THE EASTERN TRANSPORTATION COALITION

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Charging the Charge

Considerations for EV Charging Per-kWh Tax Policy

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This report outlines the current situation regarding state-level per-kWh EV taxation, lessons learned from states already implementing the tax, and key considerations for states weighing the benefits and drawbacks of the policy.

Prepared by Atlas Public Policy

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The Eastern Transportation Coalition is a partnership of 19 states and the District of Columbia focused on connecting public agencies across modes of travel to increase safety and efficiency. Additional information on the Coalition, including other project reports, can be found on the Coalition's website: www.tetcoalition.org

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Introduction

Due to a combination of escalating infrastructure costs and diminishing revenues from gasoline and diesel taxes—which have traditionally contributed the greatest share of road funding—states face growing challenges in road funding nationwide. The U.S. government has not increased the federal gas tax since 1993, and the advent of more fuel-efficient and alternative-fueled vehicles means on average drivers are paying less per mile in gas tax and those who do not purchase fuel are not contributing to road funding at all. These factors have driven states to seek alternative revenue sources, including new vehicle registration fees for EVs and other fuel-efficient vehicles, and more recently, per-kilowatt-hour (kWh) taxes on electricity used for EV charging.

This report focuses on per-kWh charging taxes as a potential policy tool to ensure that EV drivers contribute equitably to road maintenance funds as EV adoption rises. This approach is akin to the conventional gas tax, charging EV drivers based on the electricity they consume for vehicle operation. States have adopted various strategies for implementing per-kWh taxes. Some have enacted legislation early on to parallel the gas tax, while others view per-kWh taxes as temporary measures, ideally leading to a national mileage-based user fee for all vehicles to uniformly and more equitably address infrastructure costs.

This report will evaluate the current state-level efforts regarding per-kWh tax policies, assessing their effectiveness in addressing legislative concerns and exploring additional funding mechanisms that could help close the road funding gap. Working with The Eastern Transportation Coalition (TETC), Atlas Public Policy interviewed six of the eight states' Departments of Transportation and Departments of Revenue (excluding Oklahoma and Wisconsin) currently implementing a per-kWh charging tax to learn from each state's intent, design, and implementation of these policies. These insights offer a foundational understanding of the complexities involved in funding transportation infrastructure in an era of increasing EV usage. Through a detailed analysis of these policies, the report aims to inform policymakers of the practical impacts of per-kWh taxes and support the development of effective, equitable road funding strategies.

State of Play: Per-kWh EV Charging Taxes

The implementation of per-kWh charging taxes has gained traction over the years as states seek solutions to the persistent road funding gaps. Pennsylvania was the first state to pass such legislation in 1997, followed by Iowa over twenty years later in 2019. Since 2021, six states (Oklahoma, Kentucky, Utah, Georgia, Montana, and Wisconsin) have passed legislation. These states report that this approach aims to ensure that EV drivers contribute their fair share to maintaining the infrastructure they use. Table 1 provides an overview of each state's specific legislation.

