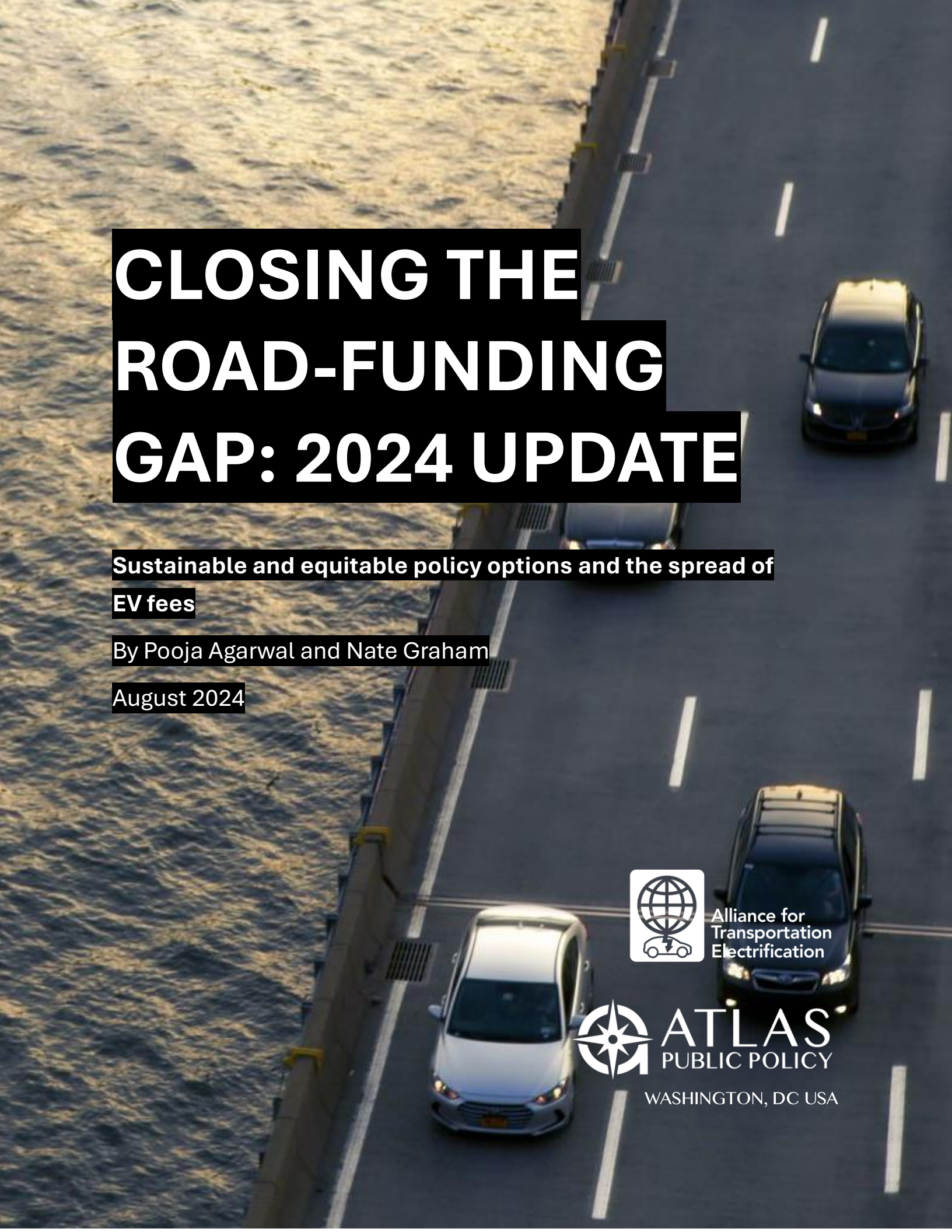

CLOSING THE ROAD-FUNDING GAP: 2024 UPDATE

Sustainable and equitable policy options and the spread of EV fees

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Acronyms

BEV	Battery electric vehicle
CAFE	Corporate Average Fuel Economy
CBO	Congressional Budget Office
DOE	U.S. Department of Energy
DOT	U.S. Department of Transportation
EIA	U.S. Energy Information Administration
EPA	U.S. Environmental Protection Agency
EV	Electric vehicle
FHWA	Federal Highway Administration
GAO	U.S. Government Accountability Office
HEV	Hybrid electric vehicle
HTF	Highway Trust Fund
LDV	Light-duty vehicle
MPG	Miles per gallon
MPGe	Miles per gallon equivalent
NHCCI	National Highway Construction Cost Index
PHEV	Plug-in hybrid electric vehicle
RUC	Road usage charge
VMT	Vehicle-miles traveled

Executive Summary

Taxes on motor fuel have historically been the primary mechanism for funding public road infrastructure on the federal level. In recent years, revenues from gas taxes have provided roughly a third of road funding for state governments, which carry out most road spending. However, over the past two decades, motor fuel tax revenues have failed to keep pace with road spending in the face of inflation, fuel economy improvements, and slowing growth in vehicle miles traveled (VMT). Meanwhile, cost drivers such as highway construction supply chain issues and climate change risk ballooning road expenditures even further. Together, these trends are leading to a growing road funding gap.

The accelerating sales growth of more efficient cars and trucks, from gasoline vehicles to battery electric vehicles (BEVs), is now adding to the pressure on motor-fuel tax revenues. However, the effect of electric vehicles (EVs) on road funding is marginal. In 2022, the 2.44 million light-duty BEVs registered in the United States accounted for just 0.87 percent of all light-duty vehicles. Based on the gasoline taxes paid by the average new light-duty vehicle, lost gas tax revenues from **electric vehicles only correspond to about one percent of the gap between 2022 federal motor-fuel revenues and highway spending**. Meanwhile, increasing fuel efficiency is more relevant to falling motor fuel tax revenues. For example, the fuel economy of Ford's flagship model, the gasoline-fueled, two-wheel-drive Ford F-150 pickup increased almost 60 percent between model years 2011 and 2018 [37].

Box 1A. Update of 2023 Report for 2024

Since the first version of this report was published in August 2023, states have continued to move forward with electric vehicle registration fees, charging taxes, and other fees for electric vehicle drivers to compensate for lagging road revenues. This report aims to update data and policy developments relevant to road funding in the United States. Additionally, this updated report includes a new mechanism for assessing the financial burden faced by an electric vehicle driver in a state.

Despite the marginal impact of EVs on highway revenues to date, and likely for some years into the future, additional annual registration fees and similar taxes for EVs have been at the center of the road-funding conversation in many states. Annual BEV fees range from $50 to $250 and average $142 among the 37 states that have adopted them. Recently, numerous states have turned their focus to collecting taxes on the electricity used at public EV charging stations. Seven states have enacted such taxes to date. Taxes on EV charging can

compound when considering utility taxes collected at the electricity meter, taxes specific to the charging service itself, and retail sales taxes. While they can play a role in ensuring that EV drivers contribute fairly to funding roads instead of paying gas taxes, these fees also result in EV drivers paying, on average, more than their fair share. EV drivers can pay up to four taxes that drivers of conventional vehicles are not subject to.

We have developed an "EV Penalty" assessment to quantify the total amount of EV-specific taxes and fees an EV driver that relies on public charging pays in a single calendar year for each state in comparison to a typical gasoline vehicle driver. The full formula and assumptions for the assessment are detailed in the report and Appendix. Based on our findings, EV drivers in 43 states, including the District of Columbia, pay more in taxes and fees when compared to drivers of gasoline-powered vehicles in a single calendar year. Of these 43 states, drivers in seventeen states pay more than a $150 EV Penalty. At the highest end, an EV driver in New Jersey can pay more than $346 in taxes and fees compared to the driver of a gasoline vehicle, from the state's BEV registration fee of $250 and a sales tax of 6.63 percent on the electricity they purchase at EV charging stations.

In addition to being unfair to EV drivers in some cases, and only marginally helpful for closing the road-funding gap, these fees can potentially depress EV adoption even as other policies seek to drive it up. Researchers at the University of California, Davis estimated in 2018 that a $100 annual fee could result in a decrease in EV adoption of 11 to 24 percent. Thus, policymakers must broaden the focus from EVs to a policy mix that will fund roads sustainably, equitably, and adequately.

Other road-funding policies are used to varying degrees in the United States. While the federal government and all 50 states tax motor fuel, the rates vary substantially, and most do not automatically rise with inflation. Tolls are another mechanism used in around 35 states. In 2025, four states will have voluntary road usage charge (RUC) programs that charge drivers by the mile, while at least 30 others are studying this method. Many states and the federal government collect additional taxes and fees on commercial road use and several states dedicate a portion of general revenues to transportation.

All the policies discussed above come with tradeoffs when evaluated against criteria that policymakers are likely to consider within the context of their jurisdiction. These include revenue sustainability, fairness, equity, cost-effectiveness, political viability, and a policy's role in reducing environmental impact and advancing transportation electrification. Potential for revenue generation is also a criterion but depends on the rates of taxes or fees, which in turn depend on other criteria and how a given measure fits within a state's policy mix.

If states choose to use EV fees to collect transportation revenue, they should not disproportionately burden EV drivers, particularly as they seek to encourage EVs with other policies. They could also blunt the impact of EV fees on adoption, such as through phase-ins and

avoiding multiple taxation pitfalls that PHEVs face. As used and more affordable EV models become available, reducing the barrier of large one-time costs, such as through an option to pay in installments, will grow in importance as an equity issue.

Ultimately, in most states, EV drivers will contribute only marginally to the funding gap for some time. Road funding policies should focus on ensuring that all drivers equitably and sustainably fund roads. To do so, policymakers can enact a suite of complementary, nonoverlapping policies based on their state's transportation funding sources and needs and on the priorities, demographics, and economic realities of their constituents.

Introduction

Taxes on motor fuel have historically been the primary mechanism for funding public road infrastructure on the federal level. In recent years, fuel taxes have provided roughly a third of road funding on the state level, where the majority of spending takes place.[1] This is based on the premise that road users should contribute more to maintaining and expanding the highway system. However, over the past two decades, motor fuel tax revenues have failed to keep pace with expenditures due to inflation, stagnant motor fuel tax rates, increasing fuel economy, and slow growth in vehicle miles traveled (VMT). Expenditures have also continued to rise due to highway construction supply chain issues and climate change. Despite the prevalence of these factors, in recent years, the increasing popularity of electric vehicles (EVs) and their potential to decrease transportation tax revenues has led to a disproportionate focus on charging EV drivers to fund transportation. Annual registration fees and similar measures, such as electricity-based taxes on charging ("EV charging taxes" for short), that are exclusive to EV drivers can discourage EV adoption at a critical juncture for the decarbonization of the transportation sector and in many states, introduce a financial burden for EV drivers that could be considered unfair.

This report summarizes the current sources of federal and state road funding, discusses funding trends and the reasons for the road-funding gap, introduces factors driving higher road costs, and illustrates that EVs currently represent a very small share of the problem. It lays out a series of policy options for states to fund roads sustainably and equitably and ensure that all users, including EV drivers, pay their fair share. The report also sketches out the national state of play for each of these policies and assesses their performance along key criteria, outlining each policy's inherent tradeoffs. Finally, given the current popularity of additional registration fees and growing attention on charging taxes for EVs as transportation-funding tools, this brief offers a mechanism for assessing a state's "EV Penalty," or the total excess fees and taxes paid by an EV driver compared to a driver of a gasoline vehicle.

[1] Motor-fuel taxes generate funds for public transit in addition to roads. For instance, in 2022, roughly 20 percent of federal motor-fuel tax revenues were destined for the Federal Highway Trust Fund's Mass Transit Account, with the rest dedicated to the Highway Account [3]. Although the funding gap from motor-fuel tax collections affects public transit, this paper focuses on road funding because it is the primary use of motor-fuel tax revenue. Additionally, data on the sources and uses of funding for roads is publicly available through the Federal Highway Administration's annual Highway Statistics Series, on which this report relies considerably.

