

Transportation Funding Principles:

1. Revenue sufficiency and sustainability
 - a. Revenue needs to be sufficient today and in the future to meet the road

and bridge construction/maintenance needs of the state.

- b. Revenue should not be allowed to decline from current levels due to price inflation and improving vehicle fuel economy.
2. Taxes paid proportionally by system beneficiaries/cost-causers
 - a. Drivers who use Michigan's roads more than others by driving more miles should pay their fair share of the costs associated with maintaining the system.
 - b. Drivers of heavier and larger vehicles that cause exponentially more damage to roads and bridges than smaller, lighter vehicles should pay fees proportional to the costs they incur.
3. Social equity
 - a. Taxes on transportation system users should be consciously structured in a way that doesn't unfairly penalize households that can least afford higher costs.
4. Incentivizing cleaner and more efficient technologies/systems
 - a. Rather than subsidizing inefficient vehicles that worsen air quality, climate impacts, and public health outcomes, transportation policy should encourage the adoption of less-polluting alternatives.
 - b. Using less petroleum-based fuel improves the state's energy independence and ensures more of its energy expenditures remain within the state's economy.
 - c. Lessen the transportation cost burden on Michigan's citizens with efficient vehicles and transportation systems that help household budgets, improve safety, and reduce the impacts of traffic congestion.

¹⁸<https://www.bloomberg.com/opinion/articles/2018-02-15/gas-taxes-aren-t-paying-the-bills-for-roads-anymore>

Trends in Technology and Mobility:

1. Increasingly connected and autonomous vehicles
2. Increased ride-hailing, vehicle sharing
3. Increasing fuel-efficiency of gas-powered cars
4. Gradual electrification of the vehicle fleet

INDEXING TAXES FOR FUEL ECONOMY/ CONSUMPTION

Michigan's 2015 transportation legislation ensured that fuel taxes and EV fees would be indexed to price inflation beginning in 2022. This measure, while certainly necessary, will not be sufficient to maintain transportation funding going forward. Even as current revenue levels are inadequate for meeting the state's construction and maintenance needs, real fuel tax revenues will continue to decline due to improved vehicle efficiency in addition to price inflation.

Indexing both gas tax rates and plug-in fees to the total volume of motor fuel taxed in the state could provide a path toward revenue sustainability. Total fuel purchases subject to tax is an annually measured figure that incorporates both total state VMT and fleet fuel efficiency, changing proportionally in response to positive or negative trends in both. Total fuel purchases could serve as a basis for ongoing adjustments to fuel and EV tax rates, and such adjustments would help to at least maintain needed tax revenues in the face of improving vehicle efficiency.

MILEAGE-BASED (VMT) USER FEES

Another approach that has become a popular point of discussion in recent years would be to switch from fuel taxes to a mileage-based fee system. Mileage-based or VMT fees charge drivers for each mile they travel on a state's

roads, similar to automatic tolling but the fees are charged on every road rather than just designated highways. There are many mechanisms for assessing fees, but a common method is to charge a small fee per mile and provide an annual tax credit to drivers for their fuel taxes paid throughout the year. With pilot programs around the country, many policymakers and researchers have argued that such fee structures will be the next logical step in transportation funding as overall fuel economy improves, plug-in vehicles gain in market share, and administering the necessary technology becomes more feasible.

Fuel taxes are considered a proxy charge for both miles traveled on state roads as well as vehicle weight, given that heavier vehicles generally need to consume more fuel to travel similar distances as lighter ones. Mileage-based fees are a direct charge on each mile traveled rather than a proxy, and would be even more fair and proportional to driver behavior of all vehicle types than fuel taxes if also adjusted for weight. However, current mileage-based fees do not serve as a proxy for fuel consumption or carbon emissions, a third policy function that many consider to be a valuable and increasingly necessary aspect of petroleum fuel taxes.

Additional concerns have been raised over the privacy and data security challenges inherent in individual vehicle tracking. Pilots like Oregon's multi-year pilot "OReGO" have sought to mitigate some of those concerns by partnering with a third party to manage the program's data security needs.¹⁹ To date these programs have been small and voluntary, but the interest of lawmakers has increased and the number of pilots around the country have proliferated in recent years.

¹⁹<https://www.energy.gov/eere/vehicles/articles/fotw-1093-august-5-2019-model-year-2018-electric-drive-vehicle-models-were>

TRANSPORTATION SYSTEM TAXES FOR ELECTRIC VEHICLE CHARGING (KWH FEE)

Another option for ensuring plug-in vehicles specifically pay their fair share of system costs would be to implement a transportation tax on their fuel source: electric charging. The Regulatory Assistance Project (RAP) has recently presented research into different policy models for aligning transportation system costs with user fees. Among their recommendations is a move toward a transportation fee on EV charging for each kWh, facilitated by smart charging infrastructure and adaptable rate structures.²⁰ This policy approach would allow the state to generate revenues from plug-in vehicles in much the same way that a traditional fuel tax does, with kWh's charged serving as a proxy for vehicle

miles traveled and weight similar to the proxy nature of gasoline and diesel purchases. Such a charge would be more responsive to actual driving behavior than a fixed registration fee while allowing for ongoing adjustments to ensure that plug-in vehicles pay their fair share of system costs.