Figure 1: States with Per-kWh Taxes and Year Initially Enacted

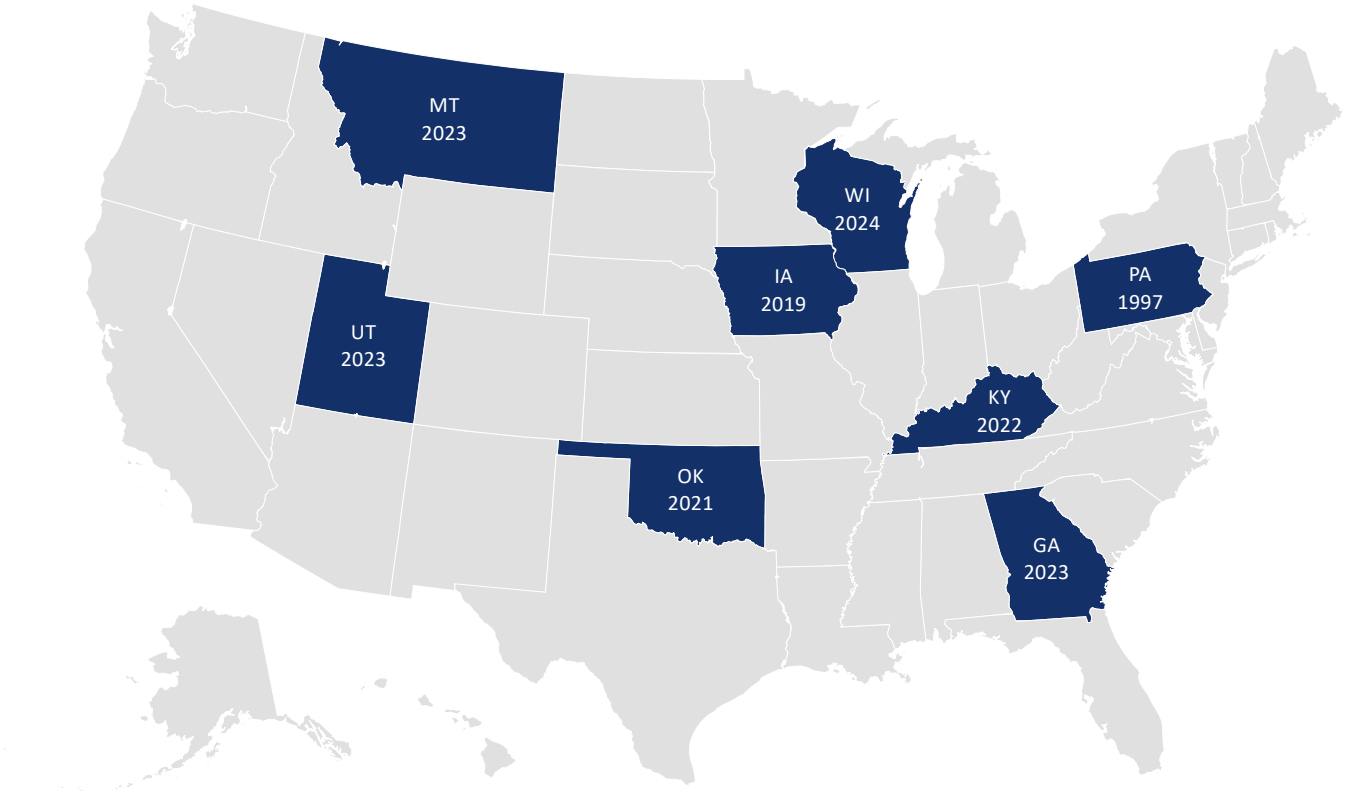

Table 1: Per-kWh Tax Implementation Across States

State	Legislation	Per-kWh Tax	Rate Methodology	Legislation Passed	Effective Date	Scope	Means of Collection
Utah	Link	12.5% on retail cost	N/A – unavailable in legislation or interviews.	3/22/2023	1/1/2024	Public chargers that impose per-session or subscription fees	Collected from charging operators
Pennsylvania	Link – Initial legislation Link – New legislation	1.8 cents/ kWh	Tax based on energy density equivalent to one gallon of gas, linked to annual gas tax rate.	Initial Legislation: 4/17/1997 New Legislation: 7/17/2024	Initial Legislation: 10/1/1997 New Legislation: 1/1/2025	Initial Legislation: All EV charging New Legislation: All non-residential charging	For both bills: through PA Department of Revenue MyPATH: PA's online platform for managing various state tax forms, payments, and accounts.
Iowa	Link	2.6 cents/ kWh	Based on DOT recommendation using analysis converting kWh to gallon of diesel.	05/16/2019	7/1/2023	All non-residential charging	Owners of non-residential chargers must register and remit tax biannually
Georgia	Link	2.8 cents/ kWh	kW pegged to motor fuel indexed annually to state Consumer Price Index.	5/2/2023	7/1/2023	All non-residential charging	Vehicle registration and collection from charging operators
Kentucky	Link	3.0 cents/ kWh	N/A – unavailable in legislation or interviews.	4/14/2022	1/1/2023	Publicly accessible chargers only	Charging station operators must register initially and then file tax reports monthly via an online portal.
Montana	Link	3.0 cents/ kWh	Rate defined by bill sponsor.	5/23/2023	7/1/2024	All non-residential charging from stations operating after 07/01/2023	All utilities in state bill registered charging station operators, utilities collect and then remit taxes based on tracked electricity usage.
Oklahoma	Link	3.0 cents/ kWh	N/A – unavailable in legislation or interviews.	4/22/2021	1/1/2024	All non-residential charging	Charging station operators must register with the OK Tax Commission and file monthly.
Wisconsin	Link	3.0 cents/ kWh	N/A – unavailable in legislation or interviews.	3/21/2024	1/1/2025	All non-residential charging	Charging station operators must register with Dept. of Revenue and file biannually.

