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# **Electric Vehicles and Other Issues Affecting Road and Highway Funding in Tennessee**

## **Summary and Recommendations**

Since 1923—almost a century ago—Tennessee has taxed sales of gasoline to help pay for highway construction and maintenance, and a portion of the revenue from this tax has been shared with local governments since 1929. Fuel taxes have become the primary source of road funding for the state and local governments. The principle behind a fuel tax is straightforward—the more a person drives, the more that person should contribute towards the upkeep and construction of the roads they use, and until recently the amount of fuel consumed has been a way to approximate how much a person drove.

The way that cars and trucks are powered is changing—electric vehicles (EVs) have become a fast-growing segment of the market, and representatives of the automobile industry say they are moving towards a predominantly electric future. Fully electric vehicles, of course, don't use gas or diesel. While owners of these vehicles in Tennessee do pay additional fees to the state for registering their vehicles each year, revenue from these fees is not shared with local governments, unlike revenue from gas or diesel taxes. Given that the adoption of EVs is expected to increase in coming years, Commission members at their January 2021 meeting expressed concerns about the effect EVs might have on state and local road funding and directed staff to

1. study fuel taxes and the current intergovernmental funding structure for road construction and maintenance;
2. investigate road maintenance and construction costs, fuel efficiency, and electric vehicles in Tennessee and their effects on that funding; and
3. examine potential alternative means of financing transportation infrastructure to offset lost revenues without discouraging electric vehicle expansion.

Members also noted that increased adoption of EVs has brought with it demands from residents for more EV charging infrastructure. To that end, the Tennessee Department of Environment and Conservation (TDEC) and the Tennessee Valley Authority (TVA) are partnering to develop a statewide EV fast charging network to power the growth of EVs across Tennessee and reduce barriers to transportation electrification, agreeing to collaborate and fund a network of fast charging stations every 50 miles along Tennessee's interstates and major highways. Six major US utilities, including TVA, have also come together to form the Electric Highway Coalition, coordinating the expansion of charging

stations throughout 16 states—including Tennessee—from the Atlantic Coast to the Gulf and Central Plains regions. As the charging infrastructure evolves, the demand for EVs is projected to increase.

Additionally, members asked staff to investigate the effect increased EV adoption will have on total electricity consumption and on TVA payments in lieu of taxes (PILOTs). Vehicle charging will remain a small percentage of total electricity consumption, with only a small effect on TVA PILOTs.

### ***How Tennessee Funds its Roads***

To build and maintain the state’s network of roughly 96,000 miles of public roads and 20,000 bridges, the Tennessee Department of Transportation (TDOT) and local governments across the state rely on federal (approximately 34% of total road funding), state (approximately 54%), and local (approximately 12%) sources of revenue. Use of federal funding is restricted to the highways that are part of the federal-aid system, which account for approximately 20% of the road mileage in Tennessee, leaving much of the fiscal responsibility for road construction and maintenance up to Tennessee’s state and local governments. The 54% of total revenue for roads that comes from state sources includes

- the state’s 27-cents-per-gallon tax on gasoline and 28-cents-per-gallon tax on motor fuels (36% of total road funding), some of which is distributed to counties and cities;
- vehicle registration and other fees (15% of total road funding), which unlike fuel tax revenue are not shared with local governments—revenue from registration fees goes entirely into the state highway fund; and
- other sources (3% of total road funding).

Tennessee was one of just six states at the end of 2020 with zero debt obligations from bonds to finance new highway construction and hasn’t typically allocated general funds for highway purposes—although the General Assembly did so in fiscal years 2021-22 and 2022-23, totaling \$826.5 million. Most states do allocate general fund revenue for highway purposes; 37 did so in 2020.

### ***Although electric vehicles will affect road funding, increased fuel efficiency and inflation will have greater effects on the state’s gas tax.***

In Tennessee, less than 0.2% of light-duty vehicles registered in 2020 were electric—either fully electric or plug-in hybrid (PHEVs)—but that number is growing. From June 2020 to June 2022, the number of EVs registered in Tennessee more than doubled, increasing from about 9,000 to more than 20,000. If current trends continue, the percentage of light-

duty vehicles registered in Tennessee that are EVs is projected to increase to about 3% in 2030 and between 7% and 10% by 2040.

Even as the number of EVs in Tennessee increases, their effect on gas tax revenue will be at least partially offset by a new fee. The IMPROVE Act of 2017 introduced an additional EV registration fee of \$100 to compensate for EV drivers not buying gasoline (and therefore paying no gas taxes). This fee is less than what a driver of an average, new gas-powered car might pay in fuel taxes during a year:

$$15,054 \text{ miles driven at } 29.9 \text{ mpg} = 503 \text{ gallons} = \$135.93 \text{ gas tax}$$

From July 2017 through June 2022, the state collected approximately \$3.6 million in EV registration fees—compared to \$4.2 billion from gasoline taxes. Unlike the gas tax, however, revenue from this additional registration fee is not shared with local governments, and no revenue is collected from owners of EVs registered in other states. To help Tennessee’s citizens with a one-time break, Public Chapter 1143, Acts of 2022, waived the regular state registration fee for renewals occurring after July 1, 2022 and before June 30, 2023. However, the additional electric vehicle registration fee was not waived.

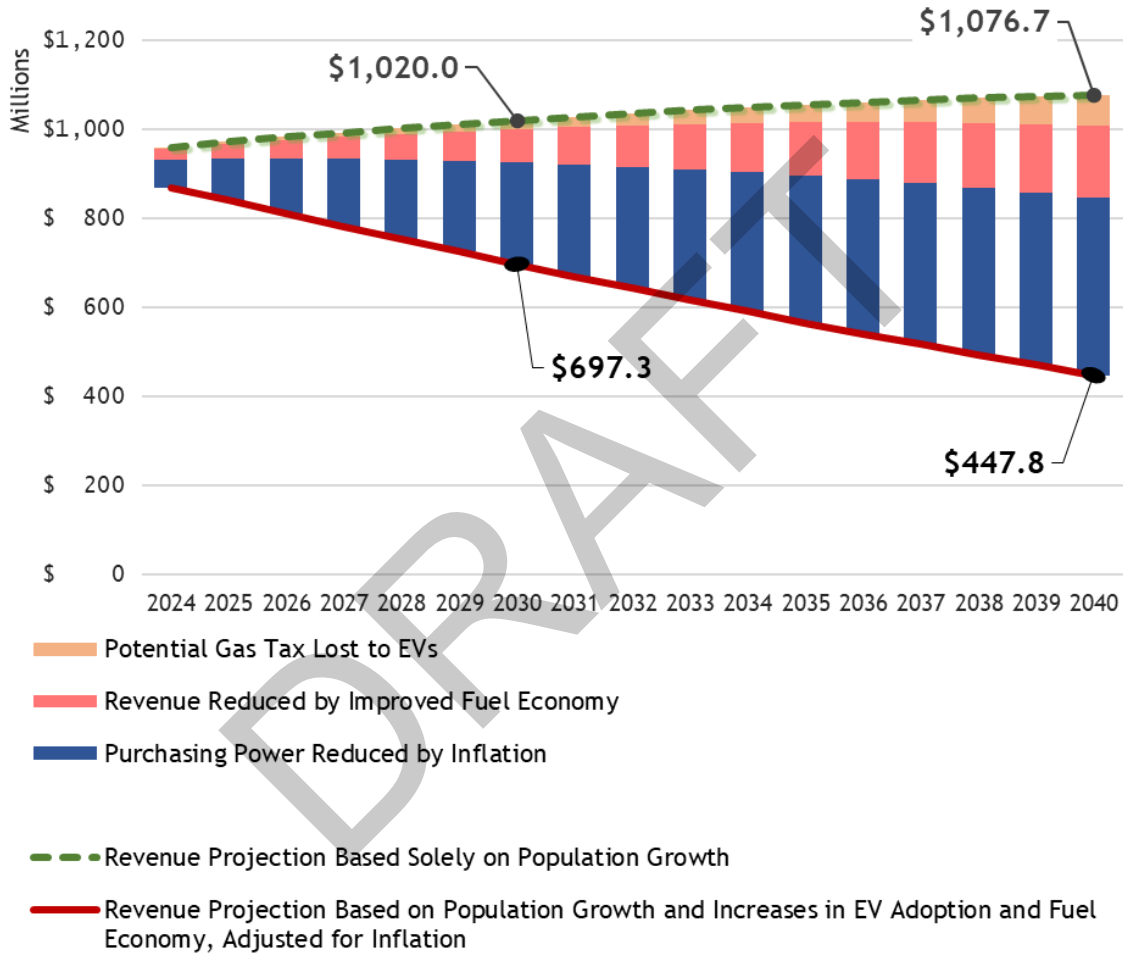
Until EVs surpass gas- and diesel-fueled vehicles as the predominant type of vehicle on the roads, increases in fuel efficiency will have a greater effect on the state’s road funding than EVs will. The average fuel economy for all light-duty vehicles reached 23 mpg in 2020. However, overall average efficiency is projected to increase by nearly 2 miles per gallon by 2030 and 4 miles per gallon overall by 2040. Increases to the overall fuel economy of vehicles registered in Tennessee have the potential to reduce total gas tax revenue by \$75 million in 2030 and \$163 million in 2040.

Beyond this potential for reduced gas tax revenue, inflation significantly decreases the purchasing power of revenue collected. Tennessee’s gasoline and motor fuel taxes are flat amounts based on volume sold, not price. This means that gasoline and motor fuel tax revenue will not necessarily keep up with inflation when prices increase. Furthermore, road construction costs (3.6% average annual increase) have risen faster than overall inflation (2.1% average annual increase) in the past decade. If construction costs continue to increase at that rate, they would increase 33% by 2030 and 89% by 2040. Based on current trends, inflation is going to be the most significant factor affecting future funding for the state’s roadways, as the buying power of the state’s fuel taxes is diminished.

As shown in figure 1, the rising costs of highway projects and maintenance are projected to have a greater effect on road funding in Tennessee than either the growing number of

EVs or improvements in average vehicle fuel efficiency. If trends in fuel efficiency and the adoption of electric vehicles continue, the current 27-cents-per-gallon gas tax would generate \$95 million less in 2030 and \$230 million less in 2040 than projected gas tax revenue based solely on population growth. Rising construction costs, however, have the potential to reduce the purchasing power of that revenue by an additional \$228 million in 2030 and \$399 million in 2040.

**Figure 1. Select Factors Affecting Tennessee’s State Gas Tax Revenue, 2024-2040.**



Source: TACIR staff projections based on state population projections and data from Atlas EV Hub (EV registrations), EPA Automotive Trends Report (fuel economy), the National Highway Construction Cost Index and Bureau of Labor Statistics (inflation).

**Additional or Alternative Sources of Revenue for Road Funding**

Twenty-two states have variable fuel taxes that adjust automatically—each year or periodically—without a need for new legislation. Many index their tax rate to inflation and/or average fuel economy. If Tennessee were to do this, it could result in automatic tax increases in future years when the General Assembly might otherwise choose to

exercise its discretion to maintain existing rates. The General Assembly is already alerted to the effects of inflation on other important state programs—for example, each year the Tennessee Consolidated Retirement System informs the General Assembly of the effect of inflation on retirement benefits and cost of living adjustments.

Some states, including Tennessee, also rely on vehicle registration fees to fund their roads. Tennessee ranks near the bottom of all states in revenue per capita (\$55.63) from “motor vehicle and carrier taxes” (i.e. fees). The national average is about \$97. Tennessee charges the same flat registration fee for all light-duty, personal vehicles. Several states charge higher registration fees for heavier vehicles, but there are tradeoffs to relying more on registration fees. While basic registration fees are indifferent to whether a vehicle is powered by gasoline or electricity, they are not exportable to drivers of vehicles registered in other states and not proportionate to road use like a fuel tax. Registration fees are usually paid in one annual payment instead of a few dollars each time a driver buys gas, which could make higher fees more difficult for some Tennesseans to pay. As discussed above, no registration fees in Tennessee are shared with local governments, so shifting more of the state’s road funding framework to rely on registration fees would not benefit local road funding unless the revenue is shared in a manner like the gas tax.

Tennessee’s additional EV registration fee applies only to fully electric vehicles (battery electric vehicles, or BEVs), but 17 states with EV fees also apply them to plug-in hybrid electric vehicles (PHEVs), usually at a reduced amount. PHEVs can average the equivalent of 100 mpg or more, meaning driving 15,054 miles uses 150 gallons of gas and generates about \$41 in gas tax revenue.

Historically, a vehicle’s fuel consumption was a reasonable approximation of its miles driven, and fixed-rate fuel taxes generated revenue in close proportion to road use. As fuel efficiency has increased, the connection between fuel consumption and road use has weakened, and with the introduction of EVs, some drivers pay no fuel tax at all. There has been a great deal of literature published regarding the idea of taxing vehicles on a per-mile basis, regardless of whether the vehicle is electric or gas-powered. New technology and systems would be required to implement a vehicle-miles traveled (VMT) tax system, and several states are testing pilot programs—although none has fully replaced its fuel tax with a VMT tax. There has also been discussion among some states to form regional consortia to administer interstate VMT agreements, and some officials have mentioned the possibility of a federal VMT framework. There are two basic methods of implementing a VMT system: a self-reporting approach in which the driver reports the number of miles traveled in a given year or a tracking approach in which tracking technology keeps track of how far a car is driven in a given year. Citizens may

have privacy concerns about their vehicles being tracked for the purposes of a VMT tax and such concerns may be a significant barrier to implementing such an approach.

While growing adoption of EVs might not become a major issue for road funding in Tennessee for decades, it along with changes in fuel economy, increases in inflation, and decisions about the distribution of new registration fees point to the need for modifications to Tennessee's road funding system. Moreover, automakers are investing heavily in EV manufacturing facilities across Tennessee. **Recognizing this, the Commission makes the following recommendations:**

- 1. Because the practical effect of the state's EV registration fee is to serve as a substitute for the gas tax by collecting revenue for road funding from vehicle owners who don't purchase gasoline—and therefore don't contribute to road funding through the gas tax—**
  - a. the state should consider sharing EV registration fees with local governments in the same proportion as the gas tax and**
  - b. the state could consider applying a reduced EV registration fee to plug-in-hybrid vehicles and share this revenue with local governments in the same proportion as the gas tax.**
- 2. Given the effect of inflation on the purchasing power of gas tax revenue, and to assist lawmakers in evaluating whether to adjust the state's fuel tax rates, the Department of Revenue or another entity such as the State Funding Board should inform the General Assembly of the effect of inflation on the purchasing power of the state's fuel taxes at least once every two years.**
- 3. As the state confronts the tradeoffs associated with any potential alternatives to its current fuel-tax-based road funding framework, it should**
  - a. balance the ability to raise adequate revenue with equity for all drivers regardless of whether their vehicles are powered by gas, electricity, or some other method;**
  - b. ensure that revenue from any adopted alternatives is shared with local governments in an equivalent manner to the current sharing of fuel taxes; and**
  - c. ensure any alternatives intended to offset lost revenues are designed to do so without discouraging customers from purchasing electric vehicles.**



## **Analysis: Electric Vehicles and Other Issues Affecting Road and Highway Funding in Tennessee**

At the Commission's January 2021 meeting, several members raised concerns that the increased adoption of electric vehicles (EVs) as replacements for gas- or diesel-powered vehicles would reduce state-shared tax revenue—specifically from state fuel taxes—that the state and local governments use to build and maintain roads. Members also noted growing demand from residents for more EV charging infrastructure. Members directed staff to

1. study fuel taxes and the current intergovernmental funding structure for road construction and maintenance;
2. investigate road maintenance and construction costs, fuel efficiency, and electric vehicles in Tennessee and their effects on that funding; and
3. examine potential alternative means of financing transportation infrastructure to offset lost revenues without discouraging electric vehicle expansion.