Federal funding has been available in recent years for states to pilot programs for alternative road funding structures, administered through the Surface Transportation System Funding Alternatives (STSFA).²¹ Pilots for these and other alternative transportation funding systems may be an option worth exploring to address the serious challenges Michigan faces in this arena today and in the future.

²⁰<https://www.raonline.org/knowledge-center/funding-roadway-infrastructure-in-an-electrified-world/>

²¹<https://www.grants.gov/web/grants/view-opportunity.html?oppld=303186>

APPENDIX

Current Vehicle Registration Fee Comparisons, EV v. Gasoline

Make	Model* (2019)	Fuel Type	MSRP	Ad Valorem Regis. Fee	EV and Hybrid Fees**	Est. State Fuel Tax*** (12,000 miles/ year avg.)	Total Annual Fees (+ fuel tax)	Percent/Value Vs. Baseline	
Toyota	Prius L Eco	Hybrid	\$23,770	\$158.00	None	\$55.71 (56 mpg)	\$213.71		
Kia	Niro LX	Hybrid	\$23,900	\$158.00	None	\$63.67 (49 mpg)	\$221.67		
Honda	Insight EX	Hybrid	\$24,160	\$164.00	None	\$60 (52 mpg)	\$224.00		
Ford	Fusion Hybrid SE	Hybrid	\$27,555	\$182.00	None	\$72.26 (42 mpg)	\$254.26		
Toyota	Camry Hybrid LE	Hybrid	\$28,400	\$188.00	None	\$60 (52 mpg)	\$248.00		
Representative Gas Vehicle				\$170	None	\$62.40 (50 mpg)	\$232.40		
Toyota	Prius Prime Plus	Hybrid (plug-in electric)	\$27,350	\$182.00	Hybrid \$30 + \$17.50	\$28.89**** (54 mpg/ 133 MPGe)	\$258.39	+11.18%	+\$25.99
Chevy	Volt	Hybrid (plug-in electric)	\$33,520	\$218	Hybrid \$30 + \$17.50	\$37.14**** (42 mpg/ 106 MPGe)	\$302.64	+30.22%	+\$70.24
Nissan	Leaf S	Electric	\$29,990	\$194.00	Electric \$100 + \$35	None (108 MPGe)	\$329.00	+41.57%	+\$96.60
Chevy	Bolt LT	Electric	\$37,495	\$242	Electric \$100 + \$35	None (119 MPGe)	\$377.00	+62.22%	+\$144.60
Tesla	Model 3	Electric	\$39,900	\$254	Electric \$100 + \$35	None (123 MPGe) ²²	\$389.00	+67.38%	+\$156.60

* Comparative gasoline models are mid-trim level, similar to base electric and plug-in hybrid models.

** Additional fees based on fuel tax escalator of \$5 x .07c for full electric, and \$2.50 x .07c for hybrid-electric vehicles.

*** Based on combined city/highway MPG and MPGe figures from www.fueleconomy.gov.

**** Based on a 50%/50% VMT split using gas and electric respectively. Different vehicle makes and models, individual driver behavior, and urban/rural locations lead to widely varying splits - this figure is intended to capture a plausible split without favoring any particular scenario.

²²Based on 2019 Tesla Model 3 Mid Range

\$0.45/Gallon Fuel Tax Increase Scenario

Make & Model*	Ad Valorem Regis. Fee	EV and Hybrid Fees**	Est. State Fuel Tax*** (12,000 miles/ year avg.)	Total Annual Fees w/ \$0.45 Gas Tax Inc.	Percent/Value Vs. Baseline	
Representative Gas Vehicle	\$170	None	\$170.40 (50 mpg)	\$340.40		
Toyota Prius Prime Plus (PHEV)	\$182.00	Hybrid \$30 + \$130	\$71.89**** (54 mpg/ 133 MPGe)	\$413.89	+21.59%	+\$73.49
Chevy Volt (PHEV)	\$218	Hybrid \$30 + \$130	\$101.43**** (42 mpg/ 106 MPGe)	\$479.43	+40.84%	+\$139.03
Nissan Leaf S (Electric)	\$194.00	Electric \$100 + \$260	None (108 MPGe)	\$554	+62.75%	+\$213.60
Chevy Bolt LT (Electric)	\$242	Electric \$100 + \$260	None (119 MPGe)	\$602	+76.85%	+\$261.60
Tesla Model 3 (Electric)	\$254	Electric \$100 + \$260	None (123 MPGe) ²³	\$614	+80.38%	+\$273.60

* Comparative gasoline models are mid-trim level, similar to base electric and plug-in hybrid models.

** Additional fees based on fuel tax escalator of \$5 x .07c for full electric, and \$2.50 x .07c for hybrid-electric vehicles.

*** Based on combined city/highway MPG and MPGe figures from www.fueleconomy.gov.

**** Based on a 50%/50% VMT split using gas and electric respectively. Different vehicle makes and models, individual driver behavior, and urban/rural locations lead to widely varying splits - this figure is intended to capture a plausible split without favoring any particular scenario.

²³Based on 2019 Tesla Model 3 Mid Range