Per-kWh Tax Rate Setting

Eight states have introduced taxes on electricity used at public EV charging stations. The specifics of these taxes vary. Seven of the tax policies are structured to collect a fee per kWh, but Utah implemented a 12.5 percent tax on the retail cost. Notably, Pennsylvania adjusts its rate annually to the energy equivalent indexed to the energy within a gallon of gasoline; Iowa has done the same, except with a gallon of diesel instead of gasoline.

Legislation

Seven states (Pennsylvania, Iowa, Georgia, Kentucky, Montana, Oklahoma, and Wisconsin) have set precise per-kWh rates through legislative measures, aiming for simplicity and predictability in tax collection.

In Pennsylvania, the policy was enacted in the late 1990s as part of an Alternative Fuel Tax that covers various fuel types, including electricity. This tax was intended to mirror the gas tax in response to emerging transportation technologies but was scoped before anyone knew how the EV charging landscape would evolve. It was amended in 2024 by limiting taxation to non-residential charging, which will take effect in 2025.

Based on feedback gathered from state departments of transportation (DOTs), it is evident that enactment of recent per-kWh taxes came after considerable deliberations. Kentucky and Iowa passed their respective legislation after comprehensive studies and legislative debates, underscoring the thorough consideration given to these policies. States such as Idaho, Maryland, Missouri, Mississippi, Nebraska, and Wyoming have introduced bills to implement per-kWh taxes.

Scope of Implementation

While more complicated than the fuel tax, the actual collection of kWh fees is relatively easy to accomplish on publicly available chargers, but much more difficult in a private or residential environment where an estimated 80 percent of charging occurs. The only state that had attempted to implement a tax on EV charging beyond public or non-residential charging was Pennsylvania. However, beginning in 2025, the fee will no longer apply to private charging due to challenges associated with collection and enforcement of the tax. Many states see a kWh fee on public chargers as a way to collect revenues on drivers from out of state who are not otherwise contributing to state transportation funding through an EV registration fee or other program (such as Utah's Road Usage Charge).

Meanwhile, Georgia has classified electricity as a motor fuel, which allows the state to apply traditional fuel tax models to EV charging. By indexing the tax rate to the energy equivalent rate of gasoline, the state's Consumer Price Index, and statewide fleet fuel economy, Georgia ensures predictable revenue generation using an existing tax structure.

Lessons Learned: Per-kWh Tax States

Because per-kWh taxes are relatively new policies and EVs are not a noticeable share of vehicles on the road, early efforts by states implementing these taxes can provide insights for states considering or developing similar policies as EV adoption increases over time. At the same time, many of these programs have been in place for less than a year. As they mature, they will undoubtedly garner more insights.