State of U.S. Road Funding

In 2021, federal, state, and local governments in the United States spent $265 billion on roads (synonymously, "highways") [1].[2] State governments generated roughly 60 percent of this funding, while local governments raised 39 percent, and the federal government, one percent [2]. However, almost all federal road funding (95.4 percent in 2021) is ultimately channeled to state and local governments, which own over 99 percent of public roads [3] [4]. Road funding sources vary by jurisdiction, but motor fuel taxes are generally an important and declining revenue stream.

Federal Funding Sources and Trends

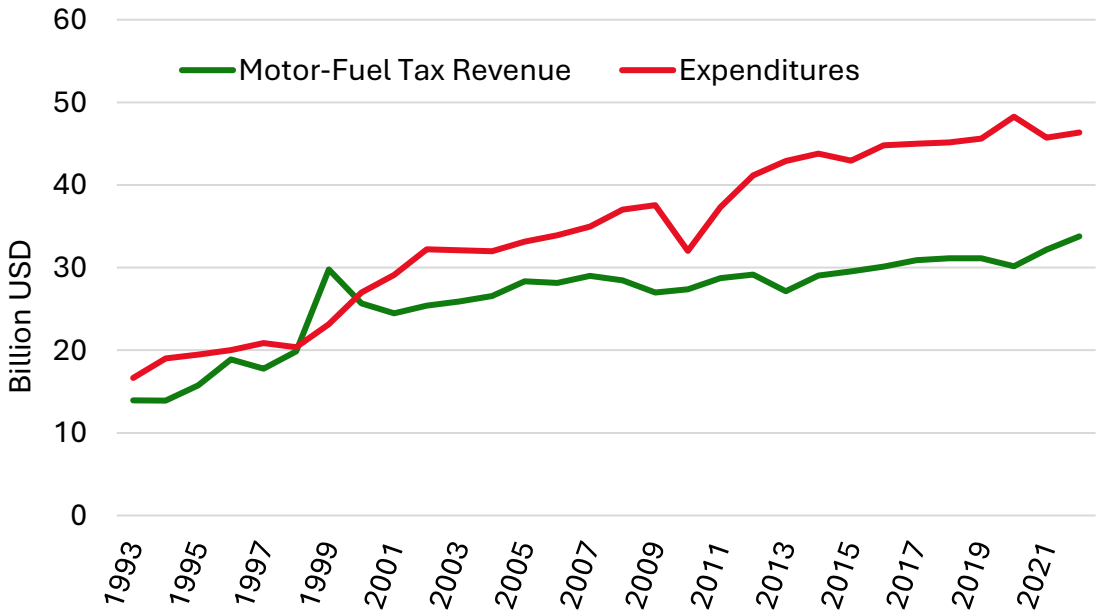
Taxation of motor fuel has historically been the most important source of federal highway funding. From 2013 to 2022, motor fuel taxes accounted for roughly two-thirds of federal highway funding, with the rest coming from general funds and from taxes on tires and on the sale and use of heavy-duty vehicles [5]. In fact, until 2008, the federal Highway Trust Fund (HTF) was funded exclusively by fuel and vehicle fees based on a) the premise that users should be the ones paying for highway maintenance and expansions and b) the assumption that these fees would provide a consistent source of revenue without the need for congressional approval [6]. Over the last two decades, however, motor fuel tax revenues have failed to keep pace with highway spending, leading to a growing funding gap and an imperative to explore other funding sources (see Figure 1).

In 2022, federal motor fuel tax revenues covered about 70 percent of highway expenditures, in contrast with 1999, when revenues exceeded spending by 30 percent [5]. As a result, the federal government has increasingly relied on transfers of general funds for highway spending. From 2008 to 2021, Congress transferred over $150 billion in general funds to the HTF [4]. When the 2021 Infrastructure Investment and Jobs Act (IIJA) was passed, it was projected to ensure the fund's solvency until 2027 with a new infusion of $118 billion of general funds [7]. However, in 2023, the Congressional Budget Office (CBO) projected that the gap between dedicated surface transportation revenues and spending will average $40 billion annually between FY 2027 and FY 2031 without additional transfers [8].

[2] There is a valuable debate over how government spends money on transportation, for example, by expanding highways and implicitly providing an incentive for greater road use while underinvesting in public transportation and other modes of transit. This report assumes that a large degree of funding for roads is essential and focuses on strategies for collecting this revenue.

Even with general revenue transfers, current spending levels are not meeting U.S. infrastructure needs. U.S. public infrastructure has historically been underinvested in and consequently, road quality has suffered. In 2021, the American Society for Civil Engineers rated 43 percent of public roadways as poor or mediocre [9]. The CBO estimates that to maintain current highway conditions and performance, average annual spending from 2022 to 2031 would have to be 22 percent greater than in 2021, and to fund all net-benefit projects, 58 percent greater [4].

Figure 1: Federal Motor Fuel Tax Revenue and Highway Expenditures



This figure shows how federal highway expenditures have increased at a faster rate than federal motor fuel tax revenues over the past three decades, leading to a growing funding gap and an increased reliance on general transfers. Over the 2017-2022 period, the expenditures of the HTF Highway Account exceeded its motor fuel tax revenues by more than $72 billion.

Source: Federal Highway Administration (FHWA) [5]

There are several reasons for the increasing gap between motor fuel revenues and highway spending. The first is simply **inflation**. The federal tax rates on gasoline and diesel have not increased from 18.4 cents and 24.4 cents per gallon, respectively, since 1993 [10]. Had these rates been indexed to an inflation rate like the consumer price index, they would now be roughly 41 and 54 cents per gallon [11]. However, over the past three decades, they have remained flat as highway construction costs have risen substantially, even outpacing the overall rate of inflation. The National Highway Construction Cost Index (NHCCI), compiled

by the Department of Transportation (DOT), shows that costs have nearly tripled between 2003 and 2023 alone [12]. Further, the Bureau of Transportation Statistics (BTS) finds that the real value of construction projects sponsored by IIJA funds could decline between 31 percent (under a modest inflation scenario) and 40 percent (under a high inflation scenario) meaning that fewer road projects could be funded [13].

The second reason for the federal road funding shortfall is **increased fuel economy** due to technological improvements and government regulation. Federal Corporate Average Fuel Economy (CAFE) standards, after remaining largely flat from 1985 to 2010, have nearly doubled since 2010 to 49.2 miles per gallon (MPG) for model year 2024 passenger cars, and risen by 60 percent to 35.1 MPG for 2024 light-duty trucks [14]. In real terms, from 2005 to 2020 this corresponded to a 29 percent improvement in the average fuel economy of new light-duty vehicles (LDVs) and a 14 percent improvement in the fuel economy of the overall light-duty vehicle fleet [15] [16]. Thus, motor fuel consumption has grown more slowly. While vehicle registrations grew 25 percent from 2000 to 2019, the total motor fuel volume taxed rose just 15 percent during that period after rising 40 percent over the previous two decades [17] [18]. This upward pressure on fuel economy will continue. The final rule for model years 2027 to 2031 would see the overall fleet of LDVs average an estimated 51.4 MPG by 2032 [19].

Since model year 2014, the U.S. Environmental Protection Agency (EPA) has also begun implementing standards for medium- and heavy-duty vehicles given their significant contribution to air pollution and greenhouse gas emissions [20]. This will further cut into highway funding revenues over time. Before, a lack of standards for larger vehicles had limited the fleet's fuel economy improvements so that vehicle miles traveled per gallon of motor fuel taxed increased just 3.5 percent from 2000 to 2019 [18] [21].

Additionally, substantially **slower VMT growth** over the past two decades has negatively impacted revenue. After growing 76 percent from 1980 to 1999, total national VMT grew just 19 percent from 2000 to 2019 [21]. There are multiple possible reasons for this, including a slowdown in suburbanization, a dip due to the Great Recession of 2008, and the aging of the population [22]. Regardless of the reasons, this trend is expected to continue, with important implications for the planning of road funding. The U.S. Energy Information Administration (EIA) projects that light-duty VMT will increase just 23 percent between 2022 and 2050 [23].

Finally, the rising share of **battery electric vehicles** (BEVs) is associated with an increasingly efficient overall vehicle fleet. BEVs consume no motor fuel whatsoever and average over 100 miles per gallon equivalent according to the Department of Energy (DOE) [24]. The market share of BEVs in new LDV sales reached an impressive 10.2 percent in Q4 of 2023 [25]. However, given the low turnover rate of the LDV fleet, EVs have only marginally

impacted motor fuel tax revenues so far. Light-duty vehicles in the United States have an average useful life of about 17 years and many, especially light trucks, stay in use for 30 years or more [26]. The number of light-duty BEV sales in 2022 was equivalent to just 0.3 percent of all light-duty vehicles registered the previous year [27] [28]. In 2022, 2.44 million light-duty BEVs were registered in the United States, accounting for 0.87 percent of all vehicles [29]. Based on the gasoline taxes paid by the average new light-duty vehicle, "lost" gas taxes from BEVs represent just 0.36 percent of total federal highway motor fuel tax revenues and almost one percent of the gap between 2022 federal motor fuel revenues and highway expenditures.

State Funding Sources and Trends

Compared to the federal level, motor fuel taxes account for a much smaller share of road funding for state governments, which carry out the majority of road spending. From 2017 to 2022, state motor fuel taxes accounted for only 19.9 percent of state revenues for highways, with the contribution of federal motor fuel taxes to federal highway aid adding another 14.5 percent (see Figure 2). The other two-thirds of state funding came from a diversity of sources including registration fees (16.9 percent) and bond proceeds (9.5 percent) [30] [31] [32] [33] [34].

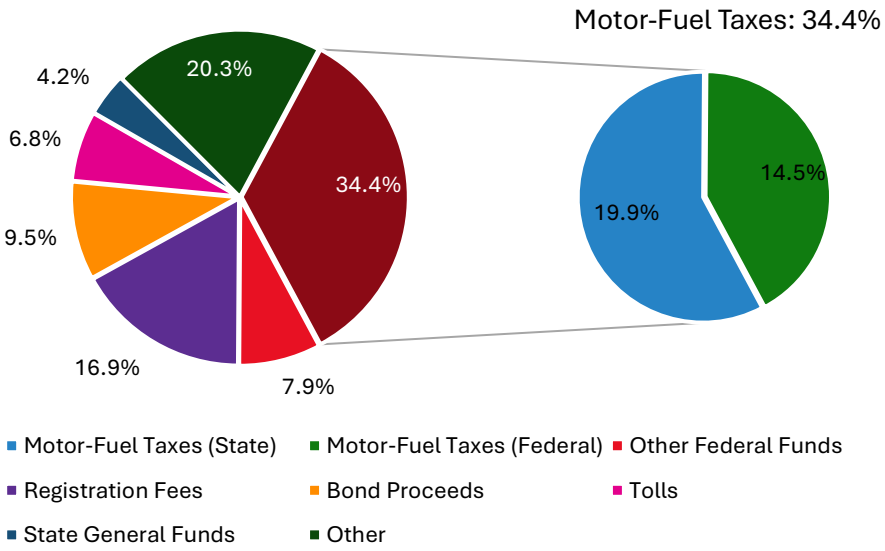
The breakdown of road funding sources varies significantly from state to state. For example, from 2017 to 2022, federal funding ranged from a share of just 11.3 percent in Delaware and New Jersey to 59.2 percent in Montana. Overall reliance on motor fuel tax revenue (both state and federal) ranged from 9.9 percent in New Jersey to 64.7 percent in Tennessee. Registration fees accounted for 45 percent of highway spending in Iowa and tolls reached 26.1 percent in New York. Washington, DC (29.3 percent) and Alaska (19.6 percent) led the nation in use of state general funds and Massachusetts in bond proceeds (48.3 percent). Appendix A shows the detailed breakdown for each state.

The same factors that affect federal motor fuel tax revenues (inflation, fuel economy, and VMT) also impact state motor fuel tax revenues. However, because states are generally less reliant on motor fuel tax for highway spending than the federal government, the impacts are less pronounced on average though considerable variation among states exists here as well.