Additionally, members asked staff to investigate the effect increased EV adoption will have on total electricity consumption and on TVA payments in lieu of taxes (PILOTs). Vehicle charging will remain a small percentage of total electricity consumption, with only a small effect on TVA PILOTs.

In 2019, electric vehicles in the US accounted for just 0.1% of all electricity used. In November 2020, TVA adopted new policies intended to remove barriers to the expansion of EV charging stations and set a target for 200,000 EVs in the region by 2028. This was a significant increase from approximately 14,000 EVs at the time. Commission staff estimate that, if there were currently 200,000 battery-powered EVs in the TVA region, the electricity needed to charge them would only represent 0.6% of TVA's total annual power sales. TVA's 2019 Integrated Resource Plan considered a projected 750,000 EVs in its baseline 20-year outlook and forecasted annual systemwide growth rates of just 0.1%.

Because the amount of electricity used to charge EVs will remain a small portion of total consumption compared to other residential, commercial, and industrial uses, even as EVs become more common, their effect on TVA PILOTs will be minimal. Using TVA's goal of 200,000 EVs in the region, Commission staff estimates the electricity needed to power an additional 186,000 EVs could add about \$2.8 million to TVA's total PILOT, assuming all other electricity use remains the same. Tennessee could see \$1.9 million of that increase, with approximately \$650,000 going to counties and \$280,000 to cities, which local governments could use to offset a portion of lost state fuel tax revenue. However, any increase from EVs would not be distinguishable from typical fluctuations in these

payments. And unlike state fuel tax revenue, TVA PILOT revenue is not earmarked for transportation and local governments use their PILOT revenue to fund many different needs.

### **Tennessee's System of Highways, Roads, and Bridges**

Tennessee's road system is generally considered to be in good condition, and responsibility for construction and maintenance rests with both the state and local governments. There are about 96,000 miles of public roads in Tennessee:

- The Tennessee Department of Transportation (TDOT) owns and maintains about 14,000 miles of roads (15% of the state's total), which includes 41% of the state's 20,377 bridges. Just a small portion—5,100 miles or 5% of the state's total—of these state-managed roads carry 55% of the state's annual traffic.
- There are about 58,000 miles of roads under county ownership (60%), mostly small with comparatively little traffic—although counties are responsible for 47% of all bridges.
- The remaining 23,000 miles (24%) of roads and 12% of bridges fall under city ownership.<sup>1</sup>

According to analysis of FHWA data by TRIP, a nonprofit organization that researches, evaluates and distributes economic and technical data on surface transportation issues, "Nationwide, 40% of major roads are in poor or mediocre condition." Tennessee ranked best among all states with just 14%.<sup>2</sup> This ranking helped put the state at the top of WalletHub's 2022 list of best states for vehicle ownership and maintenance costs.<sup>3</sup> Tennessee's highway system ranks 10th in the nation in overall cost-effectiveness and condition, according to the Reason Foundation.<sup>4</sup>

Tennessee also ranks among the states with the smallest percentage of poor bridges and has a low share of bridges more than 50 years old. Sixty-three percent of the 880 poor-rated bridges in Tennessee are owned by counties and cities. Using 2020 estimates, it

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<sup>1</sup> Federal Highway Administration (FHWA) "Highway Statistics 2020," Tables HM-10, HM-50, HM-60, and VM-2. Another 1,200 miles are owned by federal agencies. For bridge data, see FHWA "Bridge Condition by Owner 2022."

<sup>2</sup> TRIP 2022.

<sup>3</sup> Flessner 2022.

<sup>4</sup> Reason Foundation 2021.

could cost more than \$200 million to replace these 554 local bridges.<sup>5</sup> As part of the federal Bipartisan Infrastructure Law passed in 2022, Tennessee is set to receive \$302 million for bridge replacements, with incentives “to direct the new Bridge Formula Program funds to off-system bridges owned by a county, city, town or other local agency.”<sup>6</sup>

Governments in Tennessee report increasing needs for transportation projects. TACIR is charged with developing and maintaining an inventory of public infrastructure needs (PINI), and each year the category with the greatest estimated cost of needed improvements is transportation. The Commission’s 2022 report noted that “of the \$3.4 billion increase in infrastructure needs reported in this year’s inventory, just over \$2.0 billion (60.2%) is attributable to increases in the estimated cost for Transportation and Utilities.” And as “infrastructure needs for Transportation and Utilities increased for the sixth year in a row,” the report points to a \$1.1 billion increase in the cost of new road projects and a \$1.5 billion increase in the cost of road projects already in the inventory.<sup>7</sup> There were \$34.1 billion in transportation project needs reported for the 2020-2025 inventory window—a 40.1% increase from the \$24.4 billion reported for the 2016-2021 period.<sup>8</sup>

### ***How Tennessee Funds its Roads***

Road funding in Tennessee comes from federal, local, and state sources. Of these, federal revenue, which comes primarily from federal fuel taxes, accounted for approximately 34% of the state’s overall road funding in 2019. But use of this federal funding is restricted to the highways that are part of the federal-aid system, which account for approximately 20% of the road mileage in the state, leaving much of the fiscal responsibility for road construction and maintenance up to local governments and the state.<sup>9</sup> Local revenue sources contributed about 12% of Tennessee’s overall road funding, including both local general fund revenue and, in some cases, bond issues. State revenue sources accounted for approximately 54% of overall road funding in Tennessee. Almost all the state’s own-source revenue for roads comes from state fuel taxes, vehicle registration fees, and, in the two most recent fiscal years, the state’s general fund. About 3% of total road funding in 2019 came from other state sources.

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<sup>5</sup> FHWA “Bridge Condition by Owner 2022.”

<sup>6</sup> Raucoules 2022.

<sup>7</sup> Tennessee Advisory Commission on Intergovernmental Relations 2022.

<sup>8</sup> Tennessee Advisory Commission on Intergovernmental Relations “Data Explorer.”

<sup>9</sup> FHWA “Highway Statistics.” Tables HM-15 (2020), LGF-1 (2020 with data for 2019), and SF-1 (2019).

## Tennessee State Taxes on Fuel and Their Distribution

Since 1923—almost a century ago—Tennessee has taxed sales of gasoline to help pay for highway construction and maintenance, and a portion of the revenue from this tax has been shared with local governments since 1929. One of the strengths of Tennessee’s existing road funding framework has been that fuel taxes have historically collected revenue from road users in rough proportion to their road use, including revenue generated from fuel purchased by out-of-state drivers who use Tennessee’s roads. About 40% of the revenue used by the state for roads comes from the state’s own fuel taxes.<sup>10</sup> In 1989, Tennessee raised its gas tax by four cents to a total of 21 cents per gallon.<sup>11</sup> The per-gallon rate remained 21 cents until July 1, 2017, following passage of the Improving Manufacturing, Public Roads and Opportunities for a Vibrant Economy (IMPROVE) Act of 2017. The Act raised the gas tax to 27 cents over the course of three years.<sup>12</sup> Despite these recent increases, Tennessee’s gas tax is below the average among all states (31.0 cents), and 27 states have higher tax rates on gasoline. See figure 2.

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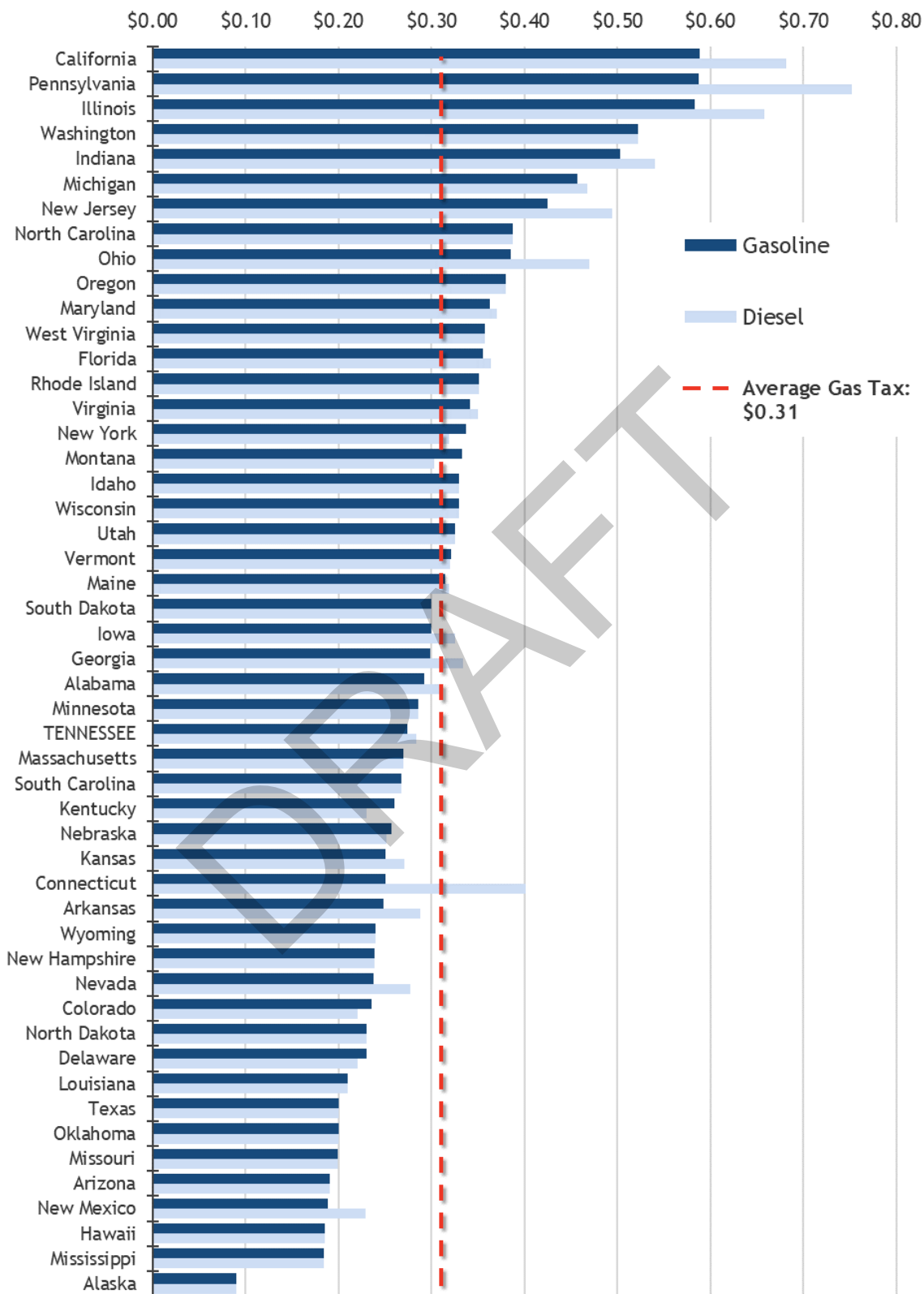
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<sup>10</sup> FHWA “Highway Statistics” Table SF-1. Average of last three years (2018-2020).

<sup>11</sup> Public Chapters 46 and 241, Acts of 1989. See Tennessee Department of Transportation “Gas Tax History.” Rates shown include the one-cent Special Privilege Tax on all petroleum products imposed under Tennessee Code Annotated, Section 67-3-203.

<sup>12</sup> Public Chapter 181, Acts of 2017. See <https://www.tn.gov/revenue/tax-resources/legal-resources/improve-act.html> for a summary of the act’s provisions.

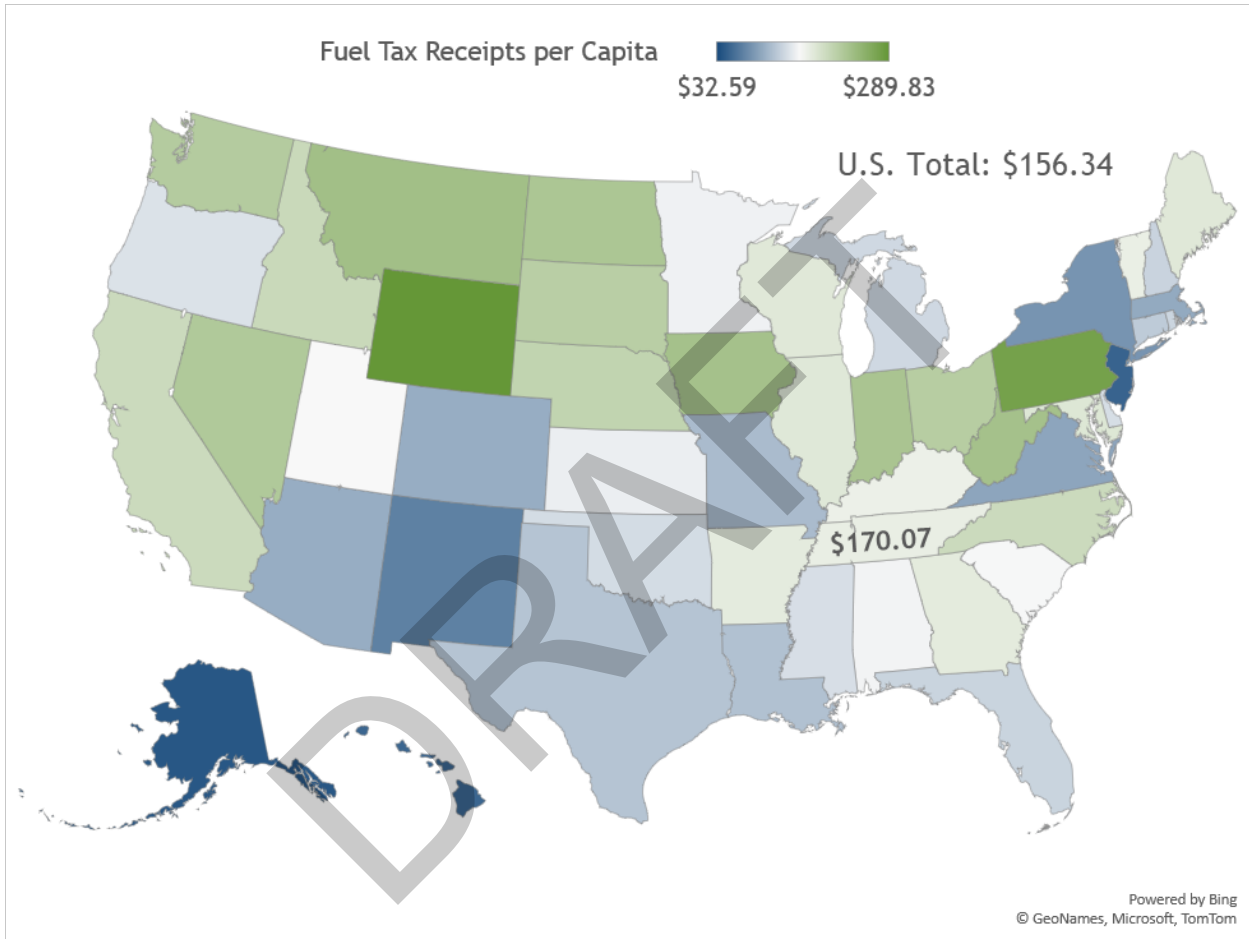
**Figure 2. State Fuel Tax Rates, January 2022.**



Source: US Energy Information Administration 2022b.