Metering Energy Use Can Be Unreliable

All per-kWh taxes require that charging stations must accurately report the energy dispensed. However, Kentucky, Iowa, and Pennsylvania have reportedly faced considerable hurdles related to metering electricity use by chargers. While DC fast chargers (DCFCs) and "smart" models of Level 2 (L2) chargers can accurately and reliably measure electricity dispensed, “dumb” L2 chargers often lack the necessary metering capacity to do so. This means that states face difficulty verifying charging use and enforcing the tax universally across all types of chargers. Pennsylvania has faced substantial challenges related to this under the current scope of their policy, with few residential chargers able to reliably or accurately measure charging use. While it is technically possible to retrofit chargers with sub-metering capabilities, states report that doing so is practically infeasible and prohibitively expensive. Anticipating these challenges, Montana decided to exclude private residential and “dumb” charging stations that cannot measure energy use accurately.

States Must Educate Drivers About Their Tax Obligations

As demonstrated in Table 1, implementation of per-kWh taxes can vary widely. As such, states need to make a concerted effort to educate both EV drivers and EV charging operators about their process. States have reported that they struggle to ensure EV drivers understand their tax obligations. In Pennsylvania, for instance, all EV drivers were expected to pay a kWh fee on electricity used to charge a vehicle regardless of charging location. Pennsylvania relies on self-reporting, but many EV drivers who use private residential charging were not even aware that they needed to pay a tax at all. While these requirements for both private and public charging exist on paper, Pennsylvania avoided implementing tax enforcement mechanisms—particularly for private residential charging. Recognizing this issue, among others pertaining to residential charging, Pennsylvania enacted legislation in 2024 and will no longer require residential charging to pay a fee beginning in 2025.

Too Soon to Tell About Efficacy

Almost all states with per-kWh tax policies have only had those taxes pass through their respective legislatures within the last 18 months. As such, they reported that they cannot adequately assess the efficacy of the tax. However, Pennsylvania has had the per-kWh tax in place for over 20 years. While the tax has generated modest revenue, residential charging has had very low compliance and lower than desired revenue. Not only did this lead the Pennsylvania state legislature to limit the tax to non-residential charging only; they also implemented an annual EV Road Use Charge that will be applied concurrently with registration fees beginning in 2025.

Administrative Decisions Impact Collection Cost

While per-kWh taxes target the “fuel” of EVs like gas taxes target the fuel of internal combustion engine (ICE) vehicles, measure electricity consumed for per-kWh taxes is more complex than measuring the volume of gasoline for the gas tax. Determining how much electricity was used for charging requires accurate metering capabilities and can burden the taxpayer to measure and report on energy use after charging occurs. It also burdens the state, who must validate reported energy use to confirm accuracy.

Per-kWh and gas taxes can also differ in terms of collection. The gas tax is collected upstream in a centralized manner from very few taxable entities, typically the refinery or distributor. This

relatively simple and efficient system is far less administratively burdensome and complex than per-kWh taxes—which varies state to state based on policy design. States have not shared their implementation costs as a share of total taxes collected, but they are likely substantially than the gas tax.

Most states levy the tax directly on charging service providers—a much larger pool of potential taxpayers than the gas tax. This results in greater administrative burden on states to ensure all obligated parties register with the state, remit their taxes, and accurately report their charging use. Notably, Montana levies the tax on electric utilities, which is most analogous to the gas tax by collecting taxes upstream and reducing the number of responsible entities. However, the burden to identify and collect energy use data from charging operators shifts to the utilities instead. It is possible that utilities in Montana will impose higher costs on charging operators to offset this requirement, which would negatively impact the viability of the EV charging service business.

Policy Scope Affects Revenue Sustainability

Despite greater burdens, states can still generate revenue from per-kWh taxes. Pennsylvania has doubled their revenue from their per-kWh tax annually over the last five years—reaching approximately $1 million in revenue in 2023. However, this still represents a small fraction compared to traditional state gas tax revenues, which totaled $3.6 billion in 2022. According to Pennsylvania Department of Revenue (PADOR), more than 75 percent of non-residential EV charging stations in the state are reportedly licensed and remitting taxes. However, according to concerns raised by both the Pennsylvania Department of Transportation (PennDOT) and PADOR, the administrative and enforcement costs from collecting taxes on residential charging, public L2 charging, and public DCFC use very likely exceed the revenue generated.