States may also use revenues from motor fuel taxes for purposes other than funding roads, including for the general fund, transit projects, and law enforcement. Again, there is significant variation in how much and where funding is diverted—ranging from New York diverting 37.5 percent of its motor fuel tax revenue to Oklahoma diverting only 0.4 percent among the 25 states that divert road funding. While government spending is relatively fungible and

diverted funding can be replaced by state general funds, this practice poses a small but noticeable risk to road funding stability [35].

Figure 2: Revenues Used by States for Highways (2017-2022)



This figure shows that while a third of revenues that states spent on highways from 2017 to 2022 came from motor fuel taxes, a range of other sources also contributed. Appendix A shows that this breakdown varies significantly by state.

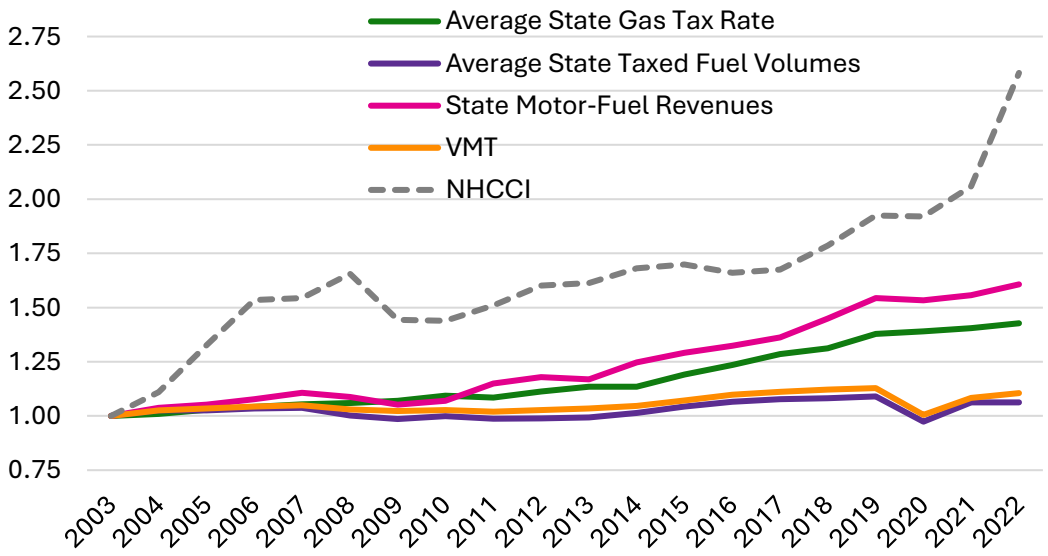
Source: FHWA [30] [31] [32] [21] [34] [36]

With respect to inflation, while the federal tax rate on gasoline and diesel has not increased for three decades, most states have raised taxes at least to a degree. On average, state gasoline tax rates in 2022 were close to 50 percent higher than in 2003 (see Figure 3) [37]. While New Mexico and Nevada's state tax rates on gasoline and diesel have decreased since 2003, New Jersey and Georgia's rates have more than tripled over the same period. Overall, state gasoline tax rates have increased faster than the NHCCI in just four states.

Data on state-level trends in fuel economy and VMT are more limited, but the trend of taxed motor fuel volumes is clear. The state with the largest growth in taxed motor fuel-volumes from 2003 to 2022 was Colorado, with growth of 57 percent, while 18 states, plus the District of Columbia, saw volumes decrease [18]. When combined with the slow increases in motor fuel tax rates, the result is that in 2022, three states plus DC collected less motor fuel

tax revenue than 20 years ago.[3] Only Georgia saw growth in revenues from 2003 to 2022 that exceeded the growth in the NHCCI.

Figure 3: Trends Related to Transportation Funding (2003 = 1)



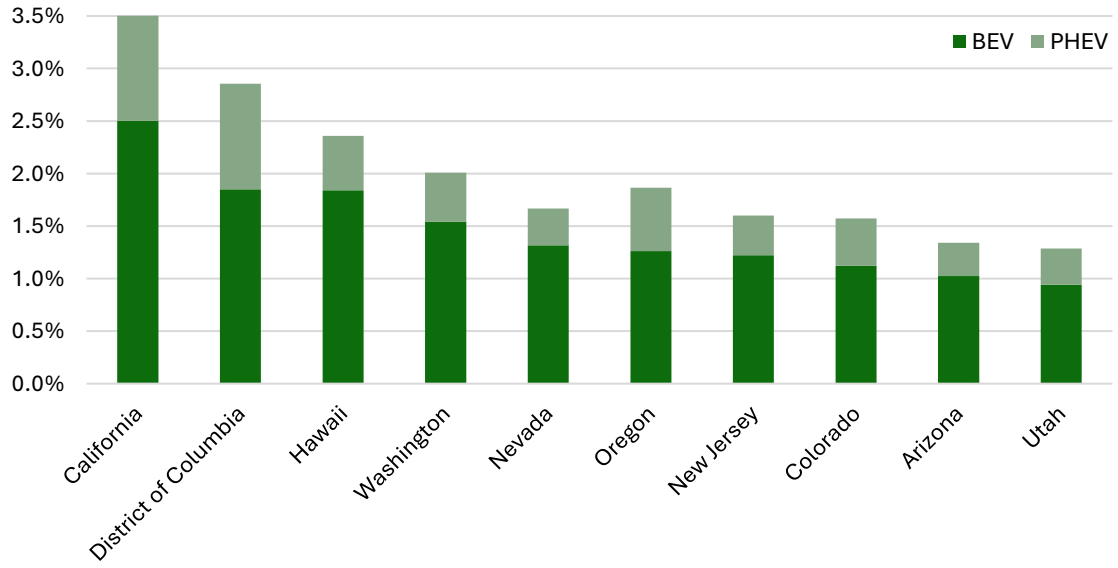
This figure shows how the NHCCI has significantly outpaced the growth of various metrics related to state highway funding over the past two decades.

Source: FHWA, EIA, DOT, Atlas Public Policy [12, 37, 18, 21, 38]

While EV adoption also varies substantially across states, in 2022, California was the only state in which BEVs surpassed two percent of LDV registrations. North Dakota and Mississippi had the lowest EV penetration at 0.08 and 0.09 percent respectively, while the median state was Pennsylvania, with 0.47 percent [29]. See Figure 4 for a tally of the states with the top EV share of light-duty vehicles, including plug-in hybrid electric vehicles (PHEVs).

[3] These findings take into account the fact that New York [104], Connecticut [105], Florida [106], Georgia [107], and Maryland [108] all enacted a gas tax holiday sometime in 2022, leading to drops in motor-fuel tax revenue.

Figure 4: EV Share of Light-Duty Vehicles in Top Ten States (2022)



This figure shows that even in the top 10 states, including DC and ranked in descending order by BEV penetration, EVs represent a very small fraction of the light-duty vehicle stock. The low turnover rate of light-duty vehicles counteracts EVs' rapidly increasing share of new sales.

Source: DOE [29]

The impact of EVs and the associated loss of motor fuel tax revenue is currently very low. Assuming that all BEVs registered in 2022 were paying annual gas taxes equivalent to a vehicle getting the 2024 CAFE standard, 40.6 mpg, they would have contributed approximately $262 million to state spending on roads. This "lost" tax revenue represents only 0.14 percent of the $182 billion that states spent on roads in 2022. Under this assumption, California would have seen the largest impact in lost gas taxes from BEVs (0.72 percent of state highway spending).

Even in comparison to the gas taxes paid by the average light-duty vehicle registered in each state (using 2018 measures of average fuel economy), states are losing just 0.28 percent of their 2022 highway spending from BEVs. Again, California's highway spending was impacted the most (1.37 percent) by increasing BEV registrations in the state.

Increased fuel efficiency has decreased motor fuel tax revenues far more than the rise of electric vehicles. In addition to the small but growing share of EVs in the light-duty vehicle fleet, conventional hybrids have grown in popularity in recent years, reaching two percent of registrations in 2022 [29]. More importantly, the fuel economy of conventional vehicles has increased substantially. For example, between model years 2011 and 2018, the

combined fuel economy of a gasoline-fueled, two-wheel-drive Ford F-150 pickup increased almost 60 percent, from 14 to 22 MPG [39].

If transportation electrification trends continue, EVs will eventually play a greater role in the road-funding gap. Tax incentives in the 2022 Inflation Reduction Act (IRA) could result in EVs accounting for 19-57 percent of LDV sales in 2030, depending on production costs [40]. Still, low LDV turnover will depress the impact of these sales on the overall fleet. The International Energy Agency projects that EVs will account for 17 percent of cars on the road in the United States in 2030 [41]. Meanwhile, the growing efficiency of conventional gasoline and diesel vehicles and rising road construction costs will continue to play major roles in the road-funding challenge.

Despite the limited impact of EVs on highway revenues to date, and likely for the near future, EVs have been at the center of the road-funding conversation in many states. These fees focus on forcing EV drivers to pay their fair share of road funding even as the persistent shortfall in road funding indicates that not even the *average* driver is paying their fair share. In some cases, states charge EV drivers more than the average driver pays in gas tax when accounting for electric vehicle-specific registration fees and EV charging taxes, which could slow EV adoption even as other state policies seek to grow the EV market to mitigate climate change and reduce local air pollution. Thus, there is a need to broaden the focus from EVs to a policy mix that will fund roads sustainably, equitably, and adequately. Box 1 describes Hawaii's road use charge program, a policy option that has the potential to meet many of these criteria.

Box 1: Hawaii's Landmark Road Use Charge Program

Hawaii's approach to declining motor fuel tax revenues stands out for its emphasis on community engagement throughout the policy design process. The state was awarded a $4 million grant from the Federal Highway Administration (FHWA) to conduct research and pilot a road usage charge (RUC) program. Their community engagement process was extensive to ensure the program was responsive to the needs of Hawaii's diverse communities residing across six islands. After a six-year process starting in 2018, which involved 14 meetings, over 40,000 surveys, and more than 2,000 participants in a three-year Demonstration Project, Hawaii will become the first U.S. state to institute a mandatory mileage-based RUC program for EV drivers. The first phase of the program will start in July 2025 when EV drivers can choose to participate in the RUC program (by paying $0.008 per mile) or pay a $50 flat annual fee. If they choose the RUC, their vehicle's odometer will be recorded at their annual vehicle safety inspection required for registration renewal. Starting in July 2028, all EV drivers will be required to participate in the RUC program. By the end of 2025, the Hawaii DOT is required to create a plan for phasing gasoline vehicles into the program by 2033 [42].

The state's program and community engagement process could serve as a model for other states considering a wider rollout of a RUC program. However, Hawaii's program does not solve the challenge that other states face in distinguishing between miles driven in-state and out-of-state.

Cost Drivers

Beyond the current factors driving the growing gap between motor fuel tax revenues and expenditures, additional causes such as climate change and skyrocketing highway construction costs warrant further attention.

Extreme weather events exacerbated by climate change are increasing in frequency and severity, but the budgetary implications of climate change are insufficiently considered in the road funding crisis. For example, pavement lifespans will be reduced due to high temperatures and improperly determined asphalt grades. This alone could translate to an additional $19 billion in pavement costs by 2040 [43]. A 2017 Climate Action Benefits Report by U.S. EPA found that the cost of adapting U.S. roads to climate impacts would range from $5.8 to $10 billion without more effort to mitigate climate change [44]. Investing in climate

resilience—which involves planning and preparing for potential future losses from climate hazards—can reduce the future costs of adapting.

In September 2021, the Governmental Accountability Office (GAO) released a report reviewing options to increase the climate resilience of federally funded roads and issued a number of recommendations for Congressional and executive action. In the context of roads, climate resilience can involve changing road designs and materials, moving roads, or using nature-based solutions. The report outlined how, historically, FHWA has supported states with improving the climate resilience of roads by developing agency policy, providing technical assistance to states, and funding research on resilience, but has made insufficient funding available for disaster relief. GAO recommended that Congress make more funding available for the FHWA to help states with planning and implementing climate resilience into road projects [45].