In fiscal year 2022, Tennessee collected \$877.6 million from its gasoline tax and \$325.2 million from the tax on motor fuel.<sup>13</sup> Although the state’s per-gallon tax rates are below average, Tennessee’s fuel tax receipts were above average on a per-capita basis in 2020, because the state has higher-than-average fuel sales on a gallons-per-capita basis. See maps 1, 2, and 3.

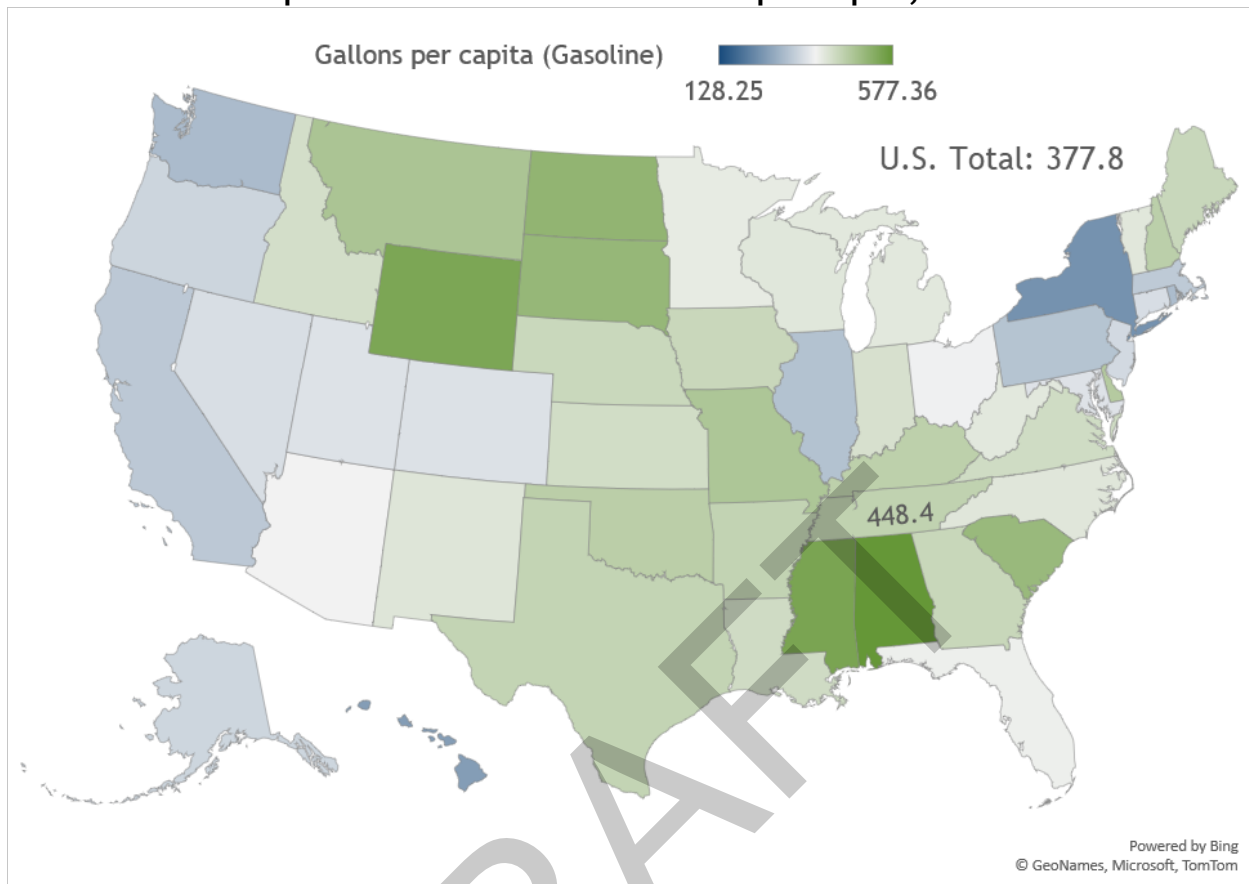
**Map 1. State Fuel Tax Receipts per capita, 2020.**



Source: FHWA. Table MF-1 (2020) Gross Tax Collections divided by Census 2020 state populations.

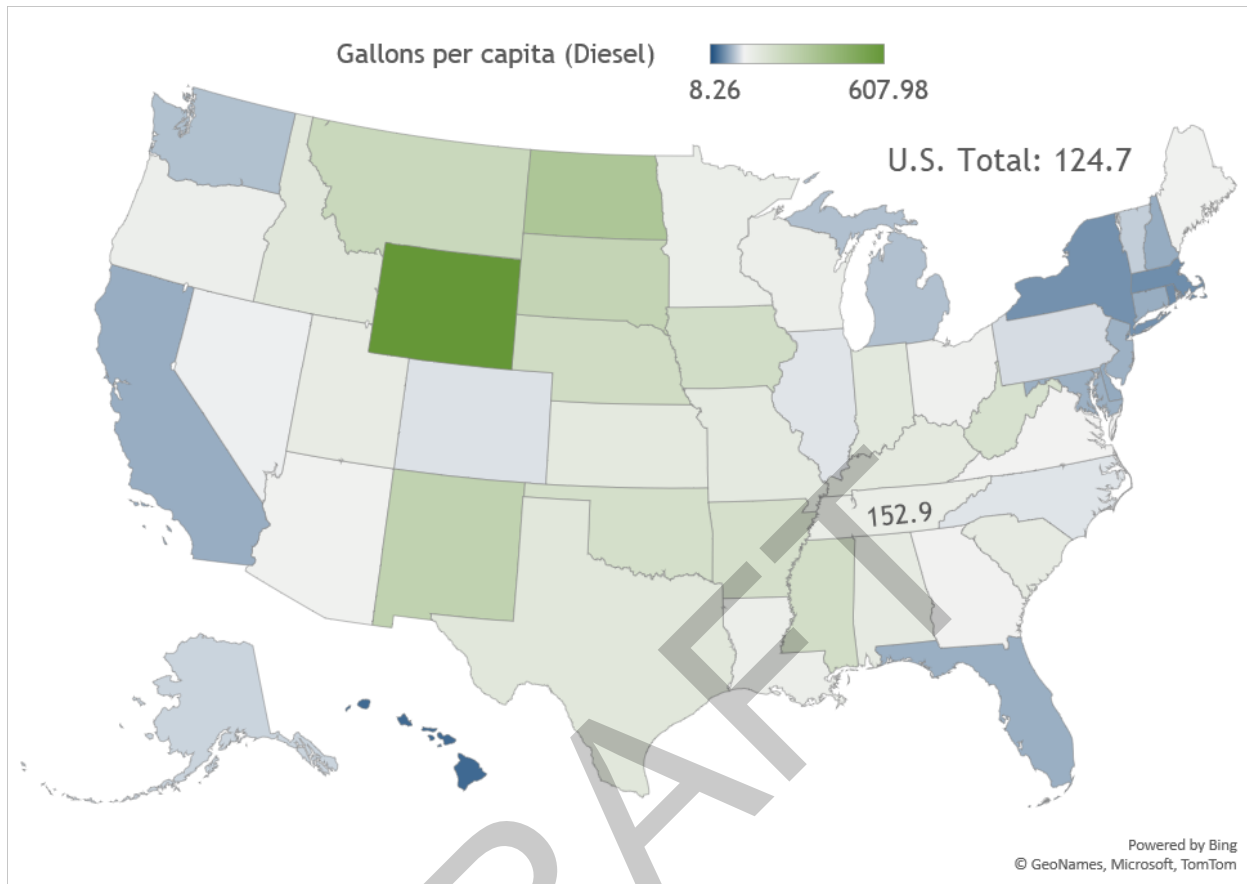
<sup>13</sup> Tennessee Department of Revenue.

**Map 2. Gallons of Gasoline Taxed per capita, 2020.**



Source: FHWA. Table MF-2 (2020) Net Volume Taxed divided by Census 2020 state populations.

**Map 3. Gallons of Diesel Taxed per capita, 2020.**



Source: FHWA. Table MF-2 (2020) Net Volume Taxed divided by Census 2020 state populations. Some of the revenue from the gas tax is retained by the state, the rest is distributed to local governments. The state collects 27.4 cents in taxes for each gallon of gasoline sold, including a 0.4-cent portion allocated for the state’s Petroleum Underground Storage Tank Fund.<sup>14</sup> The remaining 27 cents is the sum of decades of individual statutory taxes, and the revenue from each of these is allocated differently.<sup>15</sup> Overall, the combined receipts from Tennessee’s gasoline tax (36% of total road funding) are distributed as shown in figure 3. Approximately 60% goes to the State Highway Fund, 25% to counties, and 13% to municipalities, with the remainder set aside for administrative costs and minor earmarks for mass transit, wildlife resources, and government training.<sup>16</sup>

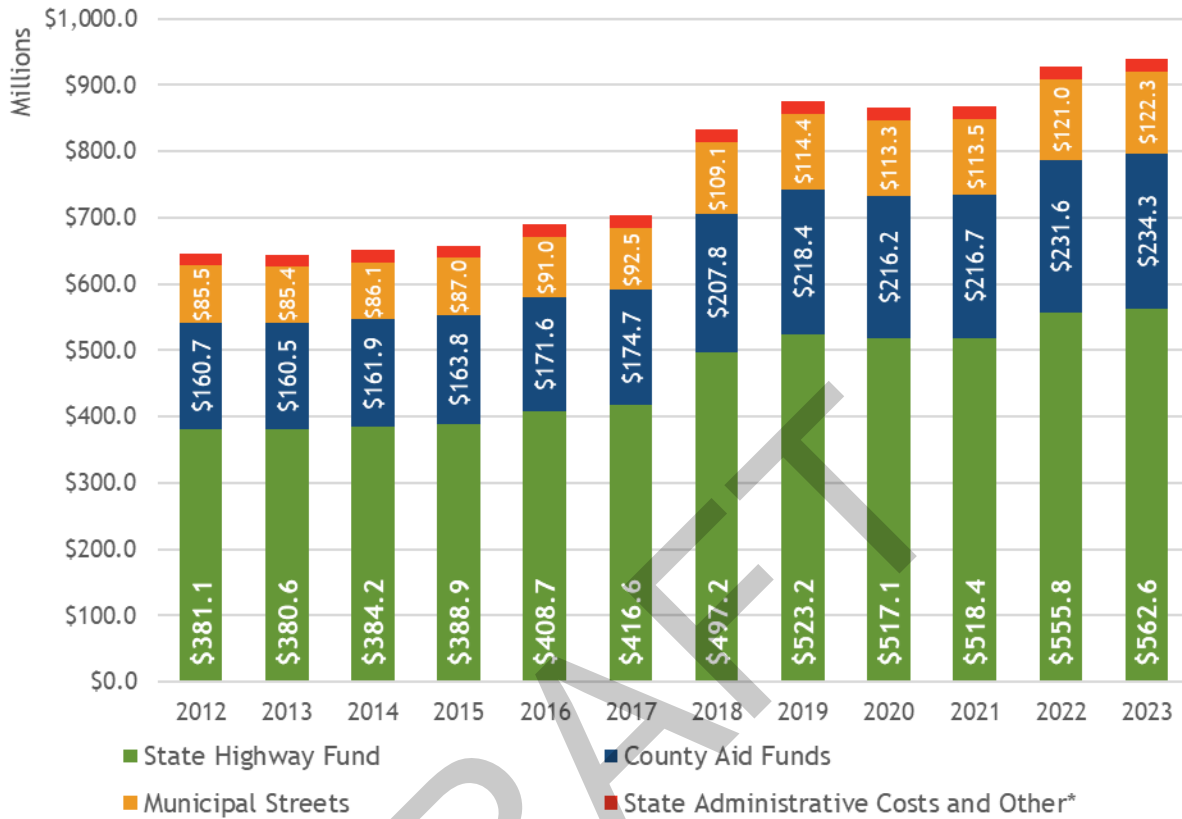
<sup>14</sup> Tennessee Code Annotated, Section 68-215-110.

<sup>15</sup> Tennessee Department of Transportation “Gas Tax History.”

<sup>16</sup> TACIR calculations based on each subsection within Tennessee Code Annotated, Section 67-3-901, plus the Special Privilege Tax imposed under Section 67-3-203 as allocated under Section 67-3-906.



**Figure 3. Allocation of Revenue from Tennessee’s Gasoline Tax State Fiscal Years 2012-2023.**

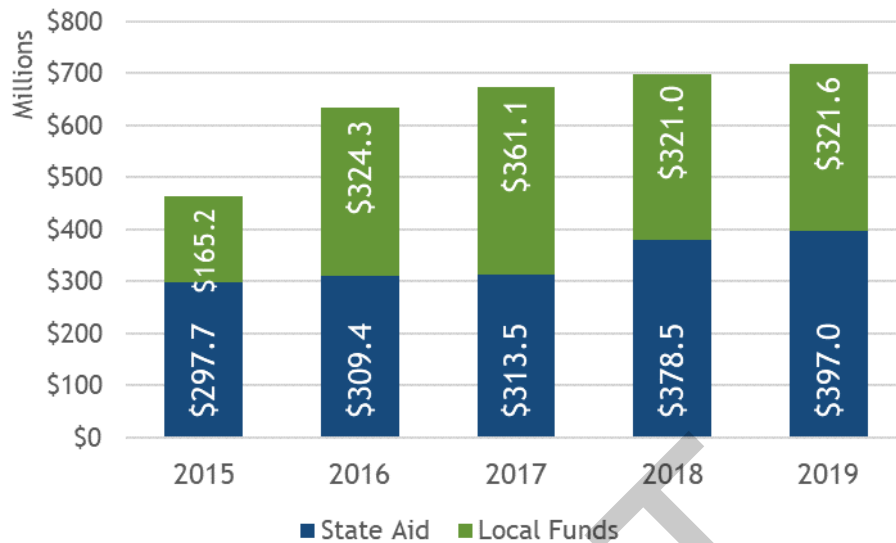


Source: TACIR staff analysis of Tennessee Department of Revenue data. 2023 based on estimates.  
 \* Includes statutory allocations for mass transit projects, wildlife resources, and the University of Tennessee Center for Government Training.

State-shared fuel tax revenue accounts for just 55% of local governments’ total road funds. Many of Tennessee’s local governments supplement this revenue with their own funds to pay for improvements they believe their communities need—adding \$322 million to what they received from shared fuel taxes in 2019 (44% of total funding for local roads).<sup>17</sup> See figure 4.

<sup>17</sup> FHWA “Highway Statistics.” Table LGF-1.

**Figure 4. Revenue Sources Used by Local Governments for Roads**



Source: FHWA “Highway Statistics.” Table LGF-1, 2015-2019.

Unlike the state, local governments don’t have any local revenue streams similar to the gas tax. Local governments can use general fund revenue from many sources to build and maintain their roads, including property taxes, sales taxes, and privilege taxes. Local governments sometimes issue bonds to finance road improvements.

### Vehicle Registration Fees in Tennessee

Revenue from vehicle registration fees represents approximately 15% of Tennessee’s total statewide highway funding.<sup>18</sup> The annual fee to register passenger vehicles in Tennessee is \$23.75.<sup>19</sup> To help Tennessee’s citizens with a one-time break, Public Chapter 1143, Acts of 2022, waived the regular state registration fee for renewals occurring after July 1, 2022 and before June 30, 2023. However, the additional electric vehicle registration fee was not waived.<sup>20</sup> Fees for other types of vehicles, like those used for commercial transportation or to carry freight, can be as much as \$1,352.50.<sup>21</sup> Unlike the way revenue

<sup>18</sup> FHWA “Highway Statistics” Table SF-1 (2019).