While Pennsylvania will shift toward only taxing non-residential charging in 2025, PennDOT assesses that public L2 charging still likely results in more cost than revenue because of a very high number of service providers. PennDOT asserts that focusing on DC fast charging would result in greater revenue sustainability due to the smaller number of service providers that provide DC fast charging; it would also capture more road use from out of state drivers—the primary intent behind the tax. PennDOT also assessed that this could have the added benefit of reducing the tax burden on in-state drivers who may be more likely to opt for local L2 charging instead of DCFC when they lack access to residential charging. However, in-state drivers would also still likely use DCFCs in Pennsylvania, so this does not eliminate the burden altogether.

Key Considerations

States interested in per-kWh taxes should consider the following advantages and disadvantages.

Advantages

Transparency

Unlike hidden or discreet taxes like sales taxes on electricity or other utility taxes, per-kWh taxes can be more transparent to EV drivers. When using public charging stations, EV drivers could clearly see the amount of taxes being paid relative to the charging service costs. In addition, this is an opportunity for states to educate drivers on the sources of transportation funding and how such funds are spent. This transparency enhances trust and understanding of the cost of EV ownership among consumers and provides a baseline information for citizens as states explore solutions to supplementing or replacing the gas tax.

Similarities to Gasoline and Diesel Fuel Tax

Per-kWh taxes are similar to the energy-based tax imposed on drivers of gasoline-powered vehicles, providing a familiar framework for the public. By equating the tax to a use fee based on energy consumption, per-kWh taxes are intuitive to EV drivers who are accustomed to driving gas-powered vehicles.

Proven Revenue Generation

Moreover, per-kWh taxes have demonstrated their ability to generate revenue. While the current revenue cannot compete with that collected from the gas tax, rising EV adoption and utilization of public charging stations, per-kWh taxes could contribute more to infrastructure funding over time. This revenue stream helps to ensure that EV drivers are contributing to the transportation system they rely upon. See Appendix A for the potential revenue generations from a per-kWh tax in Pennsylvania.

Disadvantages

Revenue Concerns from At-Home Charging

Policies in place today do not collect enough revenue to replace gas tax losses because EV adoption is still nascent, representing about two percent of vehicles on the road, and 80 percent of all EV charging occurs at home—where fees are not collected.

While some at-home chargers can measure power consumption, many do not. For per-kWh taxes to work at the residential level, drivers will either need a specific type of charger or will need to install a sub-meter that can monitor the energy used specifically for EV charging, both of which can be cost prohibitive. Individual or state-sponsored installation of EV charging meters would be prohibitively expensive and administratively burdensome. Those who charge at home may generally have to self-report their usage—a process that requires awareness of the tax and its provisions, can be quite onerous, and has a high likelihood for inaccuracy and underreporting.

Current Legislation Limits Revenue Collection

Oftentimes, non-public chargers are either explicitly written out of tax policies or are practically infeasible to collect revenue from even if it is required by law. Effective taxing of EV drivers that considers the broader tax landscape for EVs is essential for long-term revenue sustainability. Implementing policies like per-kWh taxes early when EV adoption is low but growing can allow states to build a tax revenue framework informed by the growth of EVs on the road.

Potential High Administrative Costs Reduces Tax Revenue

Administrative expenses associated with collecting per-kWh taxes have the potential to be far more expensive than the gas tax. Unlike the gas tax, which states collect early in the fuel distribution chain before it reaches individual gas stations, per-kWh electricity taxes have far more—and more varied—collection points. Depending on state policy, these may include the utility, the hosts of EV chargers, or even the individual EV driver if they charge at home. This larger set of taxpayers will create challenges for states to enforce and collect the tax.