IIJA responded to these recommendations by expanding the eligibility of existing FHWA programs and creating new programs for improving climate resilience of road transportation infrastructure [46]. For example, the Promoting Resilient Operations for Transformative, Efficient and Cost-Saving Transportation (PROTECT) program supports states in strengthening the climate resiliency of surface transportation through competitive grants and formula funding. While these programs collectively allocate $8.7 billion over five years, representing a small share of overall road funding, the consequences of not investing in climate resilience pose a larger long-term threat to road funding budgets [47]. This sentiment is captured in GAO's "High Risk List" of government programs and operations that are vulnerable to a range of factors or need broad reform. In 2023, the funding of surface transportation and climate change were listed as the #4 and #9 riskiest areas, respectively [48].

On the other hand, rising highway construction costs—beyond inflation—have contributed to the faster depletion of the HTF. While this trend has existed for decades, with research finding that state expenditures on one mile of Interstate highway in the 1980s were three times as high as in the 1960s, there has been little movement to control spending [49] Figure 3 shows how the NHCCI has outpaced the growth of state motor fuel revenues over the past two decades. While highway construction costs highly vary between states, in recent years, increasing crude oil prices and supply chain issues have been major contributors to increased construction costs [50].

Cost overruns in infrastructure projects also pose risks to road funding budgets. A 2003 global review found that on average, road infrastructure projects cost 20 percent more than they are budgeted [51]. A 2016 study that surveyed state transportation agencies found that agencies can avoid cost escalations by developing better initial estimates of project scope and costs. Identifying risks and utilizing multidisciplinary team members to review and verify estimates are other best practices for minimizing budgetary discrepancies [52].

Policy Options

A range of policies to collect revenue for roads are used or discussed to varying degrees in the United States, as summarized in Table 1. These currently include:

- **Motor fuel taxes**, including taxes automatically indexed to factors like inflation or average fuel economy.
- **Tolls**, including congestion pricing, which charge users in rough proportion to the benefits they receive from road use and the costs they impose on road conditions and other drivers.
- **Road usage charges** (RUCs), also known as VMT fees or mileage-based user fees (MBUFs), which are more exact usage-based fees that precisely quantify individuals' road use regardless of fuel type.
- **Taxes on commercial activities**, such as increased registration fees and tolls for commercial vehicles, weight-distance taxes on heavy vehicles, retail delivery fees, commercial VMT programs, or commercial activity surcharges [53].
- **Efficient-vehicle registration fees**, which seek to recoup motor fuel tax revenues not collected from drivers of EVs, PHEVs, conventional hybrid electric vehicles (HEVs), and high-MPG conventional vehicles, generally through a flat annual surcharge. This policy is discussed further in *Deep Dive: Electric Vehicle Fees*.
- **EV charging taxes**, which mimic a motor fuel tax by charging EV drivers for the electricity they use to power their vehicles, either by the unit of energy (kilowatt-hour) or the retail cost. This policy is discussed further in *Deep Dive: Electric Vehicle Fees*.
- **General revenues** collected from sources such as income and sales tax that are earmarked for transportation but unrelated to road use.

Table 1: Sample Federal and State Road-Funding Policies and Status

Policy Option	State of Play
Motor fuel taxes	• All 50 states and the federal government tax motor fuel. • Federal gasoline and diesel taxes have not risen since 1993 and stand at 18.4 and 24.4 cents per gallon, respectively [10]. • As of January 2024, state gas taxes range from eight cents per gallon (AK) to 58 cents per gallon (CA), with an average of 29.1 cents per gallon [54] [55]. • 10 states have a gas tax rate equal to or below the rate in 2003 [37] [54] [55]. • 10+ states vary gas tax rates with inflation, highway construction costs, and/or revenue needs [56]. • GA varies gas tax rates in line with both inflation and improvements in fuel economy.
Tolls	• ~35 states have existing toll roads. • Cities in various states, including CA, FL, MN, NY, TX, and VA, use forms of congestion pricing [57].
Road usage charges	• As of July 2024, OR, UT, and VA have voluntary RUC programs. • In 2025, HI's voluntary RUC will go into effect, and in 2028, it will require all EVs to pay a RUC instead of an annual BEV registration fee [42]. • At least 30 additional states have researched and/or piloted such systems, including through the Eastern Transportation Coalition and RUC America [58] [59] [60]. • The U.S. Department of Transportation is conducting a nationwide RUC pilot testing different collection tools, methodologies, and public awareness campaigns [61]
Taxes on commercial activities	• The federal government imposes excise and use taxes on heavy-duty vehicles, which accounted for roughly 13 percent of net income to the HTF Highway Account in 2022 [5]. • Heavy vehicles generally pay higher tolls based on axle count, size, and/or weight [62], as well as higher registration fees.

Policy Option	State of Play
	• In 2023, CT became the fifth state that collects weight-distance taxes on heavy vehicles [63]. • CO and MN have both recently passed fees on retail deliveries to fund transportation [64] [65]. CO's fee also covers ride-sharing. WA and NY have also considered such measures [66] [67].
Efficient-vehicle registration fees	• 37 states (including DC) charge BEV drivers additional annual registration fees, ranging from $50 (HI, SD) to $250 (NJ). • 30 of those states charge additional fees on PHEV drivers as well, and 14 on HEV drivers. • OR and VA charge fees for high-MPG gasoline vehicles. • These fees are all detailed in Appendix B.
EV charging taxes	• Seven states have passed additional taxes on electricity used at public EV charging stations (see Appendix B). UT charges a 12.5 percent tax on the retail cost, and the other six states charge by the kilowatt-hour (1.8 cents in PA, 2.6 cents in IA, 2.8 cents in GA, and 3.0 cents in KY, MT, OK). • PA's measure applies to private charging as well, but this is based on self-reporting and compliance is low [68]. • GA's measure is designed to capture revenue from interstate travelers.
General revenues	• From 2017 to 2022, most states used state general funds to some degree, but they accounted for just 4.5 percent of overall state highway spending [30] [31] [32] [33] [34] [69]. • ID, LA, and NC have all recently passed legislation permanently dedicating a portion of sales taxes to transportation infrastructure [70] [71] [72]. • The use of general revenues is generally much more prevalent on the federal level than the state level. Ad hoc general revenue transfers account for around a quarter of federal highway spending since 2008 [5].

This table shows some of the policy options for funding roads and examples of how they are currently used at the federal and state levels. As the traditional funding stream of motor fuel taxes has become less reliable in recent decades, some states have responded by raising these taxes, while others have turned to more novel solutions, especially in recent years. These solutions include EV registration fees, EV charging taxes, retail delivery fees, and road usage charges.

Policy Criteria

As the federal government and states seek solutions to chronically underfunded transportation, they are likely to evaluate their policy options within the context of their jurisdiction and along a range of criteria which could include revenue sustainability, fairness, equity, cost-effectiveness, political viability, and their role in reducing environmental impact and encouraging transportation electrification [73]. Potential for revenue generation is an obvious additional criterion but is highly dependent on the rates of taxes or fees, which in turn depend heavily on other criteria and how a given measure fits within a state's policy mix.

Revenue Sustainability

Road-funding policies should provide a long-term solution, as opposed to short-term stopgap measures like the periodic general revenue transfers that have maintained the solvency of the HTF. A predictable and consistent stream of revenues for roads enables long-term planning not just in transportation, but also in other areas that rely on general funds.

Raising motor fuel taxes may be sustainable in the short and medium term, particularly if rates automatically increase in line with inflation, revenue needs, or some other measure. Automatically raising rates by a small amount each year gives consumers visibility into future gas tax rates and preempts the need for increases that are large, irregular, and politically challenging. While inflation is an important factor that depletes the real value of transportation revenues, policies can also account for other factors. For instance, Georgia's increasing gasoline tax rate accounts not only for inflation, but also for improvements in fuel economy. The National Resources Defense Council has proposed going one step further by indexing the gas tax to total fuel consumption so that effectively the same amount of revenue is collected each year [74].

Eventually, however, longer-term solutions will be necessary to replace gas tax revenues. Either EVs will become a large enough share of the fleet that even inflation-adjusted fuel taxes are insufficient, or, if indexing to total fuel consumption, the tax rate will rise to a level that is politically infeasible, likely with greater incidence on lower-income drivers who are less able to purchase an EV. Any of the other options cited above (e.g., tolls, RUCs, and EV

registration fees) could theoretically serve as a substitute as long as revenues increase at a rate consistent with road construction costs.

Fairness

There are different ways of thinking about whether policies are fair to road users and those who benefit indirectly from road use. The traditional "user pays" principle dictates that one's contribution to road spending should be proportional to their road use. Alternatively, a "beneficiary pays" principle reflects the degree to which one benefits from road use, for instance, through the transportation of goods.

Mechanisms such as RUCs and tolls adhere to the "user pays" principle while discouraging unnecessary road use, thereby reducing road damage. Tolls with congestion pricing have the added benefit of accounting for costs to other users due to using the road at a certain time thereby encouraging alternate routes or timings. Similarly, weight-based RUCs, tolls, or registration fees reflect the greater road damage that heavier vehicles cause. Fuel taxes, for their part, correspond to one's road use in a general sense, but decreasingly so as efficient vehicles become more popular.

One fairness-related drawback of RUCs is that barring coordination between states, they fail to collect revenue from out-of-state drivers in the way that tolls and fuel taxes do. The size of this issue depends on the state but can be significant. For example, an analysis in Vermont, which has a relatively high share of tourism and pass-through traffic, found that roughly 25 percent of gas bought with a credit card was tied to an out-of-state address [75]. In Wisconsin, a state that is not considered a "pass-through" state, officials have still estimated that 10-15 percent of motor fuel tax revenue is attributable to out-of-state drivers [76]. Taxes on public EV charging may counteract this by mimicking a tax on fuel sales.

Meanwhile, taxes on commercial activities, which are presumably passed onto the final consumer, reflect the "beneficiary pays" principle and can be designed to account for the highly disproportionate impact that heavy vehicles have on roads.

Equity

Equity relates to the impact of a policy on different groups of drivers. For instance, fuel taxes are generally regressive, imposing a greater burden on lower-income people both through fuel consumption and increases in the prices of shipped goods [77]. Given that high-income drivers account for a disproportionate share of EV adoption, at least for now [78], dependence on fuel taxes for funding roads may inherently become even more regressive. Fuel taxes also disproportionately impact rural drivers since they drive more on average.

RUCs also tend to be both regressive and disproportionately burdensome for rural drivers, although if EV uptake continues to be driven by high-income groups, RUCs may become less regressive compared to gas taxes [79].

By contrast with motor fuel taxes and RUCs, the burden of EV registration fees disproportionately falls on high-income drivers since EV drivers currently have higher incomes on average. However, this relationship will fade over time as more affordable models become available and more EVs enter the used market. Additionally, flat EV fees are regressive since they constitute a larger share of vehicle value for less expensive vehicles, and as a large one-time cost, they can present a greater financial barrier for lower-income drivers. Pennsylvania has proposed an option to pay its fee in monthly installments [68], though this comes with an administrative burden for drivers who choose it. Texas, on the other hand, charges an initial fee of $400 that accounts for the first two years of registration [80].

If limited to public charging, EV charging taxes disproportionately impact EV drivers who do not have access to home charging, such as renters, who may have lower incomes on average. According to the Federal Reserve, the median income of renters is less than half that of homeowners [81]. Renters often do not have dedicated access to charging, which may explain lower rates of EV ownership among renters, even after controlling for income [82].

The equity implications of taxes on commercial activity depend on their design. For instance, a commercial VMT program would disproportionately burden lower-income households because higher-income households consume more non-tradable goods not requiring transportation [79]. By contrast, Minnesota's retail delivery fee, passed in 2023, mitigates equity impacts by exempting orders under $100 and deliveries of food, drugs and medical supplies, and baby products [65].

Finally, the use of general revenues can produce regressive or progressive effects depending on the source of the revenue. For instance, using revenue from a graduated income tax would be progressive, while using revenue from sales tax would be regressive.

Cost-Effectiveness

The policies presented also differ substantially in how cost-effectively they collect revenue. For instance, raising fuel taxes and using general revenues would have low costs because the collection systems already exist. Registration surcharges on EVs are also inexpensive to administer since all states already impose annual or biennial registration fees [83].