<sup>19</sup> Tennessee Code Annotated, Section 55-4-111.

<sup>20</sup> Public Chapter 1143, Acts of 2022, waived fees to renew the registrations of Class A (motorcycles; \$16.75 fee) and Class B motor vehicles from July 1, 2022, to June 30, 2023. The Fiscal Review Committee estimated this would reduce highway funding by \$110.6 million, but the General Assembly appropriated the transfer of an equal amount from the general fund. (Public Chapter 1130, Acts of 2022, Section 60, Item 30.).

<sup>21</sup> Tennessee Code Annotated, Sections 55-4-112 and 113.

from the state’s fuel taxes is shared with local governments, the majority of the money collected from these fees designated for the state highway fund.<sup>22</sup> In fiscal year 2022, the state collected \$370.3 million from all types of vehicle registration fees, permits, and fines.<sup>23</sup> On a per-capita basis, however, this revenue places Tennessee near the bottom when compared to other states. Tennessee ranks near the bottom of all states in revenue per capita (\$55.63) from “motor vehicle and carrier taxes” (i.e. fees). The national average is about \$97. See figure 5.

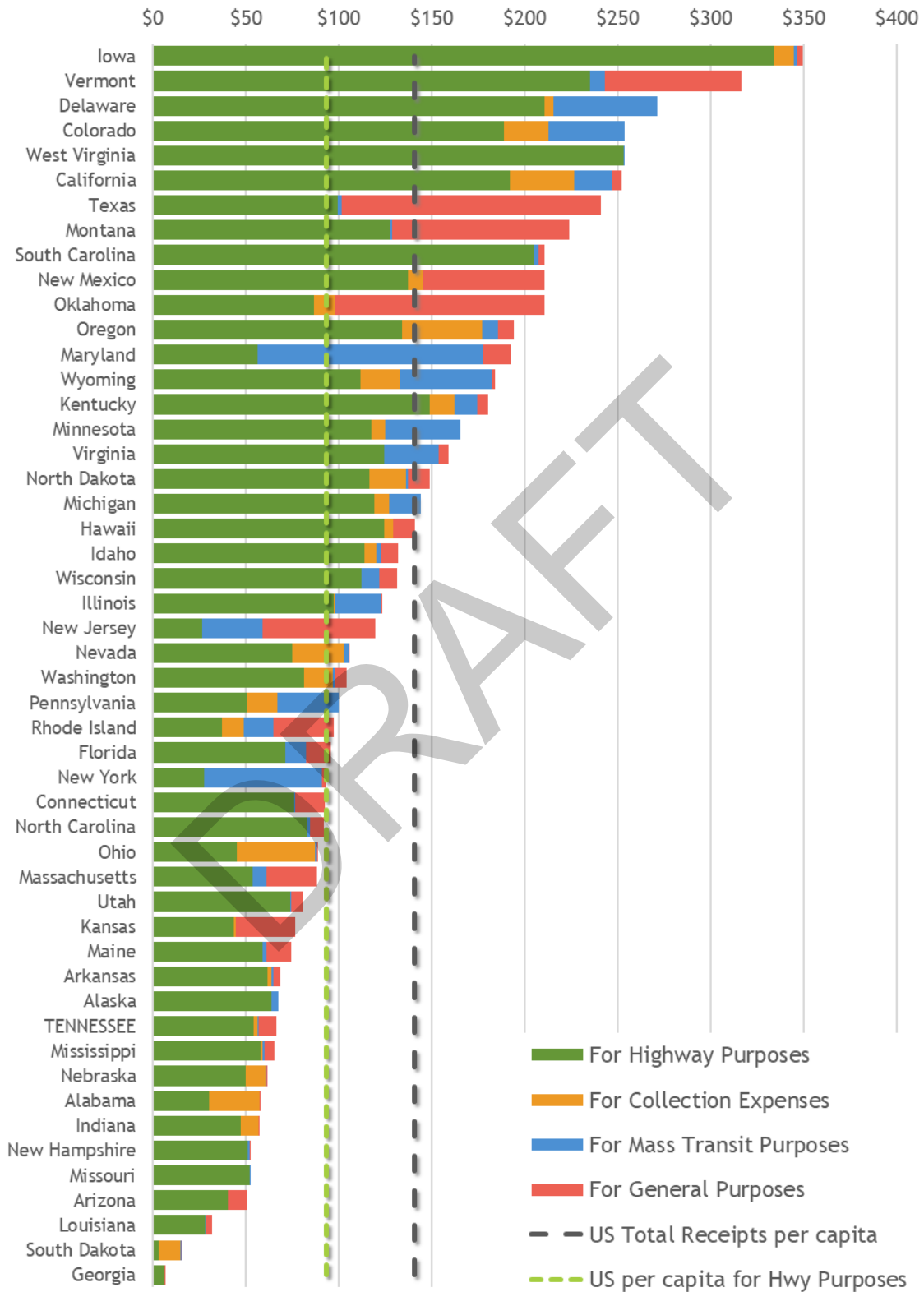
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<sup>22</sup> Tennessee Code Annotated, Section 55-6-107.

<sup>23</sup> Tennessee Department of Revenue “Summary of Collections,” July 2021-June 2022.

**Figure 5. Revenue per capita from Vehicle Fees and Taxes, 2020.**



Source: FHWA “Highway Statistics 2020” Table SDF; US Census Bureau 2020 state populations.

Because drivers of fully electric vehicles don't buy gasoline to fuel them, they don't pay the fuel taxes that provide revenue for road construction and maintenance. Tennessee is one of several states where owners of fully electric vehicles pay a fee to make up for their lack of fuel taxes. "Thirty states have laws requiring a special registration fee for plug-in electric vehicles. Of those, 14 states also assess a fee on plug-in hybrid vehicles." According to the National Conference of State Legislatures (NCSL), "proponents support the fees to bring equity among drivers by ensuring all drivers pay for using roadways."<sup>24</sup> The IMPROVE Act set Tennessee's EV registration fee at \$100, paid annually in addition to the regular fee for all passenger vehicles.<sup>25</sup> This amount is less than what a driver of a new gas-powered car might pay in fuel during a year:

$$15,054 \text{ miles driven at } 29.9 \text{ mpg} = 503 \text{ gallons} = \$135.93 \text{ gas tax}^{26}$$

Summaries from the Tennessee Department of Revenue show that EV-fee collections increased from \$584,000 in fiscal year 2020 to \$893,000 in 2021 and \$1.4 million in 2022 and have generated about \$3.6 million—compared to \$4.2 billion from gasoline taxes—for the state highway fund since the fee's inception in fiscal year 2018.

Unlike the gas tax, however, revenue from this additional registration fee is not shared with local governments, and no revenue is collected from drivers of EVs registered out of state. Had that money been shared with local governments in the same proportion as the state's gas tax, about \$2.2 million would have stayed in the state highway fund, \$900,000 would have been distributed to counties, and \$470,000 would have gone to cities. EV fees in other states range from \$50 to \$225, and the revenue is allocated in a variety of ways.

**Tennessee doesn't typically allocate revenue from its general fund for roads, though most states do.**

Tennessee state government prides itself on being a pay-as-you-go state, in which the state does not issue bonds for new highway construction—one of just six states at the end of 2020 with zero debt obligations from highway bonds.<sup>27</sup> Tennessee doesn't typically allocate general funds for highway purposes—although the General Assembly did so

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<sup>24</sup> National Conference of State Legislatures (NCSL) "Special Fees on Plug-In Hybrid and Electric Vehicles."

<sup>25</sup> Tennessee Code Annotated, Section 55-4-116. Tennessee's fee applies only to a vehicle "with an electric motor as its sole means of propulsion," which excludes plug-in hybrids.

<sup>26</sup> TACIR staff estimate of average miles traveled per licensed driver in Tennessee in 2019; EPA average miles per gallon of new cars in 2019.

<sup>27</sup> FHWA "Highway Statistics" Table SB-2 (2020).

with funds for fiscal years 2021-22 and 2022-23. In fiscal year 2022, the state transferred \$200 million from the general fund for a new interchange for Ford's Blue Oval City site,<sup>28</sup> and in 2023 the General Assembly appropriated \$626 million for highway improvement projects across the state.<sup>29</sup> Most other states allocate general fund revenue for highway purposes; 37 states did so in 2020—sometimes more than \$1 billion and constituting up to 18% of their state road revenue.<sup>30</sup>

***Electric vehicles will affect road funding as their numbers increase.***

The way that cars and trucks are powered is changing—electric vehicles (EVs) have become a fast-growing segment of the market, and the automobile industry says it is moving towards a predominantly electric future. Fully electric vehicles, of course, don't use gas or diesel and, therefore, don't contribute to road funding through the state's fuel taxes. Plug-in hybrid electric vehicles (PHEVs), which combine an internal combustion engine with a rechargeable battery, can average the equivalent of 100 mpg or more and, as a result, use substantially less gasoline than a conventional vehicle. For example, driving 15,054 miles in a PHEV getting 100 mpg uses 150 gallons of gas and generates about \$41 in gas tax revenue.

As of June 30, 2022, there were 20,354 EVs registered in Tennessee—including both fully electric vehicles and PHEVs<sup>31</sup>—approximately 0.2% of the roughly 5.6 million light-duty vehicles registered statewide in 2020.<sup>32</sup> Compared to the fuel-efficient gas-powered vehicles they replace, these EVs represent about a \$2 million loss of yearly fuel tax revenue, which was offset in part by the \$1.4 million in EV registration fees collected in fiscal year 2021-22 from owners of the fully electric vehicles—as discussed above the EV registration fee doesn't apply to PHEVs. From June 2020 to June 2022, the number of EVs registered in Tennessee more than doubled (+123%), and their share of total vehicles will likely continue to increase. If these three years of exponential growth in EV adoption are projected through 2030, as shown below in figure 6, there will be approximately 180,000 EVs registered in Tennessee—nine times as many as there are today. However, it will take even faster growth to reach the goal of 200,000 in 2028 set by the Drive Electric Tennessee coalition, which should come as EVs capture a greater share of the new vehicle market. EVs' share of new light-duty vehicle sales in Tennessee in the second quarter of

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<sup>28</sup> Public Chapter 2, Second Extraordinary Session, 2021.

<sup>29</sup> Public Chapter 1130, Acts of 2022. "Proposed Highway Program for Fiscal Year 2022-2023."

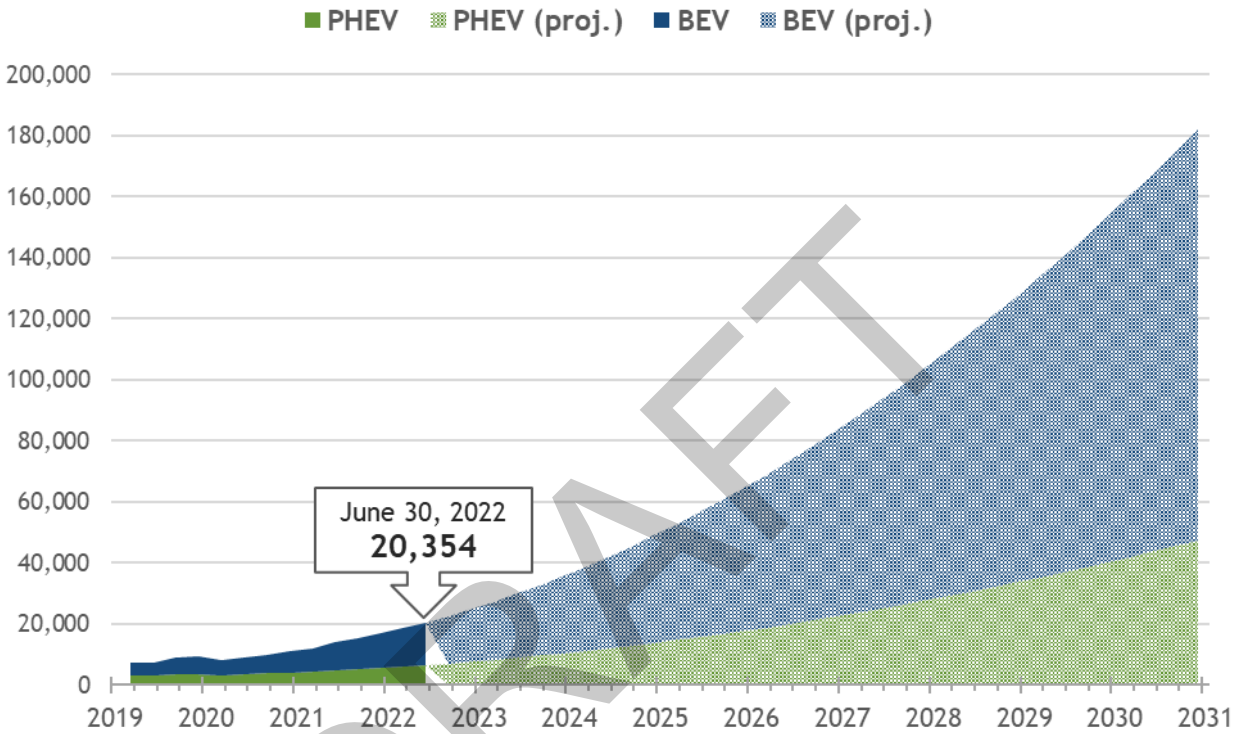
<sup>30</sup> FHWA "Highway Statistics" Table SF-1 (2020).

<sup>31</sup> Atlas Public Policy "State EV Registration Data."

<sup>32</sup> TACIR staff estimate of light-duty vehicle registrations from FHWA Tables MV-1 and MV-9.

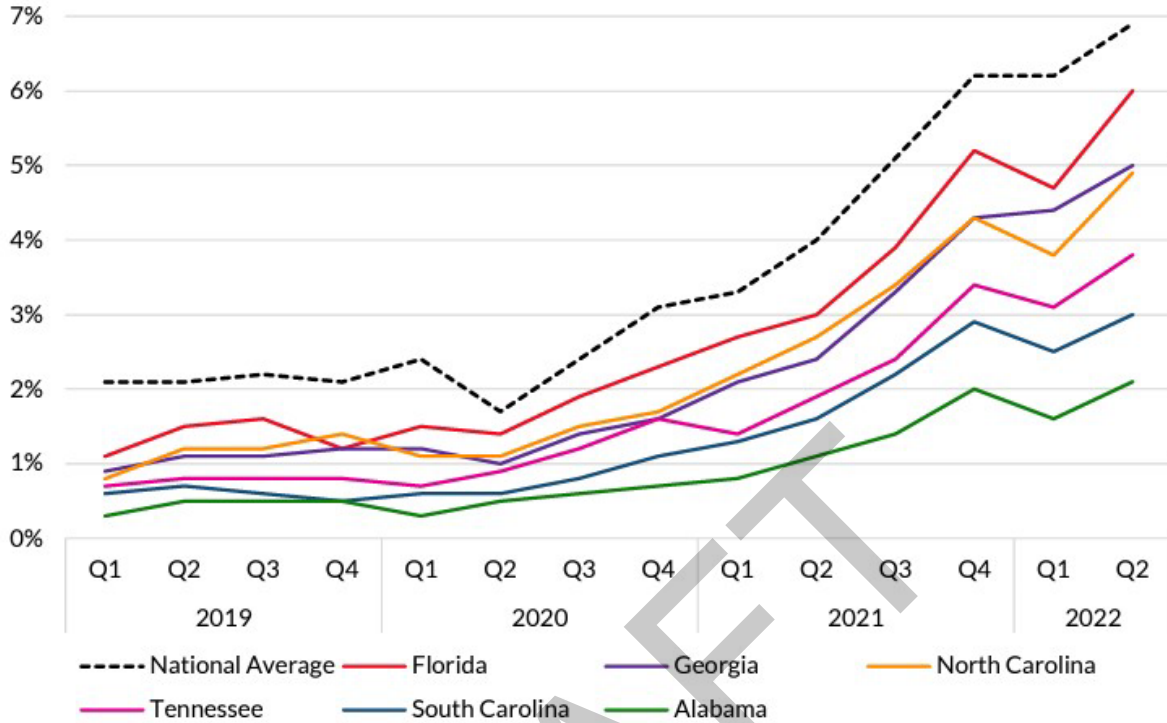
2022 was roughly double what it was the year prior, though it still accounted for less than 4% of light-duty vehicle sales. Figure 7 shows the growing share of EV sales in Tennessee and other southeastern states.