Conflicting EV Adoption Policies

State legislatures have designed per-kWh taxes as flat taxes with universal implementation across the state. Most of the states in Table 1 implemented these policies with the intention of getting EV drivers to contribute proportionately to public road funding. However, many states have also adopted new EV or high-efficiency vehicle registration fees for the same reason. It is crucial

to evaluate per-kWh taxes within the broader landscape of EV-related fees and taxes to prevent instances of double, triple, or even quadruple compounding taxation.

A recent analysis by Atlas Public Policy examined disparities in tax burdens for EV drivers across different states, highlighting the importance of what fairness, or the lack thereof, looks like in the context of EV charging taxation. In particular, the analysis researched the different taxes and fees on public EV charging designed to mimic losses in gas tax revenue, and then quantified how these fees accumulate in a single calendar year by a calculation Atlas referred to this as an "EV Penalty." Inclusive of per-kWh taxes, the analysis found that EV drivers in 36 states, including the District of Columbia, are subject to additional fees for EV usage that outweigh those paid by ICE vehicle drivers, such as higher vehicle registration fees and general fees for public charging like a sales tax (or sales tax equivalent) on electricity sold at public EV charging stations. In addition, EV drivers are double taxed in 28 states, and they are triple taxed in three states. Further, the study found that EV drivers in 16 states pay more in total taxes and fees when compared against drivers of gasoline-powered vehicles when considering all fees both sets of drivers pay. State lawmakers must take a broad look at taxes and fees to ensure the revenue raised through mechanisms like per-kWh taxes does not disproportionately tax EV drivers.

The imposition of a per-kWh tax may also conflict with broader state and national goals aimed at promoting EV adoption and developing fast charging infrastructure. While fast EV charging stations require considerable investment, adding a tax could deter businesses from installing these facilities, essential for the mass market.

Potential Equity Concerns Exist

Pennsylvania and Iowa officials cautioned that per-kWh taxes can present tax avoidance and equity issues, particularly concerning the disparity between home and public charging. The majority of EV charging occurs at home, which makes many at-home chargers noncompliant with the tax despite practical limitations that are no fault of their own. It also means that per-kWh taxes disproportionately impact drivers from low-income households and those who live in multi-family dwellings who must rely on public charging. Because low-income consumers tend to be more price sensitive, the addition of a per-kWh tax that disproportionately affects them could have a minor impact on EV adoption among this demographic. While most EV drivers are currently higher income with easy access to at-home charging, this may have both near-term and long-term impacts on adoption rates, as used EVs have become more available at more affordable prices that low-income drivers without access to residential charging may look to purchase.

Additionally, states can impose added fees on EV drivers beyond a per-kWh tax. Per-kWh taxes exacerbate these equity concerns. As mentioned above, research by Atlas Public Policy found that EV drivers can pay more in taxes than ICE drivers. As such, without proper consideration of the other taxes and fees that EV drivers pay to make up for losses of gas-tax revenue, the implementation of a per-kWh tax can lead to double, triple, or quadruple taxation when compared to taxes faced by ICE vehicle drivers. These added taxes cut into the total cost of ownership savings for EVs compared to ICE vehicles and tend to impact low-income drivers disproportionately.

Comparison of Per-kWh Taxes with Other Fees

No single approach for transportation infrastructure funding sources is without its limitations. Gas taxes have historically generated a large share of road-funding revenue, but increased EV adoption and ICE vehicles with higher fuel economy are putting downward pressure on tax receipts. While some states have managed to index the gas tax to inflation, most have not done so. Eight states have not increased their gas taxes since 1993, when the federal gas tax was last increased. Tolling on highways or bridges, while effective in capturing revenue from a wide range

of motorists, both in-state and out-of-state, lacks precision in universally accounting for fuel economy of vehicles and can only capture a fraction of overall road travel.