By contrast, a tax on EV charging has high implementation costs for whoever must collect the tax, be it an electric utility, the owner of a public charging station, etc. Taxes on commercial activity vary in terms of their cost-effectiveness from the state perspective but generally

impose compliance costs on businesses that are passed onto the final consumer. Backlash over the administrative costs of Colorado's retail delivery fee, which required businesses to print the fee as an extra line item on receipts, led to an amendment allowing businesses to pay the fee on behalf of customers [84].

Usage-based charges also vary in terms of their cost-effectiveness. The costs of toll-based systems are lower than the costs of implementing methods like RUCs. RUCs entail significant administrative costs and either require installation of GPS devices or must rely on less exact methods such as self-reporting, which raises questions of compliance, or annual odometer readings, for instance during mandatory emissions-testing visits, which would unfairly include miles driven in other states.

Political Viability

With IIJA expiring in 2026, federal surface transportation funding will be up for reauthorization. While this presents an opportunity for rethinking road funding mechanisms through these policy options, the political prospects of various policies are also crucial.

Thirty-seven states have adopted BEV registration fees, which may be popular with policymakers because they currently affect a small number of users. By contrast, tolls and higher gas taxes are politically unpopular, partially because they impact large numbers of drivers and partially because of their salience to users, who see the charges every time they pay a toll or a tax at the pump [79]. However, research shows that support for gas taxes can increase drastically when policymakers are specific about the purpose of the revenues, such as maintaining roads, improving traffic safety, and reducing congestion and local air pollution [85].

Taxes on commercial activity generally face opposition from industry and may face opposition from consumers as well, depending on the salience of the charges. For example, the growing ubiquity of delivery services and the application of delivery fees at the point of sale may generate consumer opposition to bills like those passed in Colorado and Minnesota. Because of their dependence on location data, RUCs designed for maximum accuracy may face political headwinds rooted in privacy concerns. Polling shows that the idea of having one's mileage tracked bothers nearly 60 percent of drivers, even when they are reminded that their phone may already be tracking their location [85]. Better implementation and communication of standards related to individual data could potentially mitigate these concerns.

Environment and Electrification

Finally, road-funding policies can have a range of environmental impacts based on how they affect driving behaviors and EV adoption. Based on how high they are set, all user fees (e.g., motor fuel taxes, tolls, road usage charges, taxes on commercial activity, and EV charging taxes) provide incentives to use roads more efficiently, thereby reducing air and noise pollution. Motor fuel taxes also specifically encourage drivers to choose EVs or conventional vehicles with greater fuel economy, yielding benefits including local air pollution reduction, climate change mitigation, and cost savings. Fuel economy improvements over the past 50 years have reduced emissions by more than 14 billion metric tons [86], equivalent to three times the total U.S. emissions in 2022 [87]. Further, EVs are far more efficient than the most efficient conventional vehicles on an energy basis, with an average MPG-equivalent (MPGe) of 117 [24].

Citing their lower environmental impact, greater energy efficiency, and other factors, the federal government and many states are seeking to drive up EV adoption. This is an important consideration when choosing how to fund roads. The federal government has a host of EV policy programs and 36 states plus DC provided financial incentives for EVs in 2023 [88]. All 50 states have also submitted plans to receive federal National Electric Vehicle Infrastructure (NEVI) funding [89]. Thus, road-funding policies should ideally be consistent with encouraging EV uptake but at the very least should not disproportionately burden EV drivers in a way that counteracts EV incentives. EV registration fees can have this effect depending on how high they are set.

Summary Comparison of Policy Options

All the policies discussed in this brief come with tradeoffs when evaluated against the criteria presented. Each policy option performs differently against each criterion depending on its design, the specific context of the jurisdiction, and the priorities of its policymakers and constituents.

Table 2 makes general characterizations about how each policy option compares to the others in terms of the criteria discussed.

Table 2: Performance of Policy Options Along Key Criteria

Policy Option	Revenue Sustainability	Fairness	Equity	Cost-Effectiveness	Political Viability	Environment & Electrification
Motor fuel taxes	User base will diminish over time, eroding impact of raising rates	Only roughly reflect "user pays," and to a shrinking degree	Regressive, and increasingly so as high-income drivers buy newer, more efficient vehicles	Current collection system easily modified	Depends on messaging, rate of increase, and other factors	Incentive to reduce fuel consumption and to consider an EV
Tolls	Some risk of changing traffic patterns to avoid tolls	Reflect "user pays" in localized or specific contexts	Regressive	Some administrative and technology costs	Generally unpopular but used in most states	Incentive to reduce road use and energy use in localized or specific contexts
Road usage charges	Vehicle-miles traveled generally grow or remain fairly consistent	Designed to closely reflect "user pays"	Regressive, and outsized impact on rural drivers because they drive more	High administrative costs and possibly high technology costs	Largely TBD, but privacy a major issue; majority of states are researching	Incentive to reduce road use and thereby energy use
Taxes on commercial activities	Commercial road use likely to continue growing	Reflects greater road impact of heavy vehicles; "beneficiary pays"	Depends on covered goods/activities	Depends on type of tax and implementation strategy	New such taxes likely to face opposition from both consumers and industry	Incentive to reduce road use and thereby energy use
Efficient-vehicle registration fees	User base currently very small, but will grow over time	Not linked to road use; may exceed average revenue from "comparable" vehicles	Overall progressive for the time being, but regressive for affected drivers	Easily added to existing registration system	High based on rapid rate of state adoption; currently affect a small number of users	Disincentive to purchasing an EV or other efficient vehicle and unrelated to energy use
EV charging taxes	User base currently very small, but will grow over time	Like fuel taxes, roughly reflect "user pays," though only if inclusive of home charging	Overall progressive for the time being, but regressive for EV drivers with disproportionate impact on drivers relying on public charging (e.g. low-income drivers)	High costs for utilities and/or charging providers	State adoption limited but growing; currently affect small number of users	Minimal short-term disincentive and minor long-term disincentive to EV adoption based on evolving driver demographics
General revenues	Rates can adjust to meet revenue needs	Not linked to road use	Depends on source (sales tax regressive, graduated income tax progressive, etc.)	Current collection system easily modified	Depends on source of revenue and constituency	Unrelated to road use and energy consumption

High	Moderate	Low

This table shows a general characterization of the performance of road-funding policy options along key criteria and is primarily meant to illustrate the tradeoffs associated with each policy. The weight assigned to each criterion depends on context (i.e., they are not all necessarily equally important). Performance is evaluated as high, moderate, or low, with policies marked "moderate" either because they perform moderately well compared to the alternatives or because their performance is especially dependent on their design. The potential for revenue generation is not included because of its dependence on the rates at which taxes or fees are set, and the dependence of these rates on other criteria.

Deep Dive: Electric Vehicle Fees

To help fund road infrastructure, EV drivers are generally subject to two fees: annual EV-specific registration fees and taxes on public EV charging, either by taxing electricity on a unit of energy basis and/or as a share of the retail price. However, depending on how one defines fairness, and how high fees are set, these fees can present an unfair burden to EV drivers and potentially depress EV adoption.

Without a structure to prevent the overlapping of these fees, EV drivers may be subject to a double, triple, or quadruple tax depending on what state they reside in and where they charge. Meanwhile, gasoline drivers are only subject to an annual registration fee and gasoline tax but are generally exempt from sales or other taxes.

Background on EV Registration Fees

Thirty-seven states charge BEV drivers more than conventional vehicle drivers to annually register their vehicles. This trend extends to PHEVs in 30 of those states and to HEVs in 14. Two states (Oregon and Virginia) also charge conventional vehicle registration fees that increase with fuel economy. In some states, PHEV fees are the same as for BEVs, meaning that PHEVs pay more in taxes than BEVs because they also pay gas taxes. (See Figure 5 and Appendix B for each state's fees.)

Annual BEV fees range from $50 in Hawaii and South Dakota to $250 in New Jersey, while the average BEV fee (among states with fees) is $142, and the median fee is $130. Given low EV penetration levels, in no state did revenue from these fees account for more than 0.6 percent of transportation spending in 2022. While these fees may fill some of the road transportation funding gap, they can also discourage EV adoption if they are too high.

An April 2024 study tested the impact of different factors on states' decisions to adopt EV fees. The authors found that states with greater EV sales growth, higher reliance on motor fuel tax revenues, more fuel-efficient fleets, roads in poorer condition, and more neighboring states with EV fees, are all more likely to adopt EV fees, all else equal. Factors that reduced a state's likelihood of passing EV fees included having a higher proportion of Democrats in state legislative bodies and experiencing greater growth in vehicle miles traveled [90].

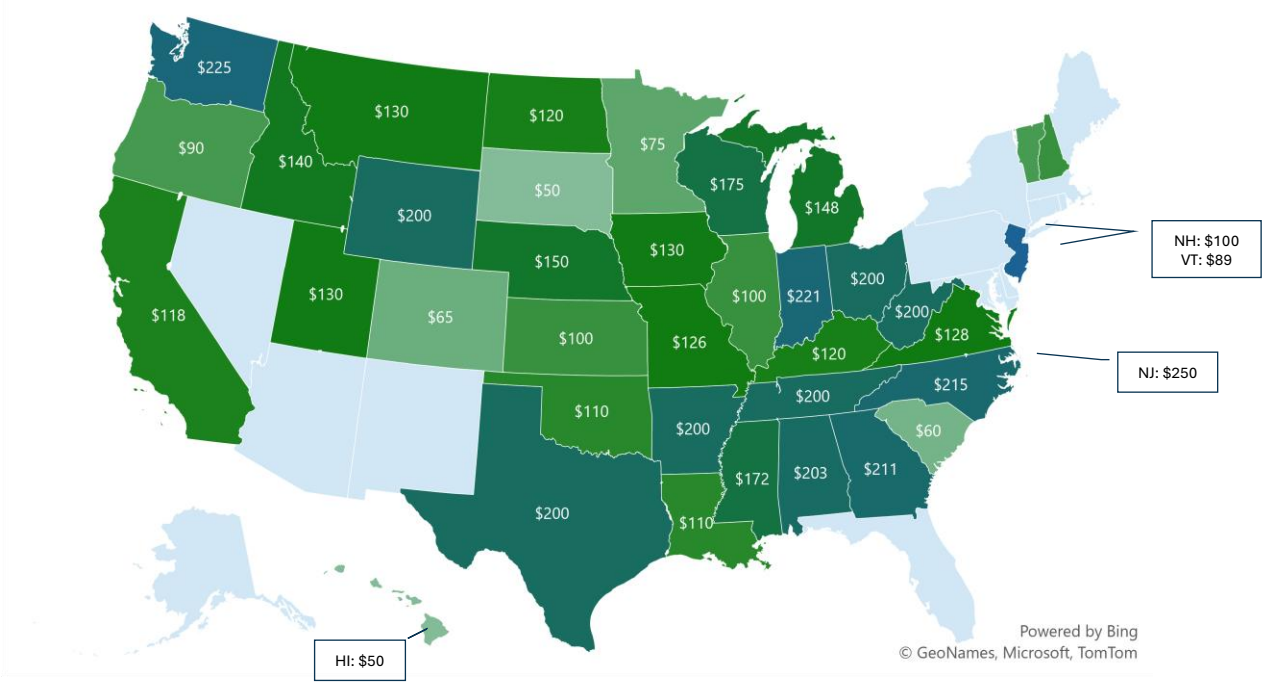
In 2018, researchers at the University of California, Davis analyzed sales data before and after the introduction of EV fees, controlling for other variables, and estimated an average decrease of 0.24 percent in EV sales per dollar of fee [91]. These results varied between states and may decrease in the long term given that "the enactment of registration fees into law

present a stronger effect on sales than the implementation of those fees." The researchers speculate that this could be due to negative media attention to these bills around the time of their passage. Still, even if the impact is more pronounced in the short term, an average BEV fee of $142 would correspond to an average short-run decrease in EV sales of 34.1 percent according to the study's findings. Through a nationwide survey, the UC Davis researchers also asked BEV drivers how their purchase decision would have changed had they been subject to a $100 fee and found an 11 percent decrease in stated BEV preference, though this method is subject to sampling and response bias given that respondents were people who had decided to purchase an EV [91].