**Figure 6. Projected Numbers of Electric Vehicles in Tennessee**  
*(based on existing trends)*



Source: TACIR staff projections of registration data provided by Atlas EV Hub.

**Figure 7. Southeast States' EV Sales as a Percentage of Light-duty Vehicle Sales.**



Source: Atlas EV Hub. EV sales (includes fully-electric and PHEVs) as a percentage of light-duty vehicle sales from January 1, 2019, through June 30, 2022.

If current trends continue, the percentage of light-duty vehicles registered in Tennessee that are EVs is projected to increase to about 3% in 2030 and between 7% and 10% by 2040. Based on the projected rate of EV adoption in Tennessee, EVs could be responsible for a \$19 million decrease in gas tax revenue in 2030—offset in part by \$12 million in EV registration fees—and \$68 million in lost revenue in 2040, offset in part by \$43 million in fees.

**Several factors could affect future adoption of EVs.**

Among the many factors that could affect future numbers of EVs on the road are the availability of charging infrastructure; automakers’ plans to shift away from internal combustion engines, government actions at the federal, state, and local levels; and other factors, including the prices of gasoline and electricity, the availability of federal and state tax incentives, the availability of raw materials needed to build EVs and batteries, and global supply chain disruptions.

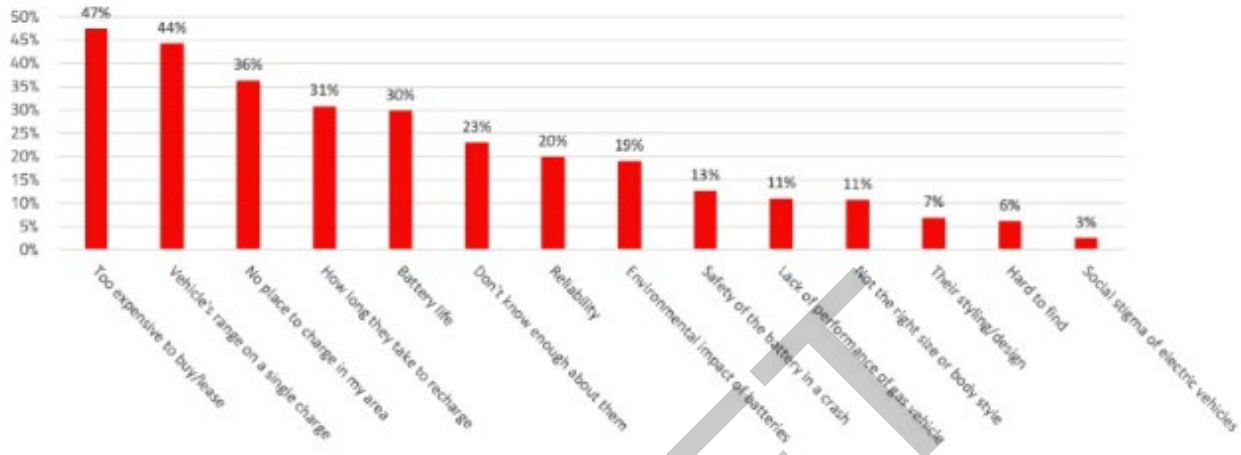
**Availability of charging infrastructure will affect EV adoption.**

In a 2022 survey of active car shoppers, 44% said they were worried about EVs’ range on a single charge, and 36% said that there wasn’t enough local charging infrastructure to



support them using an EV. After price, these were the two most common reasons shoppers wouldn't buy an EV. See figure 8.

**Figure 8. Reasons Car Shoppers Chose Not to Buy an EV.**



Source: Autolist.com 2022.

The federal government has put new programs in place to encourage the expansion of the nation's charging infrastructure. The 2022 Bipartisan Infrastructure Law (Infrastructure Investment and Jobs Act) established a \$5 billion National Electric Vehicle Infrastructure Formula Program (NEVI) to build out a national network of 500,000 EV chargers by 2030. The law also created a Joint Office of Energy and Transportation to facilitate collaboration between the departments of Energy and Transportation.<sup>33</sup>

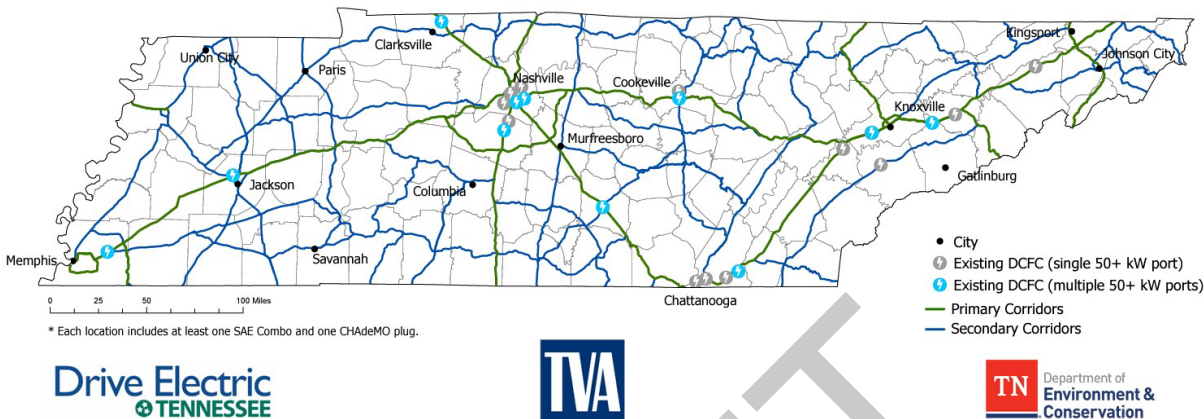
### **Efforts to Expand Charging Infrastructure in Tennessee**

Tennessee has been developing plans to expand charging availability since 2018 when several stakeholders came together to form Drive Electric Tennessee (DET). In January 2019, DET published *A Roadmap for Electric Vehicles in Tennessee*, setting the goal of having 200,000 EVs on the road by 2028. One aspect of the group's plan to reach that goal was to improve charging infrastructure across the state—at the time, there were just 23 publicly accessible fast-charging stations in Tennessee. To help facilitate these improvements, TDEC and TVA formed a partnership to construct 50 new fast-charging locations at a cost of \$20 million towards the construction of, including \$5 million from the state's Volkswagen Diesel Settlement Environmental Mitigation Trust allocation and \$7 million in federal funds provided through TDOT. The program will provide up to

<sup>33</sup> Public Law 117-58 (Nov. 15, 2021). See FHWA "Bipartisan Infrastructure Law" and Joint Office of Energy and Transportation at [driveelectric.gov](https://driveelectric.gov).

80% funding for local power companies and utilities to develop charging stations along designated corridors.<sup>34</sup> See map 4.

**Map 4. Designated Charging Corridors in Tennessee (July 2021).**



Source: Drive Electric Tennessee.

In July 2022, TDEC awarded \$5.2 million to 12 entities for the installation of 32 charging units at 13 sites. TVA says it anticipates funding an additional 21 projects in Tennessee that will include 56 total charging units in 27 locations.<sup>35</sup> TDEC says the state will need at least 20 additional charging sites to meet the federal government’s requirements to locate chargers at 50-mile intervals along the designated corridors. To help reach this goal, the state will use some of the \$88 million in NEVI funds it expects to receive over the next five years.<sup>36</sup>

Some of Tennessee’s local power companies offer incentives to residential and commercial customers who install charging equipment. The Knoxville Utilities Board offers residential customers rebate up to \$400 for the purchase and installation of a Level 2 EV charging station.<sup>37</sup> In Chattanooga, EPB offers incentives of \$500 or \$2,000 for commercial customers to install publicly available charging stations.<sup>38</sup> Figure 9 shows how the number of charging stations in Tennessee has increased since 2017. Some

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<sup>34</sup> TDEC “Fast Charge TN Network.”

<sup>35</sup> TDEC 2022.

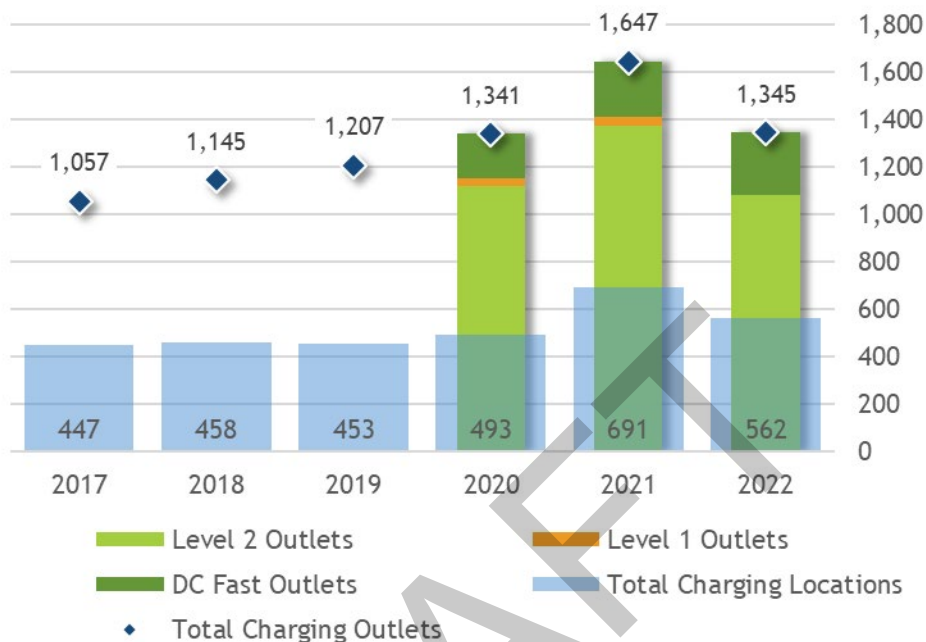
<sup>36</sup> TDOT 2022.

<sup>37</sup> KUB “Electric Vehicle Charger Rebate.”

<sup>38</sup> EPB “EV Charging Incentive.”

stakeholders have expressed concerns that the current electric grid may not be able to support the projected number of charging stations in certain locations.<sup>39</sup>

**Figure 9. Electric Vehicle Charging Stations in Tennessee, 2017-2022.**



Source: Alternative Fuels Data Center (last updated: 9/13/2022). In 2021, increases resulted from a change in counting methods; in many cases, one station was split into several new stations to represent different physical locations of equipment at one address. Data for outlet types was not collected prior to 2020.

**Automakers are decreasing production of internal combustion engines and investing heavily in EV and battery manufacturing**

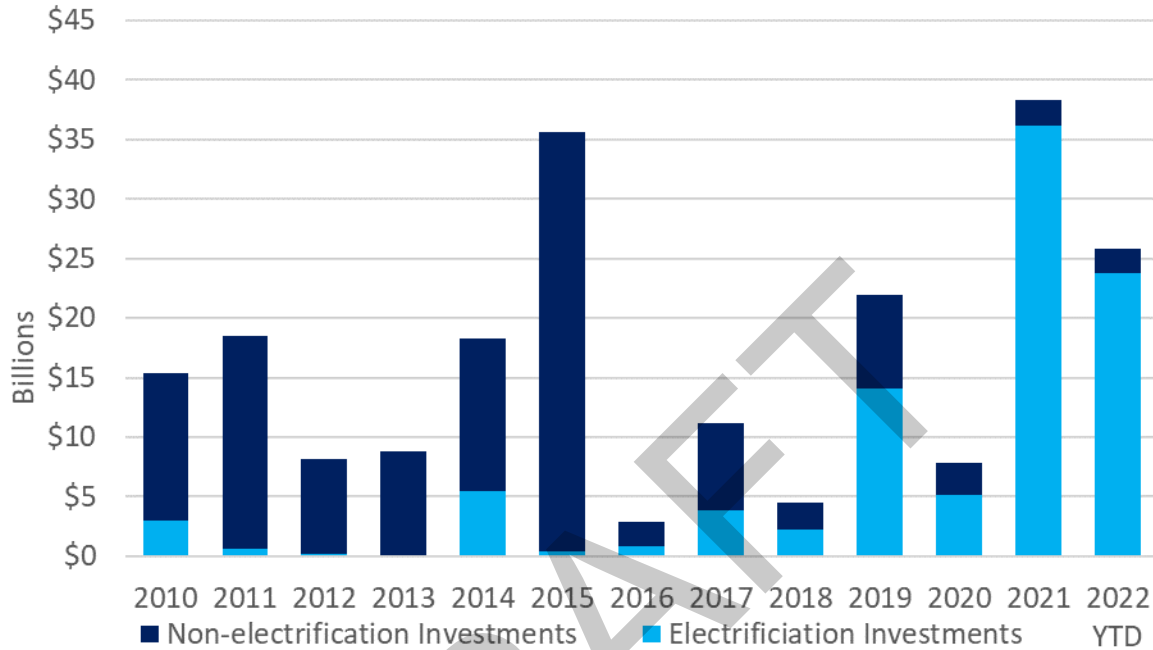
Nearly every major vehicle manufacturer has made a public statement or commitment to virtually end their production of internal combustion engines by 2040, and automakers are making substantial investments in EV and battery manufacturing. In October 2020, General Motors (GM) announced it would invest \$2 billion in its Spring Hill assembly plant to transition the facility for electric vehicle manufacturing. Shortly thereafter, Ultium Cells, GM’s joint venture with LG Energy, said it would invest more than \$2.3 billion to build its second US battery cell manufacturing plant in Spring Hill.<sup>40</sup> According to the Center for Automotive Research, automakers have announced \$60 billion of investments in 2021 and 2022 to build North American facilities dedicated to

<sup>39</sup> Giordano 2022 and Vock 2022.

<sup>40</sup> Area Development 2021.

manufacturing EVs and batteries—including Ford’s plan to invest \$11.4 billion to build Blue Oval City and Blue Oval SK Battery Park in Tennessee and Kentucky.<sup>41</sup> See figure 10.

**Figure 10. Automotive Investment Announcements in North America, 2010-2022**



Source: Center for Automotive Research 2022.

The federal government is encouraging automakers to rapidly increase EV production as well. In 2021, President Biden issued an executive order with the goal “that 50 percent of all new passenger cars and light trucks sold in 2030 be zero-emission vehicles, including battery electric, plug-in hybrid electric, or fuel cell electric vehicles.”<sup>42</sup> California’s governor signed a similar order for his state in 2020<sup>43</sup>; in 2022, the California Air Resources Board approved the regulations necessary to phase out the sale of new gasoline-powered cars completely by 2035.<sup>44</sup>

<sup>41</sup> Center for Automotive Research 2022.

<sup>42</sup> Executive Order 14037 of August 5, 2021. 86 FR 43583.