Road usage charges present a promising solution due to their comprehensive nature, but implementation hurdles such as privacy concerns and political resistance have hindered their adoption for many years. Conversely, medium-and-heavy duty excise and use taxes target specific vehicle types based on their outsized road usage impact, but there is no similar program for light duty vehicles yet.

Efficient vehicle registration fees offer a more universal approach, inclusive of both highly efficient gas vehicles and EVs. Many states have opted to introduce additional registration fees specifically for EVs, aiming to ensure that these vehicles contribute proportionally to road funding. Approximately 35 states charge battery EV drivers additional registration fees, ranging from $50 (Hawaii and South Dakota) to $225 (Washington) with the average fee costing $132.58, and 28 of these states charge an additional registration fee for plug-in hybrid vehicles. However, as a flat fee, they pose equity issues because they are not linked to actual use of the infrastructure.

While per-kWh taxes can help raise some revenue from EV drivers, states must consider implementing this policy in conjunction with a comprehensive funding strategy that achieves a fair and sustainable funding model. Achieving an equitable balance requires the full understanding of EV drivers' total contribution to road funding and a willingness to adapt policies to reflect the evolving transportation funding landscape.

Table 2 provides a high-level overview of how per-kWh taxes compare to other road funding policy options in the near term, which is likely to change as market conditions evolve. This table is adapted from a report by Atlas Public Policy that reviews road funding and the equitability and sustainability of policy options in greater detail. Readers should use Table 2 as a snapshot when considering the pros and cons of various policy options. Table 2 reflects qualitative analytical judgement regarding general policy options. Individual states' design and implementation of these policy options may result in higher or lower performance when compared to the generalized performance reflected in Table 2. The per-kWh row in Table 2 has been updated from its original publication source to reflect evolving analysis on this policy.

Table 2: Performance of Policy Options Along Key Criteria

Policy Options	Revenue Sustainability	Fairness	Equity	Cost-Effectiveness	Political Viability	Environment & Electrification
Per-kWh Taxes	User base currently very small, but will grow with greater EV adoption.	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 administrative burden due to high number of taxpayers; 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
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
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	Medium	Low

Conclusion

As most states have only relatively recently implemented per-kWh taxation, it is too soon to tell how effectively the tax will address road funding gaps. Pennsylvania's implementation does show that the tax can contribute a modest amount of revenue, but state officials recognize that it cannot replace the gas tax alone due to the relatively low rates of public charging utilization and challenges with taxing at-home charging; which the Pennsylvania legislature addressed by amending the policy to restrict per-kWh taxation to non-residential charging. As EV adoption becomes more widespread and extends to low-income drivers or those without access to at-home charging, it presents considerable equity concerns by requiring these drivers to pay a disproportionate amount of per-kWh taxes compared to higher income drivers or those with access to private/at-home charging. Finally, while the tax policy is more intuitive for policymakers and drivers who are looking for a discernible analogue to the gas tax, it is more complicated for collection because of the greater number of taxable entities.

Despite these limitations, state officials tend to agree that thinking about per-kWh taxes as one portion of a greater set of road funding policies—rather than a silver bullet solution—can help states implement this policy in a balanced and thoughtful manner that addresses equity concerns. Doing so can ensure EV drivers pay a fair amount compared to ICE vehicle drivers and will be the first step in developing a more sustainable and equitable transportation funding landscape.

As implementation of these programs advance, we will learn more about their efficacy and opportunities for improvement. Advances in metering technology may make per-kWh taxation more feasible and accurate, addressing some of the current limitations. Additionally, per-kWh taxes could serve as a short-term solution until a comprehensive mileage-based user fee program is implemented across multiple participating states or nationwide. By continuously refining these policies and leveraging new technologies, states can create a more equitable and effective framework for road funding in the evolving transportation landscape.

Appendix A.