A more recent study – published in July 2024 – assessed how changes to EV registration policy in Denmark impacted BEV sales. In the first period of analysis, EVs were exempted from registration fees until 2016. That exemption was then removed, and the EV registration tax was set to 20 percent of the full fee (which is higher than 100 percent of the vehicle's value) until the end of 2018. In 2019, the third period of analysis, BEVs below a certain value were again exempted from the registration fee. The researchers estimated that removing the EV registration fee exemption in 2016 decreased BEV sales by 0.6 percentage points. Further, they found that setting the registration fee to 20 percent of the full fee lowered BEV sales by 1.7 percentage points compared to exempting vehicles under a certain value [92]. While the context in Denmark differs, this research provides valuable insights into how consumers respond to EV fees.

Additional research would be valuable to validate these findings and characterize the effect of EV incentives, which often provide a larger upfront discount compared to annual EV registration fees, on adoption.

Figure 5: BEV Fees by State (2024)



This figure shows the BEV fee level as of January 2025 in states that have passed such fees. Georgia's 7/1/2024 fee increase was not published as of July 9. Fees in Illinois, Michigan, Montana, and Oklahoma vary by vehicle weight and the values shown correspond with a class 1 vehicle. In Oregon and Virginia, conventional vehicle registration fees are based on fuel economy, and "additional" fees for BEVs as displayed in this map are relative to the fee paid for the average new light-duty vehicle registered in the state.

Source: Atlas Public Policy

Box 2: Recent Road-Funding Reforms in Virginia

Since 2020, Virginia has taken several steps to improve how it funds its roads. One was raising its state gas tax from 16 cents per gallon to 26 cents per gallon and indexing it annually to inflation [93]. Virginia also reformed its registration fees in 2020 with the Highway Use Fee (HUF). Unlike in most states, vehicles with fuel economy greater than 25 MPG pay fees proportional to their fuel efficiency. BEV drivers pay a fee equal to 85 percent of the gas tax paid by a vehicle with 23.7 MPG that travels an average distance, while other drivers of fuel-efficient vehicles pay 85 percent of the difference between what they already pay in gas tax and what a 23.7-MPG vehicle pays [94]. The HUF essentially ensures that all vehicles meet a minimum revenue level while maintaining some incentive for fuel economy. However, by basing fees on the average distance traveled, it fails to follow the "user pays" principle.

To address shortcomings regarding "user pays," in July 2022, Virginia established an RUC program that allows drivers paying the HUF to instead pay by the mile [95]. Charges are capped at the level of the HUF the driver would pay, but the system does not currently distinguish between miles traveled in- and out-of-state. As of December 1, 2023, there were 21,000 participants in the program, out of Virginia's 7 million registered vehicles and 2 million that are required to pay the HUF. While the program's take-up has been limited so far, 80 percent of those who participated in the program's first year opted to renew their participation [96].

Virginia's creative solution to road funding relates positively to the evaluation criteria in several respects:

- Raising the gas tax and indexing it to inflation increases its sustainability.
- The HUF is effectively a revenue floor that all vehicles must meet, barring participation in the RUC, contributing to sustainability and fairness. A slightly lower floor maintains an incentive for more fuel-efficient vehicles.
- Through the RUC, Virginia provides an alternative, albeit a cumbersome one, to the HUF that more closely hews to the "user pays" principle.

These benefits do not come without tradeoffs—Virginia's system likely has high administrative costs associated both with the RUC program as well as annually recalculating and administering a different HUF for each model/model year of non-BEV, fuel-efficient vehicle. Still, it illustrates how states can improve performance along multiple road-funding criteria by combining several complementary policies.

Background on EV Charging Taxes

EV charging taxes may seem like a logical replacement for lost gas tax revenue because they tax the fuel that powers an EV and capture revenue from out-of-state road users. Yet, they have high implementation costs and can create multiple taxation and equity issues for drivers without home charging.

Implementation Costs

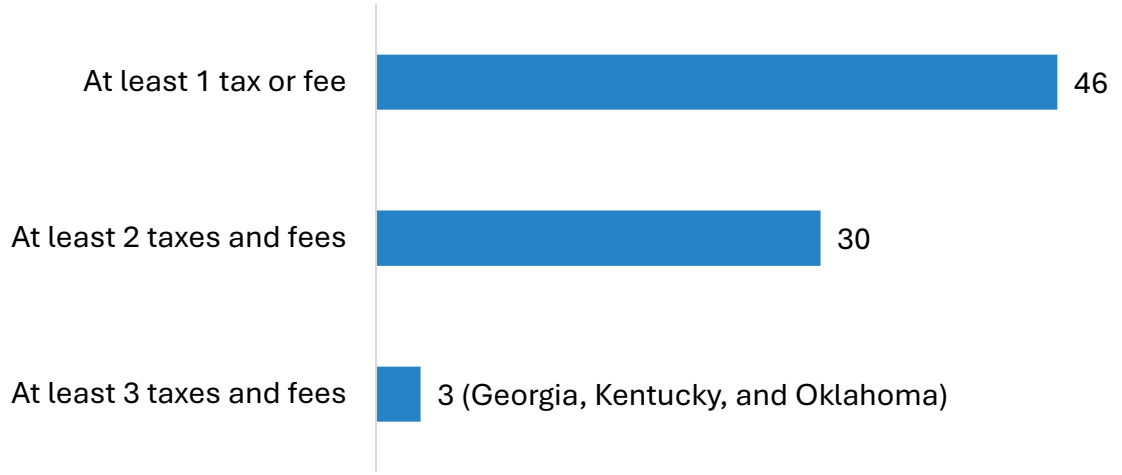
EV charging taxes can be administratively burdensome to both the taxed entity and the state government. First, public chargers may be unable to measure energy use in a way that is compatible with taxation requirements. Further, adding a tax to a charger's payment system could lead some stations, such as free-to-use public chargers, to close rather than add such capabilities. Finally, tax burden varies based on the taxed entity. In Georgia and Utah, charging taxes are levied directly on charging service providers for non-residential chargers, which is simpler and less burdensome since there are fewer operators. Meanwhile, Pennsylvania and Kentucky tax the charging operator, which places a greater burden on taxpayers and creates challenges in ensuring all obligated parties pay the tax.

Multiple Taxation

Taxes on EV charging—on top of EV registration fees—can take the form of utility taxes collected at the electricity meter, a tax specific to the charging service itself, and a retail sales tax, if applicable. Consequently, depending on what state they reside in and where they charge, EV drivers may pay up to four overlapping taxes that drivers of conventional vehicles do not pay. However, revenues from some of these taxes often benefit states' general funds rather than road budgets.

A key factor in deciphering an EV driver's tax responsibility is understanding how EV charging stations are regulated in their state. Because an EV charging station's capacity to furnish electricity to end-use customers is traditionally the role of a public utility, policymakers have worked to distinguish EV service providers from utilities through legislative or regulatory action. Since last year, every state besides Tennessee has passed policies ensuring EV charging services are not subject to the jurisdiction of the public service commission and are entitled to separate tax treatment [97].

Figure 6: States with stackable taxes or fees for EV charging



This figure shows that most states have more than one fee or tax on EVs and EV charging with three states having three stackable taxes and fees. No state has all four possible taxes and fees identified in this report. A complete table of fees or taxes on a state-by-state basis and our assumptions on how taxes are classified can be found in the Appendix.

Equity Issues with EV Charging Taxes

Taxes on public EV charging can unintentionally burden in-state drivers who lack home charging and are already paying extra registration fees for their EV. According to U.S. DOE, 80 percent of charging takes place at home [98], where expensive and potentially cost-prohibitive submetering and billing upgrades would be necessary to separate EV charging from other electricity consumption. Likely because of these costs, only Pennsylvania collects a tax on private EV charging, which very few users pay because it relies on a confusing self-reporting system that some users are not even aware of [68].

As more states implement taxes on public EV charging, it will be important to study the incidence of these taxes on in-state drivers, their implementation costs, and their effect on public charging availability and EV adoption.

Defining the "EV Penalty"

When considering registration fees and charging taxes, BEV drivers, on average, pay more than their fair share for roads compared to non-BEV drivers. To understand the accumulation of taxes on EVs and charging, we computed an "EV Penalty" using the formulas provided in the Appendix. The EV Penalty is the total amount of EV-specific taxes and fees an

EV driver pays in a single calendar year for each state in comparison to a typical gasoline vehicle driver. The estimate assumed vehicles travel 12,000 miles per year, with EVs getting three miles per kilowatt-hour and gasoline vehicles getting 40.6 miles per gallon (model year 2024 CAFE fleet standard). Importantly, we also assumed a driver is only charging at Electrify America stations because of the charging company's nationwide network. While most charging is done at home today, many potential new EV drivers will not have ready access to home charging because they park on the street, are renters, or otherwise do not have easy access to power where they park. As such, the illustration presented here does not reflect the experience of drivers who can readily access home charging. This challenge is especially present for low-income households and those in disadvantaged communities.

Comparison of Gas Taxes to EV Fees

The results of the EV Penalty assessment show that EV drivers in 43 states, including the District of Columbia, pay more in taxes and fees when compared to drivers of gasoline-powered vehicles in a single calendar year. Of these 40 states, drivers in seventeen states pay more than a $150 EV Penalty. The average EV Penalty in states that charge EV drivers more is $142 and the median penalty is $130. An EV driver in New Jersey, for example, can pay more than $346 in taxes and fees, from the state's BEV registration fee of $250 and a sales tax of 6.63 percent on the electricity they purchase at EV charging stations.

EV drivers in eight states pay less in taxes and fees than drivers of gas-powered vehicles, up to $109.36 in Rhode Island, as shown in the Appendix. These states span the country and have noticeably lower taxes and fees for EV drivers: three have annual fees on EVs, none have a per-kilowatt hour tax on public charging, none have sales or general use taxes, and one has a utility tax. EV drivers in these states can save money, which can act as a small incentive to own an EV, though these savings are low relative to states with the highest EV Penalty.

Importantly, the figures presented above compare BEV fees only to what conventional vehicles pay in state gasoline taxes, not federal or local taxes. This is because BEV fees are charged on the state level and generally fund state-level transportation efforts. Our calculations also exclude other taxes and fees on both gasoline and electricity because these revenues are not necessarily used for transportation. States could incorporate all state and local transportation-specific revenues as well as revenues that could be re-dedicated to transportation, such as sales tax on gasoline for conventional vehicles and electricity for BEVs.

Figure 7: States with the highest EV penalties

This figure shows the 10 states with the highest EV penalties. The penalty amount is dependent on the number of electric miles traveled, the amount of charging done in public, and other factors described earlier. (See Appendix for the EV penalty formula and a full table of EV penalties by state.)

Additionally, these figures merely present a snapshot of the current situation—all the variables in the calculation will change over time as BEV fees and gas tax rates change, trends in VMT evolve, and the LDV fleet turns over and becomes more fuel-efficient.

Overall, the onset of charging fees and other taxes poses a risk of alienating EV drivers without creating a long-term solution to the road funding crisis. A list of additional considerations related to fairness in EV fees can be found in the Appendix.

Conclusion

The questions of who should pay for roads, and how much they should pay, are essential to several facets of U.S. policy including quality of life, economic well-being, environmental sustainability, and global competitiveness. A review of federal and state road-funding trends, the policy options available, and the current debate over EV fees yields several key considerations.

Roads have been underfunded for years due to inflation, stagnant gas tax rates, increasing fuel economy, and slow VMT growth. On the federal level, and in most states, taxes on motor fuel have not increased nearly fast enough to counteract these trends. This has eroded the purchasing power of revenues from user fees and led to an unsustainable dependence on ad hoc transfers of federal general funds. However, on the state level, the impact of these factors should not be overstated; on average, roughly two-thirds of state funding for roads comes from sources other than motor fuel taxes.