<sup>43</sup> Office of Governor Gavin Newsom “Governor Newsom Announces California Will Phase Out Gasoline-Powered Cars & Drastically Reduce Demand for Fossil Fuel in California’s Fight Against Climate Change.” (Press release.)

<sup>44</sup> Rott 2022.

## **Other Government Actions Affecting EV Adoption**

Federal and state tax incentives that lower the cost of buying an EV could affect the rate of EV adoption. The federal government has offered tax credits of up to \$7,500 since 2008.<sup>45</sup> The Inflation Reduction Act of 2022 continued this credit for purchases of some new EVs and expanded it for the first time with a \$4,000 credit for some used EVs. Should future administrations choose to end these incentives, it could have a negative effect on the EV market. Eighteen states also offer additional incentives, but Tennessee is not currently among them.

With an executive order issued December 2021, President Biden directed the federal government to use its scale and procurement power to achieve goals of 100% light-duty zero-emission vehicle (ZEV) acquisitions by 2027 and 100% of all vehicle acquisitions being ZEV by 2035.<sup>46</sup> Towards those goals, the US Postal Service (USPS) is replacing tens of thousands of its gas-powered delivery vehicles with EVs in the coming years. Between a contract for 50,000 newly designed next-generation vehicles and “plans to buy more than 34,500 commercial off-the-shelf delivery vehicles over two years . . . USPS says at least 40% of the 84,500 vehicles it will buy will be EVs.”<sup>47</sup> The Inflation Reduction Act of 2022 “allocated \$3 billion in additional funding to the US Postal Service for electrification of the nation’s delivery fleet.”<sup>48</sup>

Several state governors have issued executive orders directing their agencies to buy electric for their vehicle fleets. State agencies in Connecticut, Illinois, and Maine are adopting electric vehicles and installing EV charging stations on state property. The state of Washington intends to reach a 100% light-duty battery electric vehicle fleet by 2035 and make medium- and heavy-duty fleets fully electric by 2040. Finally, in Massachusetts, the governor ordered all state agencies to buy ZEVs starting in 2022, to double electric charging stations installed at state facilities by 2030, and to make its entire fleet 100% ZEV by 2050.<sup>49</sup> As of June 30, 2020, the State of Tennessee owned five electric vehicles and two hybrids.<sup>50</sup> State law “encourage[s] the acquisition of energy-efficient and alternative fuel motor vehicles in the fleet of state vehicles.” By definition, “energy-

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<sup>45</sup> Public Law 110-343 (Energy Improvement and Extension Act of 2008) October 3, 2008.

<sup>46</sup> Executive Order 14057 of December 8, 2021. 86 FR 70935.

<sup>47</sup> Shepardson 2022.

<sup>48</sup> Dow 2022.

<sup>49</sup> Mullaley 2022.

<sup>50</sup> TN Department of General Services 2020.

efficient motor vehicles” are not necessarily EVs and include gas-powered vehicles with highway fuel economy of at least 25 mpg.<sup>51</sup>

According to Drive Electric Tennessee, the cities of Knoxville, Nashville, and Kingsport have added EVs to their government fleets—Kingsport has the first Nissan Leaf police car in the country. Electric utilities in Chattanooga and Knoxville also have EVs in their fleets.<sup>52</sup> In August 2022, Shelby County Mayor Lee Harris signed an executive order to replace county government gas vehicles with hybrid and zero-emission electric ones.<sup>53</sup> The Tennessee Valley Authority (TVA) “intends to add nearly 1,200 light- and medium-duty EVs and more than 300 additional charging stations at key TVA locations” to replace half of its vehicle fleet with EVs by 2030.<sup>54</sup>

### **Other Factors affecting the adoption of EVs**

If gasoline prices are low for an extended period, consumers may not see purchasing an EV as beneficial. Conversely, if gas prices are higher, more consumers could consider EVs to replace their gas-powered vehicles. Currently, the relatively low cost of electricity makes charging an EV at home cheaper than the equivalent cost of gasoline. If electricity prices were to increase dramatically, that too could have a negative effect on EV purchases.

Supply chain and material costs in particular could make EVs too expensive for mainstream adoption. Although the gap is narrowing, EVs are often priced higher than gas-powered vehicles in the same class. Supply shortages and disruptions have the potential to drive up EV prices and slow the rate of adoption. Materials like lithium, titanium, and metals used to make rare-earth magnets come from countries all over the globe. The scarcity of these materials is a concern, as is the reliance on countries other than the United States to supply them.

### ***Improvements in fuel efficiency and inflation will have a greater effect on road funding than EV adoption.***

Although EVs will affect road funding in Tennessee, they won’t have the greatest effect in the coming decades. Instead, improvements in fuel efficiency will reduce fuel tax

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<sup>51</sup> Tennessee Code Annotated, Section 4-3-1109.

<sup>52</sup> Drive Electric Tennessee “EV Fleets & Projects in TN.”

<sup>53</sup> Chaney 2022.

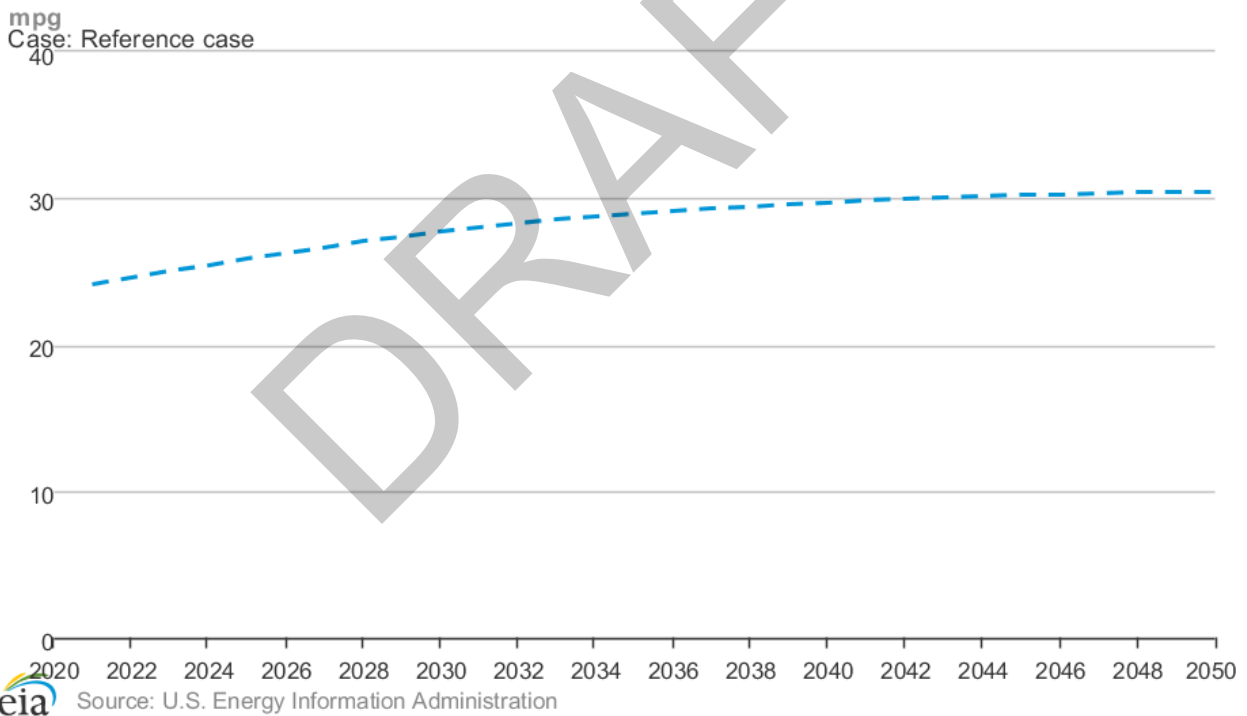
<sup>54</sup> Tennessee Valley Authority “TVA Announces Fleet EV Plan.”

revenue to a greater extent. But inflation will have the greatest overall effect because it erodes the purchasing power of the state’s road funding.

### Improved Fuel Efficiency Reduces Fuel Tax Revenue

As fuel economy increases, less tax revenue is generated per mile driven. Many new cars today routinely get 30 mpg or better; the national average fuel economy for all light-duty vehicles in use reached 23 mpg in 2020<sup>55</sup> and is projected to increase to nearly 28 miles per gallon in 2030 (a 21% improvement) and 30 miles per gallon in 2040 (30% better than in 2020). See figure 11. For a person driving an average of 15,054 miles in a year, this means buying 116 fewer gallons of gas in 2030 (paying \$31 less in gas tax at the state’s current rate) and 152 fewer gallons in 2040 (paying \$40 less in gas tax). These increases to the overall fuel economy of vehicles in Tennessee have the potential to reduce total gas tax revenue by \$76 million (-7%) in 2030, compared to what it might be without improvement, and \$163 million (-15%) in 2040.

**Figure 11. Projected Average Fuel Economy of US Light-Duty Vehicles**



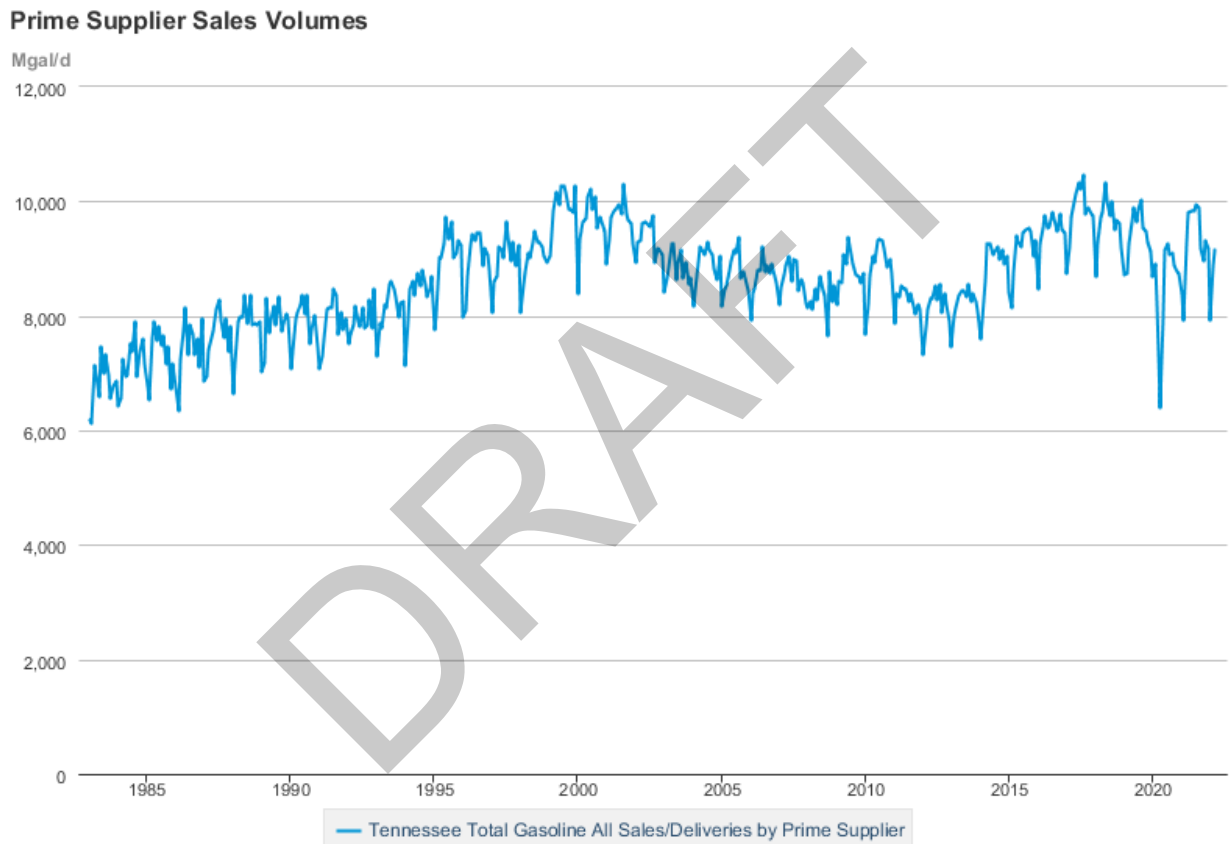
“The U.S. Department of Transportation’s National Highway Traffic Safety Administration (NHTSA) published the Final Rule on Corporate Average Fuel Economy (CAFE) Standards for Model Year (MY) 2024 – 2026 passenger cars and light-duty trucks

<sup>55</sup> FHWA “Highway Statistics 2020” Table VM-1.

in March 2022. The standards require an industry-wide average fleet fuel economy of approximately 49 miles per gallon in MY 2026, increasing fuel efficiency by 8% in MY 2024 and 2025 and 10% in MY 2026.”<sup>56</sup>

Gasoline sales in Tennessee peaked around the year 2000, then fell steadily until 2014 before peaking again in 2017. Sales in 2021 and 2022 have rebounded from 2020 lows during the COVID-19 pandemic but remain below these previous peaks. This despite there being 700,000 more registered vehicles in 2020 than 2010. See figure 12.

**Figure 12. Monthly Gasoline Sales to Suppliers in Tennessee**



 Source: U.S. Energy Information Administration

**Inflation is going to continue to decrease the purchasing power of transportation revenue.**

Road construction costs are increasing, reducing the purchasing power of Tennessee’s fuel tax revenue. The national Highway Construction Cost Index (NHCCI) is a quarterly

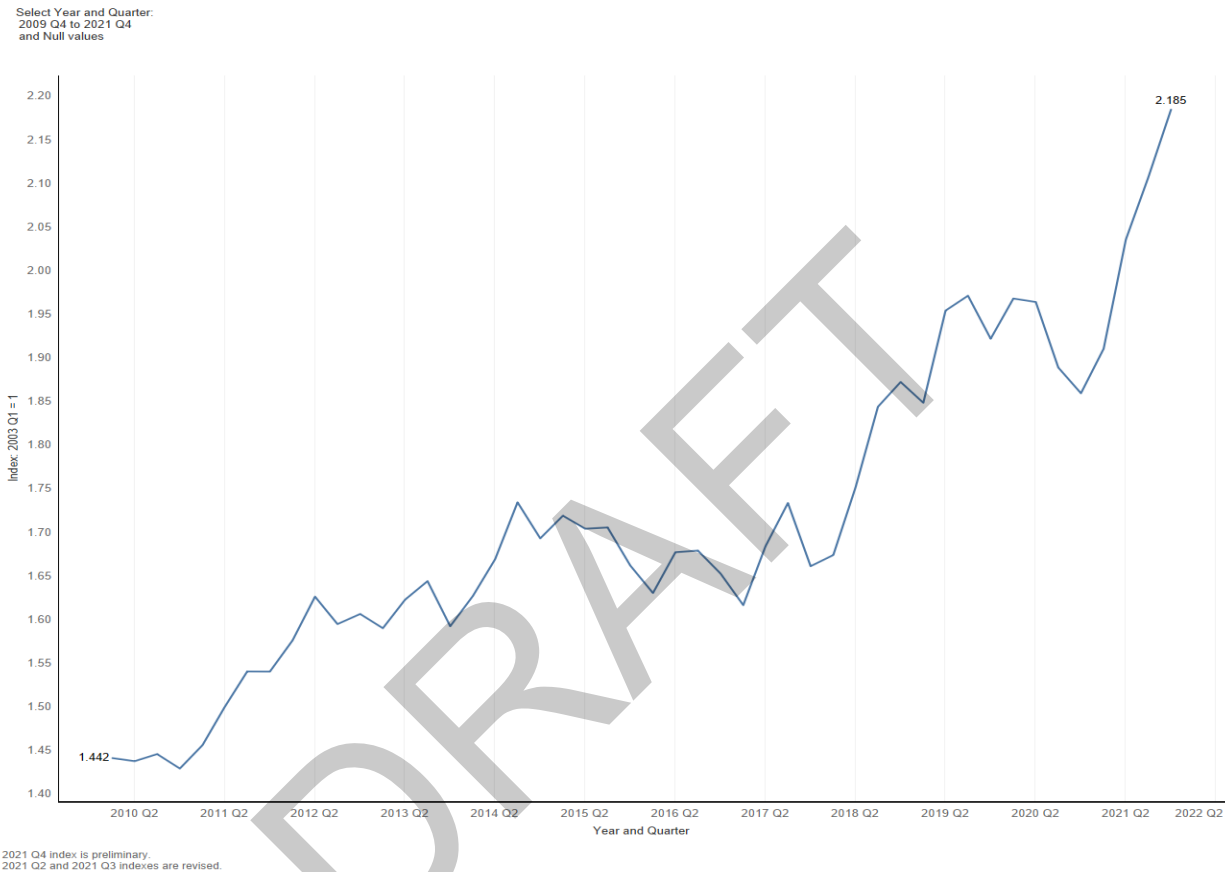
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<sup>56</sup> Alternative Fuels Data Center “Recent Federal Actions.”



price index developed by the FHWA “to measure the national average changes in highway construction costs over time.”<sup>57</sup> The NHCCI rose sharply between 2010 and 2014, held somewhat level until 2018, and has been trending upward since with the exception of 2020 during the COVID-19 pandemic. See figure 13.