Per-kWh Tax Revenue Calculator

State policymakers and other stakeholders can employ a straightforward formula to estimate future tax revenue generation over time. This methodology hinges on a set of core variables: the average number of miles driven annually within the state, the proportion of these miles that are traversed by EVs, the average EV efficiency expressed in miles per kilowatt-hour, and the percentage of EV charging that occurs at public direct current fast chargers (DCFCs).

Consider hypothetical 'State A' as an example. To calculate projected revenues, we first aggregate the total miles driven by all EVs in the state. Next, we determine what fraction of these miles are likely powered by electricity from public DCFCs. Applying the average EV efficiency metric allows us to convert these miles into the amount of electricity for which the tax would apply. The current per-kWh tax rate then translates this electricity usage into expected revenue. For the purposes of the below hypothetical scenario, we have taken the average across all current per-kWh tax rates actively being implemented by states.

Here is a hypothetical scenario based on assumptions for illustrative purposes. It should be noted that variables and actual revenues that states observe in reality can vary from the numbers used in this scenario.

Assumptions:

- $M_{EV} = 400{,}000{,}000$ miles (Total miles driven by EVs registered in 'State A')[1]
- $P_C 0.15$ (15% of energy for EVs is from non residential charging)
- $kWh_m = 0.277 \frac{\text{mi}}{\text{kWh}}$ (Average electricity consumption per mile for EVs)
- $T_k = 0.027$ dollars ('State A' tax rate per kWh, equivalent to 2.7 cents per kWh)

Calculation:

$$R = M_{EV} \times P_c \times kWh_m \times T_k$$

Results: $448,740 in annual revenue.

State offices can use their own EV registration data, road usage data, and tax rates to assess both the short- and long-term revenue potential of a per-kWh tax policy. This formula allows states to input both current data and future projections as EV adoption rates and public charging utilization evolves over time. Comparing these estimates with current gas tax revenue or the road funding shortfall will offer states a clearer picture of the role per-kWh charging taxes might play in their overall fiscal strategy.

Using projections from Pennsylvania's EV Roadmap as a stand in for 'State A's' own EV Roadmap, we can assess how revenue may stand to increase by 2033.[2] Assuming a best-case scenario projection of approximately 2,887,000 EVs on the road in 'State A' by 2033—or approximately 20 percent of total vehicle registrations, if total vehicle registration and road usage remains about what it was in 2022—and that there are no substantial changes to charging

[1] This value does not account for out-of-state EV drivers traveling through or in the state—or how much those drivers use public charging within the state. This means that the actual revenue from a per-kWh policy may be higher than reflected here.
[2] The State of Pennsylvania's EV Roadmap was used as a data source for the purposes of State A's revenue projections up to 2033.

technology or public charging rates, we can use the formula above to estimate the 2033 revenue from a per-kWh tax as currently implemented:

- $M_{EV} = 27{,}000{,}000{,}000$ miles (Total miles driven by EVs on the road in 'State A' in 2033)
- $P_C = 0.15$
- $kWh_m = 0.277 \frac{\text{mi}}{\text{kWh}}$
- $T_k = 0.027$ dollars

Projected 2033 Revenue from 'State A' EV Drivers: $ 30,289,950

$30 million in revenue from per-kWh taxes from roughly 20 percent of all vehicles on the road demonstrates this tax does not have nearly the revenue collection potential that the traditional gas tax has. For instance, in 2022, Pennsylvania collected $3.6 billion from the gas tax. If the same were true for 'State A', 20 percent of that would be $731,359,800, leaving about $700 million on the table if the per-kWh tax is presumed to replace the gas tax outright. However, state offices generally recommend that per-kWh charges be considered as just one tool for revenue collection among many.

Other factors may increase revenue from this tax, such as an increase in the availability, reliability, performance, or use of public charging. This may very well come to pass. For instance, the National Electric Vehicle Infrastructure (NEVI) Program is intended to accelerate public charging infrastructure development across the country. Relatedly, EV drivers who currently avoid long-distance travel may opt to drive across state lines where they will use public chargers.