Road-funding policies should focus on ensuring that all drivers equitably and sustainably fund roads. EV drivers will continue to contribute only marginally to the funding gap in most states for some time. Lost state tax revenue from light-duty BEVs compared to the average new light-duty vehicle was equivalent to 0.14 percent of state highway spending in 2022, up from 0.09 percent in 2021. Although this share will grow as EV adoption rises, it will remain marginal for years to come. Ensuring that EV drivers pay their fair share should be part of a holistic solution to the road funding crisis.

While ensuring sustainable revenues for roads remains the key priority, advocates should not lose sight of additional factors that could threaten the sustainability of road budgets. Climate change, inflation, and supply chain issues have the potential to grow already ballooning road funding budgets without foresight and planning.

Policymakers have a range of options for funding transportation, all of which have pros and cons. Enacting a suite of complementary policies based on a state's specific context, while avoiding overlapping policies and double taxation, is more likely to meet a state's criteria for success. Raising gas taxes, using tolls and RUCs, taxing commercial road use, adding extra fees for EV registration and charging, and permanently dedicating general revenues to transportation all entail tradeoffs along the criteria of revenue sustainability, fairness, equity, cost-effectiveness, political viability, and advancing environmental and electrification goals. Policymakers can combine these policies and others based on their state's transportation funding sources and needs and on the priorities, demographics, and economic realities of their constituents. However, it is important to ensure that policies are truly complementary rather than overlapping and resulting in double taxation. As detailed in Box 2, Virginia has sought to do this through raising gas taxes while also implementing higher registration fees for more efficient vehicles and providing the option for drivers of such vehicles to instead participate in an RUC program.

Further research is needed to evaluate the performance of policy options along key criteria. For example, the UC Davis study on the impact of fees on EV adoption was written in fall 2018, when only 19 states had passed EV fees. Data points are now available over longer periods and in 15 new states, where impacts may differ. An April 2024 study analyzed factors that led states to implement electric vehicle registration fees. However, as more

states implement EV charging taxes, it will be important to monitor the implementation costs of these taxes and their effect on public charging availability and EV uptake. More research is also needed into the equity implications of different mechanisms and how they will evolve as the composition of the vehicle fleet changes. For instance, there are uncertainties about the distributional impacts of RUC programs, especially vis-à-vis gas taxes, given questions about how long EV drivers will be disproportionately high-income and whether EV drivers tend to drive less on average [79]. The incidence of taxes on public charging is another question. For instance, how much do these taxes affect in-state drivers that may already be paying extra EV registration fees, and are affected drivers disproportionately lower-income? Another important area for research is how to design and communicate RUC programs in a way that minimizes privacy concerns and administrative costs while maintaining accuracy and fairness. More than half of states are asking such questions through research and pilot programs.

Electric vehicle drivers in 43 states (including DC) are paying an "EV penalty," compared to drivers of gas-powered cars. 30 states charge at least two taxes and fees to EV drivers. When considering registration fees, charging fees, sales or general use taxes, and utility taxes, EV drivers can expect to pay $106.73 per year more on average than drivers of gasoline cars. These fees can dissuade drivers from purchasing an EV thereby slowing the decarbonization of the transportation sector. States can seek ways to blunt the impact of EV fees on adoption and lower-income drivers, such as through phase-ins, installment payments, or waiving the initial registration fee, and avoid multiple taxation pitfalls that PHEVs face. Overall, if states choose to use EV fees and charging taxes to collect transportation revenue as part of their policy package, they should do so in a way that does not disproportionately burden EV drivers, particularly as they seek to encourage EVs with other policies.

Road use charge programs offer a promising alternative to BEV fees but require more exploration. Oregon, Utah, and Virginia offer RUC programs as a voluntary alternative to paying a BEV fee, and Hawaii will implement its own RUC program in 2025, as detailed in Box 1. Voluntary RUCs could be the prevailing model in the medium term given the political challenges of RUCs, even though more than 30 states are considering them. While voluntary RUCs can present a fairer alternative for low-VMT BEV drivers, their existence as an option does not justify unfair BEV fees. Additionally, voluntary RUC programs can have high compliance costs and generate privacy concerns, meaning that BEV drivers are faced with either paying an unfair fee or enrolling in a program that many drivers prefer to avoid.

Appendix A: State Revenues for Highways (2017–2022)

State	State Motor-Fuel Tax	Reg Fees	Tolls	State General Funds	Bond Proceeds	Other State Funds	Federal Motor-Fuel Tax	Other Federal Funds
AL	27.7%	5.9%	0.0%	3.2%	18.2%	6.1%	25.6%	13.2%
AK	2.5%	3.1%	3.4%	19.6%	4.2%	12.4%	36.8%	18.0%
AZ	20.6%	10.9%	0.0%	0.3%	8.6%	35.7%	15.8%	8.2%
AR	24.0%	9.4%	0.0%	3.2%	2.5%	25.0%	22.9%	13.1%
CA	29.5%	36.0%	2.4%	0.0%	2.2%	9.5%	13.2%	7.1%
CO	17.7%	34.7%	0.5%	5.6%	10.6%	3.6%	15.8%	11.6%
CT	15.7%	7.7%	0.0%	0.7%	30.9%	20.6%	15.6%	8.7%
DE	5.7%	8.0%	25.6%	5.0%	19.8%	24.6%	7.3%	4.0%
DC	1.9%	7.7%	0.0%	29.3%	28.0%	0.6%	21.6%	11.0%
FL	17.6%	13.4%	17.0%	0.0%	16.6%	17.5%	11.9%	6.0%
GA	34.4%	1.9%	2.0%	10.2%	9.3%	9.4%	20.1%	12.7%
HI	14.1%	34.8%	0.0%	0.0%	12.6%	0.5%	25.1%	13.0%
ID	27.6%	19.1%	0.0%	3.8%	10.1%	9.4%	19.8%	10.1%
IL	17.4%	17.6%	18.5%	7.9%	15.5%	2.3%	13.8%	7.0%
IN	42.7%	9.4%	0.0%	3.1%	6.3%	7.0%	21.0%	10.4%
IA	26.9%	45.0%	0.0%	2.5%	0.0%	1.4%	14.0%	10.2%
KS	14.4%	7.3%	7.3%	0.5%	4.9%	40.0%	17.0%	8.7%
KY	25.5%	27.5%	0.0%	0.4%	3.0%	9.8%	22.6%	11.2%
LA	21.2%	5.5%	0.9%	2.9%	33.6%	3.9%	21.3%	10.8%
ME	15.9%	8.0%	14.0%	0.0%	4.5%	36.8%	13.6%	7.1%
MD	9.2%	11.8%	22.3%	10.7%	20.9%	10.6%	9.6%	4.8%
MA	7.5%	6.1%	9.3%	3.0%	48.3%	9.8%	10.4%	5.7%
MI	26.4%	26.4%	1.0%	13.1%	8.0%	3.7%	14.3%	7.2%
MN	16.4%	16.5%	0.0%	2.9%	10.0%	35.2%	12.6%	6.5%

State	State Motor-Fuel Tax	Reg Fees	Tolls	State General Funds	Bond Proceeds	Other State Funds	Federal Motor-Fuel Tax	Other Federal Funds
MS	29.8%	13.8%	0.0%	0.0%	4.0%	7.9%	29.5%	15.0%
MO	26.7%	12.5%	0.0%	1.1%	2.6%	19.2%	25.1%	12.8%
MT	16.0%	16.6%	0.0%	0.1%	0.0%	8.1%	39.2%	19.9%
NE	23.0%	6.4%	0.0%	2.9%	0.0%	44.0%	15.7%	8.1%
NV	27.0%	22.3%	0.1%	0.0%	7.0%	15.8%	18.5%	9.4%
NH	23.9%	11.6%	18.9%	2.7%	2.1%	9.3%	17.5%	13.9%
NJ	2.7%	6.7%	14.4%	0.6%	39.8%	24.5%	7.2%	4.1%
NM	16.5%	23.2%	0.0%	13.3%	11.3%	4.6%	20.4%	10.7%
NY	5.3%	5.2%	26.1%	7.1%	10.5%	32.6%	8.6%	4.7%
NC	28.8%	14.0%	0.6%	0.0%	13.5%	21.3%	13.9%	7.9%
ND	25.6%	15.0%	0.0%	8.2%	0.0%	4.7%	30.6%	15.9%
OH	35.7%	10.5%	3.7%	7.8%	9.2%	7.7%	16.4%	9.0%
OK	6.5%	9.8%	8.8%	0.0%	11.9%	40.6%	14.9%	7.5%
OR	17.5%	20.3%	0.0%	2.2%	23.0%	19.9%	10.9%	6.3%
PA	22.5%	6.8%	16.2%	10.6%	18.4%	7.1%	11.8%	6.7%
RI	10.7%	6.8%	4.4%	9.7%	8.1%	16.8%	28.5%	15.1%
SC	28.9%	28.4%	0.7%	1.9%	0.0%	7.4%	21.6%	11.1%
SD	23.0%	0.6%	0.0%	0.0%	0.0%	27.6%	32.5%	16.3%
TN	39.0%	16.2%	0.0%	0.0%	0.0%	4.9%	25.7%	14.3%
TX	8.6%	18.4%	6.8%	3.4%	7.5%	30.7%	16.2%	8.4%
UT	19.9%	9.9%	0.1%	5.4%	9.7%	36.4%	11.1%	7.4%
VT	14.0%	26.9%	0.0%	9.8%	0.0%	5.2%	28.6%	15.6%
VA	11.6%	15.2%	1.0%	3.3%	11.6%	40.8%	10.9%	5.7%
WA	23.6%	12.9%	5.9%	0.0%	15.8%	22.8%	12.5%	6.5%
WV	22.1%	22.9%	2.1%	2.1%	21.7%	4.1%	16.4%	8.6%
WI	26.5%	19.9%	0.0%	3.1%	13.5%	6.4%	14.2%	16.5%
WY	13.4%	10.7%	0.0%	4.6%	0.0%	12.4%	35.5%	23.4%
Total	19.9%	16.9%	6.8%	4.2%	9.5%	20.3%	14.5	7.9%

Source: FHWA

Appendix B: Annual Additional Registration Fees for Efficient Vehicles

Updated in July 2024, the table below shows annualized fees that are currently in effect or will be in effect as of January 1, 2025 for class 1 efficient vehicles. These fees are "additional" relative to the fee paid for the average new light-duty vehicle registered in the state.

State	BEV	PHEV	HEV	Notes
AL*	$203	$103	$0	Increase of $3 every four years starting 2023
AK	$0	$0	$0	
AZ	$0	$0	$0	
AR	$200	$100	$50	
CA*	$118	$0	$0	Indexed annually to inflation.
CO*	$65.19	$62.19	$0	Indexed annually to NHCCI, plus additional scheduled increases until 2032.
CT	$0	$0	$0	
DE	$0	$0	$0	
DC	$0	$0	$0	
FL	$0	$0	$0	
GA*	$210.87	$0	$0	Registration fee adjusted annually based on average fuel economy and inflation. 2024 fee was not published as of July 9.
HI	$50	$50	$0	
ID	$140	$75	$0	
IL	$100	$0	$0	$100 fee excludes vehicles weighing >8,000 lbs.
IN*	$221	$74	$74	Indexed annually to inflation.
IA	$130	$65	$0	

State	BEV	PHEV	HEV	Notes
KS	$60	$10	$10	State fees are $100 total for EVs and $50 total for PHEVs and HEVs, compared to $40 for vehicles over 4,500 lbs.
KY*	$120	$120	$60	Indexed annually to NHCCI.
LA	$110	$60	$60	
ME	$0	$0	$0	
MD	$0	$0	$0	
MA	$0	$0	$0	
MI*	$148	$54	$0	Fees are indexed annually to motor fuel tax, which is indexed to inflation.
MN	$75	$0	$0	
MS*	$172	$86	$86	Current rates are not published, so fees are estimated. Fees are indexed annually to inflation.
MO*	$126	$66	$0	Fees increase 20% annually until 2026.
MT	$130	$70	$0	BEV/PHEV fees are $130/$70 for vehicles under 6,000 lbs and $190/$100 for vehicles 6,000-10,000 lbs.
NE	$150	$75	$0	Effective January 1, 2025, BEV fee increases to $150 while PHEV stays $75.
NV	$0	$0	$0	
NH	$100	$50	$0	
NJ	$250	$0	$0	BEV fee increases $10 each year until 2028, and then will be $290
NM	$0	$0	$0	
NY	$0	$0	$0	
NC	$214.50	$107.25	$0	
ND	$120	$50	$0	
OH	$200	$150	$100	
OK	$110	$82	$0	BEV fees are $110 for vehicles under 6,000 lbs and $158 for vehicles weighing 6,000-10,000 lbs. PHEV fees are $82 for vehicles