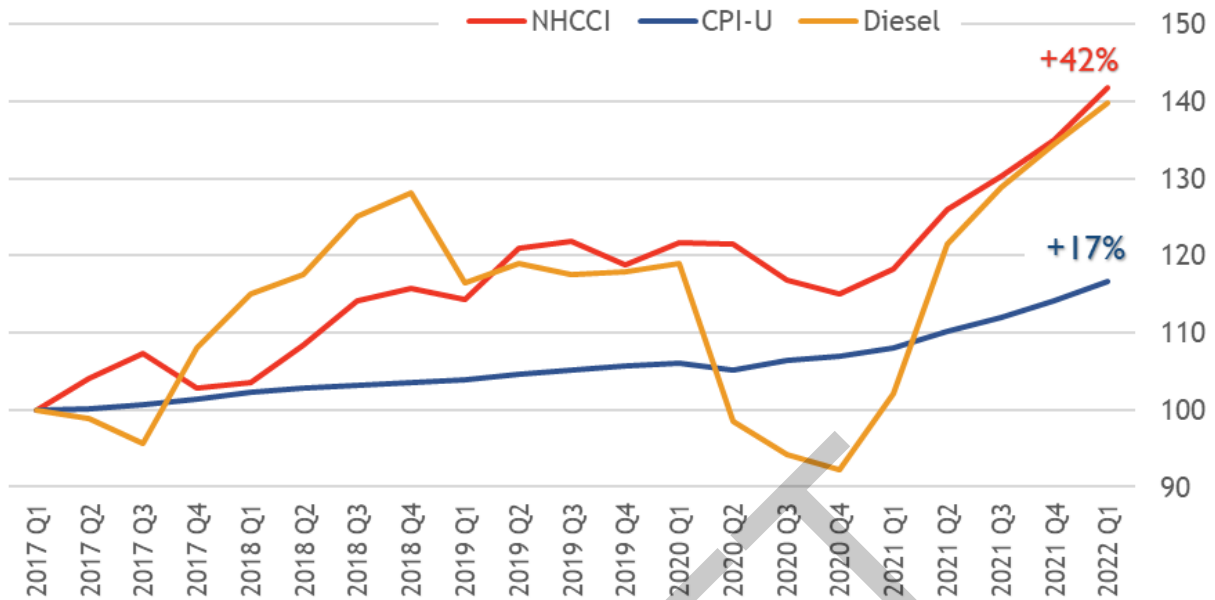
**Figure 13. National Highway Construction Cost Index (NHCCI)**



Prices for most goods and services increase each year, but over the past four years highway costs have grown much faster than prices overall. One reason could be higher fuel prices, particularly for the diesel fuel needed to power trucks and equipment. The US average price for diesel increased 40% from the first quarter of 2017 to the first quarter of 2022, while highway construction costs increased by 42%. Meanwhile, the government’s broad measure of inflation, the Consumer Price Index (CPI-U), increased just 17% over the same four years. See figure 14.

<sup>57</sup> FHWA “Description of NHCCI Methodology.” “It uses data from winning bids on highway construction contracts to “represent state- and project-level details on prices, and quantities of pay items for those winning contracts.”

**Figure 14. Highway Construction Costs and Consumer Price Inflation.**

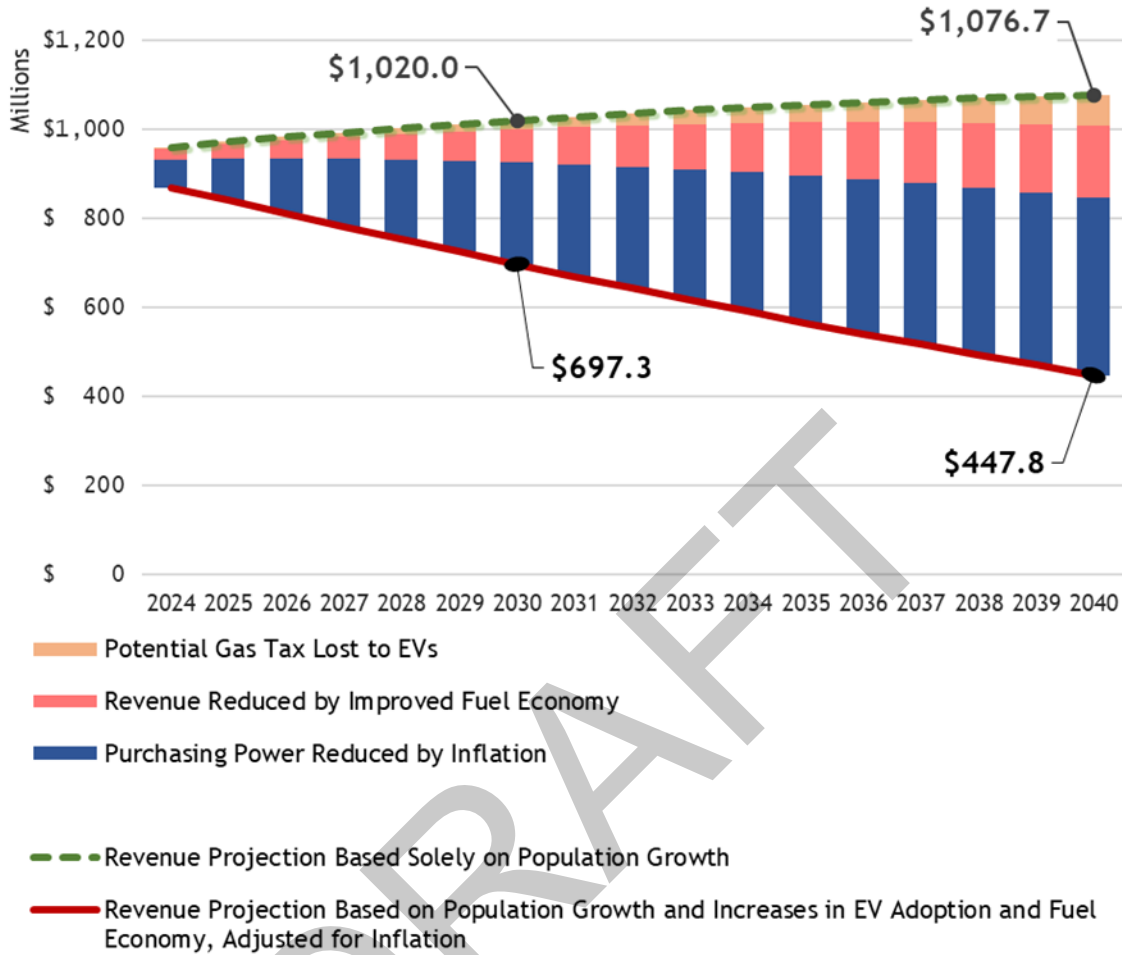


Source: Bureau of Labor Statistics CPI for All Urban Consumers (CPI-U); FHWA National Highway Construction Cost Index (NHCCI); US Energy Information Administration Weekly Retail Diesel Prices.

When inflation occurs, and prices increase, sales tax revenue increases because it is calculated according to the price of the item sold. But for gasoline and motor fuel taxes, the tax is based on the volume sold, not on the price. This means that gasoline and motor fuel tax revenue will not necessarily increase when prices increase. Highway costs have risen faster than overall inflation in the past decade (3.6% on average vs. 2.1%) and at that rate could increase by 33% by 2030 and by 89% by 2040.

Inflation is going to be the most significant factor to affect future funding for the state’s highways, as the buying power per gallon of the state’s fuel taxes is diminished. As shown below in figure 1 (reposted), the rising costs of highway projects and maintenance are projected to have a greater effect on road funding in Tennessee than either the growing number of EVs or improvements in average vehicle fuel efficiency. If trends in fuel efficiency and the adoption of electric vehicles continue, the current 27-cents-per-gallon gas tax could generate \$95 million less in 2030 than it would have otherwise—remaining essentially flat from 2024-2030. By 2040, potential revenue could be reduced by \$230 million. Rising construction costs, however, have the potential to reduce the purchasing power of that revenue by an additional \$228 million in 2030 and \$399 million in 2040, leaving the state with roughly half the buying power it will have in 2023.

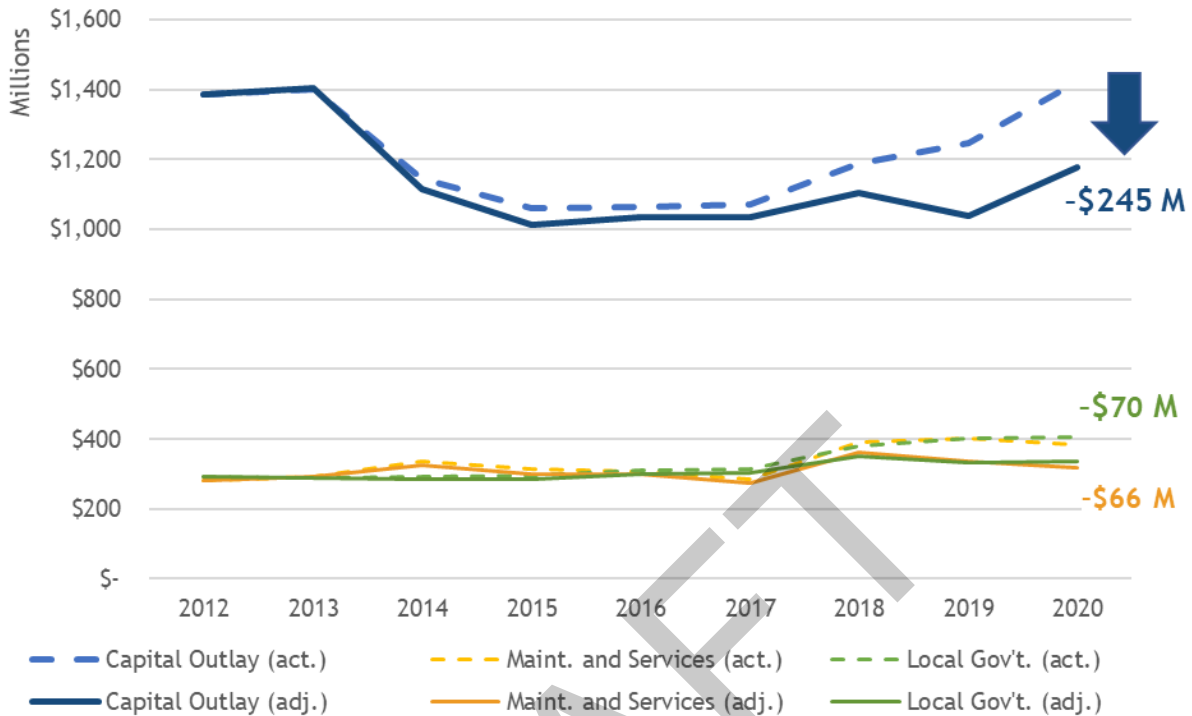
**Figure 1 (reposted). Factors Affecting Projected Gas Tax Revenue in Tennessee, 2024-2040.**



Source: TACIR staff projections based on state population projections and data from Atlas EV Hub (EV registrations), EPA Automotive Trends Report (fuel economy), the National Highway Construction Cost Index and Bureau of Labor Statistics (inflation).

Figure 15 shows the effects of inflation on actual state highway spending in recent years. In nominal dollars, capital outlay spending on state roads appears to have returned to 2012-13 levels. However, because of inflation, adjusted spending was \$245 million less. Compared to 2012, inflation has reduced the actual spending power of funding for maintenance and services by \$66 million and aid to local governments by \$70 million.

**Figure 15. Inflation-adjusted State Highway Spending by Category.**



Source: FHWA “Highway Statistics,” Table SF-2 (2012-2020).

**Other states’ approaches to maintaining or enhancing road funding.**

Tennessee is not the only state facing the adoption of electric vehicles, increasing fuel efficiency, and inflation. According to the National Association of State Budget Officers, “States are concerned that in the long term, the current structure of state and federal fuel tax revenue will not be able to meet transportation needs, as most gas taxes are set at fixed rates and do not rise with inflation, new vehicle fuel economy continues to increase, and growth in vehicle miles traveled has leveled off.”<sup>58</sup>

Some of the approaches adopted by other states to maintain or enhance their road funding include sharing EV registration fees with local governments, using EV fees to support the expansion of EV-charging infrastructure, varying all registration fees by vehicle weight, indexing fuel taxes to inflation or fuel efficiency, authorizing local option fuel taxes, and adopting vehicle miles traveled (VMT) taxes.

<sup>58</sup> NASBO 2021.

## **Allocating EV Registration Fees**

Tennessee's additional registration fee for electric vehicles is not shared with local governments unlike revenue from the gas tax. This is despite it being adopted in part to make up for EVs' lack of fuel consumption.<sup>59</sup> Nine states with EV fees distribute some of that revenue to their local governments.<sup>60</sup> Mississippi, Missouri, and North Dakota distribute revenue from EV fees in the same proportion as those states' fuel taxes.<sup>61</sup> The others share a portion of the revenue with local governments, but not necessarily the same as with fuel taxes.

A few states also allocate some EV-fee revenue to support electric vehicle infrastructure. For example, Alabama allocates \$50 of its \$200 fee for new electric vehicle infrastructure and Washington added an additional \$75 fee in 2019 to support charging stations. Colorado dedicates \$20 of [its] \$50 EV fee to the Electric Vehicle Grand Fund to support charging stations.<sup>62</sup>

## **Varying Registration Fees by Vehicle Weight**

Research has shown that heavier vehicles "impose a vastly disproportionate share of wear and tear on highway infrastructure compared with the lightest vehicles."<sup>63</sup> Like in other states, heavy freight vehicles pay higher registration fees in Tennessee, but the state does not vary the fee for personal vehicles based on weight. In Tennessee, the owner of a 7,000-pound, long-bed, crew-cab pickup truck pays the same \$23.75 registration fee as the owner of a 3,000-pound compact car. Arkansas, for comparison, has three weight classes for automobiles, with fees that range from \$17.00 to \$30.00, and trucks over 6,000 pounds are charged \$6.50 per 1,000 pounds.<sup>64</sup> Florida is similar, with fees for three classes of vehicles under 5,000 pounds (\$14.50-\$32.50). The fee for trucks between 5,000 and 5,999 pounds is \$60.75 and \$87.75 from 6,000 to 7,999 pounds.<sup>65</sup> Thirteen states and the

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<sup>59</sup> Interview with Stephen Smith, Deputy Commissioner and Director, TennCare, April 1, 2021.