State	BEV	PHEV	HEV	Notes
				under 6,000 lbs and $118 for vehicles weighing 6,000-10,000 lbs.
OR*†	$90	$10	$10	Registration fees compared to fees for vehicles with 20-39 mpg. Conventional and hybrid vehicle fees are determined based on fuel economy (values shown for PHEVs/HEVs are for all vehicles >40 MPG). Registration fees are paid every two years and all fees are scheduled to increase in 2024. Optional RUC program as an alternative to fee.
PA	$0	$0	$0	
RI	$0	$0	$0	
SC	$60	$30	$30	Fee is paid every two years.
SD	$50	$50	$0	
TN*	$200	$100	$100	BEV fee increases to $274 in 2027, and both fees are annually indexed to inflation beginning in 2028.
TX	$200	$0	$0	$400 for initial two-year registration of a new vehicle.
UT*	$130.25	$56.50	$21.75	Registration fees are indexed annually to inflation. Optional RUC program for BEVs as alternative to fee.
VT	$89	$44.50	$0	Effective 1/1/2025, $89 fee for BEVs and $44.50 for PHEVs. Fees will stay in effect until an annual mileage-based user fee/road usage charge fee is set up, once EVs make up 15% of new car sales.
VA*†	$128.14	Varies	Varies	All vehicles with >25 MPG pay a highway use fee based on their fuel economy. BEVs specifically pay a fee of 85% of the average fuel taxes paid by a vehicle with 23.7 MPG. Effective 7/1/24 this is $128.14. No specific PHEV or HEV fee. Optional RUC program as alternative to fee.
WA	$225	$225	$75	

State	BEV	PHEV	HEV	Notes
WV	$200	$100	$100	
WI	$175	$75	$75	
WY	$200	$200	$0	

* States with future adjustments based on inflation, gasoline tax rate, average fuel economy, or other scheduled changes.

† States which charge conventional vehicles higher fees based on higher fuel economy.

Appendix C: EV Penalty Calculation

Below are the formulas used to calculate the EV Penalty.

$$Total\ Taxes\ \left(\frac{\$}{kWh}\right) = \frac{BEV\_Fee\ (\frac{\$}{Year})}{Estimated\_energy\_use\ (\frac{kWh}{Year})} + Energy\_Use\_Fee\ \ (\frac{\$}{kWh}) + \left(Electrify\_America\_Fee\ \left(\frac{\$}{kWh}\right) \times\ Sales\_Tax\ (\%)\right) + \left(EIA\_Electricity\_Rate\left(\frac{\$}{kWh}\right) \times\ Electricity\_Tax\ (\%)\right)$$

$$Total\ EV\ Taxes\ \left(\frac{\$}{mi}\right) = \frac{Total\_Taxes\ (\frac{\$}{kWh})}{EV\_Fuel\_Economy(\frac{kWh}{mi})}$$

$$EV\ Penalty\ (\$) = \left(Total\_EV\_Taxes\ \left(\frac{\$}{mi}\right) - State\_Gasoline\_Tax\ \left(\frac{\$}{mi}\right)\right) x\ Annual\_Vehicle\_Miles\_Traveled$$

Appendix D: EV Fees and EV Penalty

Updated in July 2024, the table below shows fees that are currently in effect for class 1 efficient vehicles beyond the annual registration fee.

State	State Motor-Fuel Tax ($/mi)	Avg. BEV Fee	Charging Fee (c/kWh)	Sales/ Use/ General Tax	Electricity/Utility Tax	Tax and Fee Count	EV Penalty per Year ($)	Comments
AL	$0.007	$203.00	0	4.00%	0.00%	2	$176.49	
AK	$0.002	$0.00	0	0.00%	0.00%	0	-$23.65	
AZ	$0.004	$0.00	0	5.60%	0.00%	1	$54.32	
AR	$0.006	$200.00	0	6.50%	0.00%	2	$251.80	
CA	$0.014	$118.00	0	0.00%	0.00%	1	-$53.13	
CO	$0.005	$65.19	0	2.90%	0.00%	2	$65.13	
CT	$0.006	$0.00	0	0.00%	0.00%	0	-$73.89	
DE	$0.006	$0.00	0	0.00%	0.00%	0	-$67.98	
DC	$0.006	$0.00	0	6.00%	0.00%	1	$45.74	
FL	$0.001	$0.00	0	4.35%	2.60%	2	$85.22	Electricity sales at EV charging stations are subject to both sales and (utility) gross receipts tax. Sales tax on electricity is 4.35%, and its utility gross receipts tax is 2.60%
GA	$0.008	$210.87	2.8	4.00%	0.00%	3	$285.00	
HI	$0.004	$50.00	0	0.00%	0.00%	1	$2.71	
ID	$0.008	$140.00	0	0.00%	0.00%	1	$45.42	
IL	$0.011	$100.00	0	0.00%	5.00%	2	-$7.45	

State	State Motor-Fuel Tax ($/mi)	Avg. BEV Fee	Charging Fee (c/kWh)	Sales/Use/General Tax	Electricity/Utility Tax	Tax and Fee Count	EV Penalty per Year ($)	Comments
IN	$0.008	$221.00	0	7.00%	0.00%	2	$254.91	
IA	$0.007	$130.00	2.6	0.00%	0.00%	2	$145.33	
KS	$0.006	$60.00	0	6.50%	0.00%	2	$85.26	
KY	$0.007	$120.00	3	6.00%	0.00%	3	$243.97	
LA	$0.005	$110.00	0	4.45%	0.00%	2	$136.33	
ME	$0.007	$0.00	0	5.50%	0.00%	1	$16.93	
MD	$0.008	$0.00	0	6.00%	0.00%	1	$23.57	
MA	$0.006	$0.00	0	6.25%	0.00%	1	$49.06	
MI	$0.007	$148.00	0	6.00%	0.00%	2	$174.53	
MN	$0.007	$75.00	0	6.88%	0.00%	2	$122.86	
MS	$0.004	$172.00	0	7.00%	0.00%	2	$253.20	
MO	$0.006	$126.00	0	4.23%	0.00%	2	$134.80	
MT	$0.008	$130.00	3	0.00%	0.00%	2	$152.46	
NE	$0.007	$150.00	0	5.50%	0.00%	2	$145.39	
NV	$0.006	$0.00	0	0.00%	0.00%	0	-$67.98	
NH	$0.005	$100.00	0	0.00%	0.00%	1	$34.38	
NJ	$0.003	$250.00	0	6.63%	0.00%	2	$346.26	
NM	$0.004	$0.00	0	5.00%	0.00%	1	$61.75	
NY	$0.002	$0.00	0	4.00%	0.00%	1	$53.15	
NC	$0.010	$214.50	0	7.00%	0.00%	2	$229.49	Sales of electricity are subject to both sales and use tax, 7% is combined
ND	$0.006	$120.00	0	0.00%	0.00%	1	$52.02	
OH	$0.009	$200.00	0	0.00%	0.00%	1	$86.21	
OK	$0.005	$110.00	3	4.50%	0.00%	3	$260.24	
OR	$0.010	$90.00	0	0.00%	0.00%	1	-$28.23	

State	State Motor-Fuel Tax ($/mi)	Avg. BEV Fee	Charging Fee (c/kWh)	Sales/ Use/ General Tax	Electricity/Utility Tax	Tax and Fee Count	EV Penalty per Year ($)	Comments
PA	$0.014	$0.00	1.8	6.00%	0.00%	2	$16.95	
RI	$0.009	$0.00	0	0.00%	0.00%	0	-$109.36	
SC	$0.007	$60.00	0	6.00%	0.00%	2	$92.44	
SD	$0.007	$50.00	0	4.20%	0.00%	2	$34.44	
TN	$0.006	$200.00	0	7.00%	0.00%	2	$226.75	
TX	$0.005	$200.00	0	6.25%	0.00%	2	$260.89	
UT	$0.009	$130.25	7.0	0.00%	0.00%	2	$302.37	
VT	$0.003	$89.00	0	6.00%	0.00%	2	$144.44	
VA	$0.007	$128.14	0	0.00%	0.00%	1	$40.06	
WA	$0.012	$225.00	0	0.00%	0.00%	1	$78.99	
WV	$0.005	$200.00	0	6.00%	0.00%	2	$254.61	
WI	$0.008	$175.00	0	5.00%	0.00%	2	$157.67	
WY	$0.006	$200.00	0	4.00%	0.00%	2	$191.22	

Appendix E: Assumptions on Tax Classification

Our analysis of EV-specific taxes includes the following assumptions:

1. If a state considers electricity as tangible personal property and collects sales tax on it, an EV charging customer can be subject to sales tax.
2. If a state collects sales tax on electricity services, an EV charging customer can be subject to sales tax.
3. If electric vehicle service providers are subject to the jurisdiction of their state's public service commission or are considered a utility, charging service providers may purchase electricity tax-free and make taxable sales of electricity to customers.

Appendix F: Fairness Considerations

States looking to implement registration fees for electric vehicles can consider the following:

- *Avoid Overlap with EV Charging Taxes*: With the exception of Pennsylvania, all states with taxes on EV charging also charge extra registration fees for EVs. This can result in double taxation of in-state drivers who rely on public charging but have already paid an EV registration fee. Such drivers may have lower incomes on average than those with home charging.
- *Taxes on Electricity*: Some states charge sales taxes or gross receipts taxes on electricity and could consider allocating some of these revenues for transportation (if they do not already) and take them into account when evaluating the appropriate registration fee and/or EV charging tax level. From a fairness perspective, this is especially important in states that collect sales or gross receipts taxes on electricity for EV charging but exempt motor fuel from such taxes (which most states do [99]). A form of quadruple taxation can occur in cases where in-state drivers pay an EV registration fee, utility tax on electricity, a tax on public charging service, and a retail sales tax.
- *Avoid Recouping Lost Revenues from Federal Motor fuel Taxes*: Federal highway funding is largely channeled to states based on a formula,[4] not on the proportion collected in each state, meaning that lost federal revenue from EVs is unrelated to that state's lost federal highway aid. Additionally, if a state incorporates lost federal taxes into its EV fee and the federal government itself then takes action to collect revenue from EVs for the HTF, the result is double taxation for EV drivers. Still, Texas, which has the highest fee relative to its state gasoline tax, designed its BEV fee based on both federal and state taxes lost [100].
- *Avoid Double Taxation of PHEVs*: Fuel economy labeling by the EPA may overstate how much time PHEVs spend in all-electric mode [101]. This can lead to an underestimation of how much revenue PHEV drivers pay in gas taxes and result in a PHEV fee level that collects more revenue than the gas tax revenue lost.

[4] Each state's share of federal highway funds is determined by a formula with factors including interstate highway and principal arterial lane miles, VMT, state population, infrastructure improvement needs, and estimated HTF funds collected in the state [103].

- *Allow Payment in Installments*: Whereas gas taxes are a pay-as-you-go mechanism, charging a lump-sum payment equivalent to a year of gas taxes may present a financial barrier to some drivers. While Pennsylvania has proposed an option to pay its fee in monthly installments [51], Texas charges a $400 upfront fee which accounts for the first two years of registration [80].

Other design features could also help EV fees score higher on policy criteria other than fairness. One is using a phase-in of several years to reduce the impact on EV adoption and avoid creating a sudden extra financial burden for current EV drivers. Another is applying the fee only at the time of re-registration, not initial registration – again, to dull the impact on EV sales. California exempts EVs from its fee for the first year of ownership [102]. Charging differentiated EV fees based on vehicle weight, as several states do, would also more closely reflect the impact of a vehicle on the road, although some states already account for weight in their base registration fees.

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