<sup>60</sup> NCSL "Special Fees on Plug-In Hybrid and Electric Vehicles." The states are: Alabama, Idaho, Indiana, Michigan, Minnesota, Mississippi, Missouri, North Dakota, and Ohio.

<sup>61</sup> Mississippi Code Annotated, Section 27-19-21; Missouri Annotated Statutes, Sections 142.345 and 142.869; Missouri Constitution, Article IV, Section 30a; North Dakota Century Code, Section 39-04-19.2 and Section 54-27-19.

<sup>62</sup> NCSL "Special Fees on Plug-In Hybrid and Electric Vehicles."

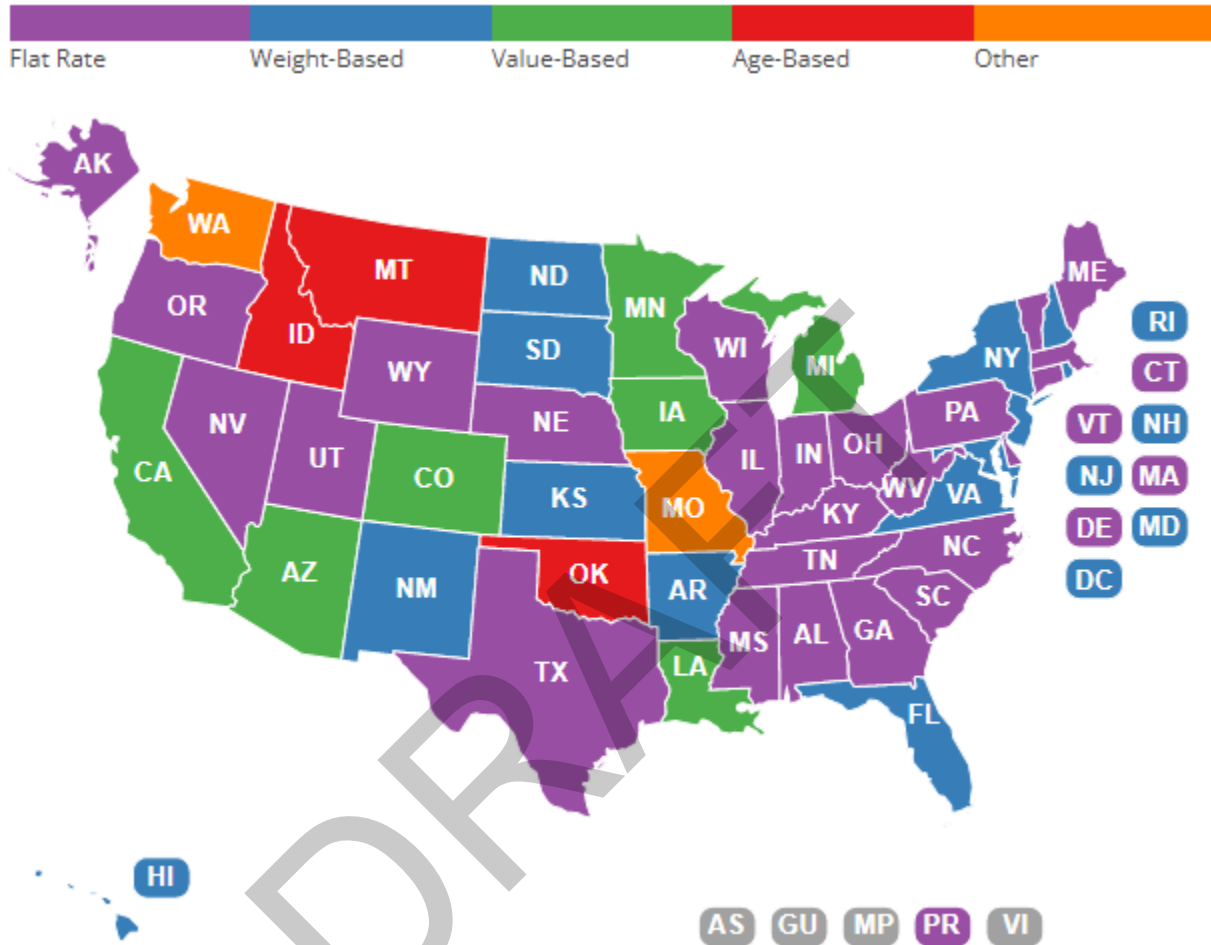
<sup>63</sup> National Academies of Sciences, Engineering, and Medicine 2019.

<sup>64</sup> Arkansas Code Annotated, Section 27-14-601.

<sup>65</sup> Florida Annotated Statutes, Section 320.08.

District of Columbia have weight-based registration fees for all passenger vehicles, ranging from \$14.50 to \$274.00. See map 5.

**Map 5. Methods to Determine Registration and Title Fees by State.**



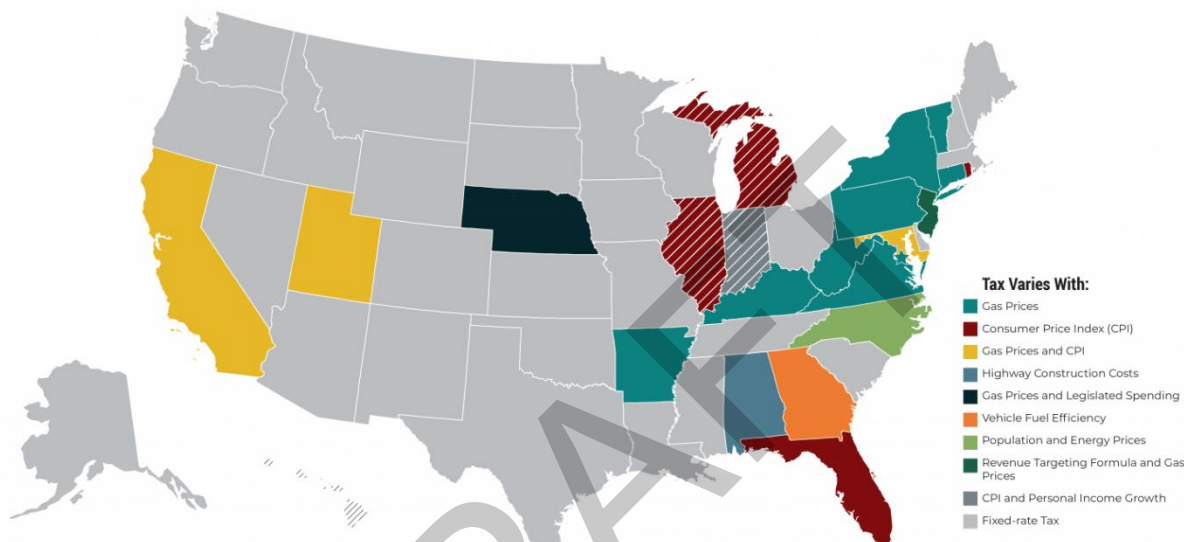
Source: National Council of State Legislatures 2020.

**Indexing Fuel Taxes to Inflation or Fuel Efficiency**

Because they are set at fixed, per-gallon amounts that require legislative action to amend, Tennessee’s fuel taxes are similar to federal fuel taxes and those in most states. This means that fuel consumption (the volume of gallons sold and taxed) needs to increase over time for revenue to simply keep up with inflation. “Since 2013, eight states (Alabama, Arkansas, Maryland, New Jersey, Pennsylvania, Rhode Island, Utah, and Virginia) as well as the District of Columbia have abandoned their old gas tax structures in favor of more sustainable, variable-rate designs where the tax rate is allowed to rise alongside gas prices, the general inflation rate in the economy, vehicle fuel efficiency, or

other relevant factors.”<sup>66</sup> In 2017, when the General Assembly was considering the legislation that ultimately became the IMPROVE Act, Senate Bill 1107 by Senator Kyle and House Bill 1243 by Representative Clemmons proposed indexing Tennessee’s fuel tax rates to a combination of inflation and population growth, but the bill did not pass. Figure 20 shows the 22 states that have mechanisms to automatically adjust gas tax rates and the criteria for adjustment used in each.

**Map 6. States that have mechanisms to automatically adjust gas tax rates (2019).**



Source: Institute on Taxation and Economic Policy, June 2019.  
 Striped states (HI, IL, IN, and MI) apply their general sales taxes to gasoline, which results in variations in the tax paid per gallon based on the price of fuel.

ITEP.org

Some of these states combine fixed rates with automatically adjusting portions and legislative adjustments in order to regularly set total rates that meet their states’ current transportation needs. “Nebraska’s gas tax is calculated twice a year based on three factors: a fixed rate which is set by the Legislature, a wholesale tax rate that varies based on the price of fuel, and a variable tax rate, which is adjusted to pay for transportation spending budgeted by the Legislature.”<sup>67</sup> If fuel prices decline, the portion based on wholesale costs declines. However, if the resulting rate becomes insufficient to meet the state’s transportation budget, the legislature can adjust the variable portion to make up the difference. In 2016, New Jersey enacted legislation to provide its Transportation Trust Fund (TTF) program with “\$16 billion over eight years to support critical infrastructure

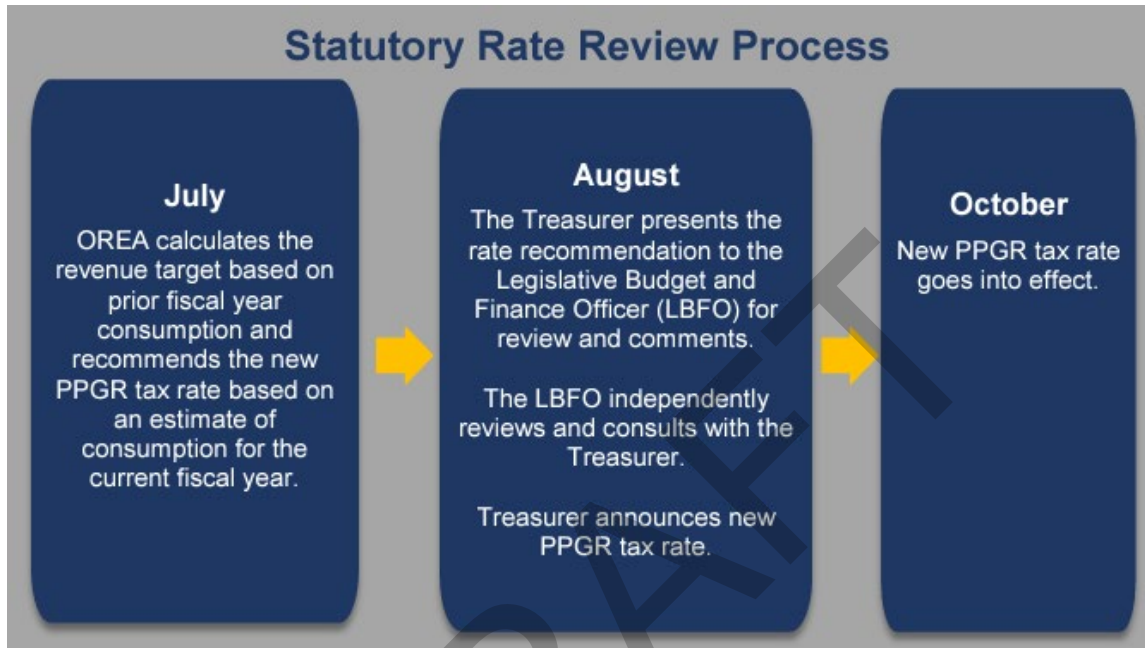
<sup>66</sup> Institute on Taxation and Economic Policy 2019.

<sup>67</sup> Weinberg 2020. See Revised Statutes of Nebraska Annotated, Sections 66-489, 66-489.02, and 66-4140 through 4145.



improvements to the state’s roadways and bridges.”<sup>68</sup> The state has a fixed “motor fuels tax” of 10.5 cents per gallon.<sup>69</sup> To generate the revenue needed for the TTF program, it adds to that a variable Petroleum Products Gross Receipts (PPGR) tax. The state’s Office of Revenue and Economic Analysis provides an explainer (see figure 16).<sup>70</sup>

**Figure 16. New Jersey’s Petroleum Products Gross Receipts Tax.**



Source: New Jersey Office of Revenue and Economic Analysis.

The PPGR rate can increase or decrease as needed. In August 2021, the PPGR rate decreased by 8.3 cents after state officials determined that fuel sales had recovered faster than expected following the 2020 pandemic and collections exceeded the state’s target.<sup>71</sup>

**Local-Option Fuel Taxes**

Fourteen states give local governments the option to levy a local fuel tax.<sup>72</sup> In 2017, Senate Bill 1107 by Senator Kyle and House Bill 1243 by Representative Clemmons would have

<sup>68</sup> New Jersey Department of the Treasury 2021a.

<sup>69</sup> New Jersey Department of the Treasury “Excise Rates.”

<sup>70</sup> New Jersey Department of the Treasury 2021b.

<sup>71</sup> New Jersey Department of the Treasury 2021a.

<sup>72</sup> EIA “Federal and State Motor Fuels Taxes.” The states are: Alabama, California, Florida, Georgia, Hawaii, Illinois, Mississippi, Missouri, Montana, Nevada, New York, Oregon, South Carolina, and Washington.



authorized counties in Tennessee to levy a local tax of up to 3 cents per gallon on gasoline, subject to voter approval. The bill did not pass.

### **Vehicle Miles Traveled Taxes**

Historically, a vehicle's fuel consumption was a reasonable approximation of its miles driven, and fixed-rate fuel taxes generated revenue in close proportion to road use. As fuel efficiency has increased, the connection between fuel consumption and road use has weakened, and with the introduction of EVs, some drivers pay no fuel tax at all.

Because of the many factors reducing the effectiveness of fuel taxes as the primary source of road funding, researchers and transportation experts in several states are exploring the viability of a vehicle-miles-traveled (VMT) tax instead. "A VMT tax is philosophically and literally a direct pay-per-mile-of-use system, similar to a toll road."<sup>73</sup> This type of system allows governments to charge drivers of all types of vehicles, regardless of their fuel source, for each mile driven. Transitioning to a VMT system, however, would require several challenges to be overcome.

#### *Data Collection and System Design Challenges*

"The hurdles to launching a new system are significant, starting with how to collect the tax," writes *Washington Post* transportation reporter Ian Duncan. "The gas tax is cheap to collect, levied on a small number of wholesalers rather than customers, while taxing mileage would require tracking millions of drivers." Possible methods of collection include: odometer reporting, smartphone apps, road sensors or cameras similar to tolling, and onboard GPS devices. Each of these methods would come with tradeoffs as to their cost, level of compliance, ease of administration, interoperability, and concerns about privacy and data security, among others.

Studies show that a VMT tax in the US could be much more efficient and could collect many more dollars for the Highway Trust Fund than the current federal taxing regimen does. One report, commissioned by the American Transportation Research Institute (ATRI), showed that a VMT tax assessed on 272 million private vehicles could result in the collection of more than \$20 billion annually—or 300 times more than the federal fuel-tax system. According to that same March 2021 ATRI study, implementing a VMT collection system would be costly—as much as \$20 billion—in hardware and administration.

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<sup>73</sup> Short and Murray 2021.

*Case studies and pilot programs underway*

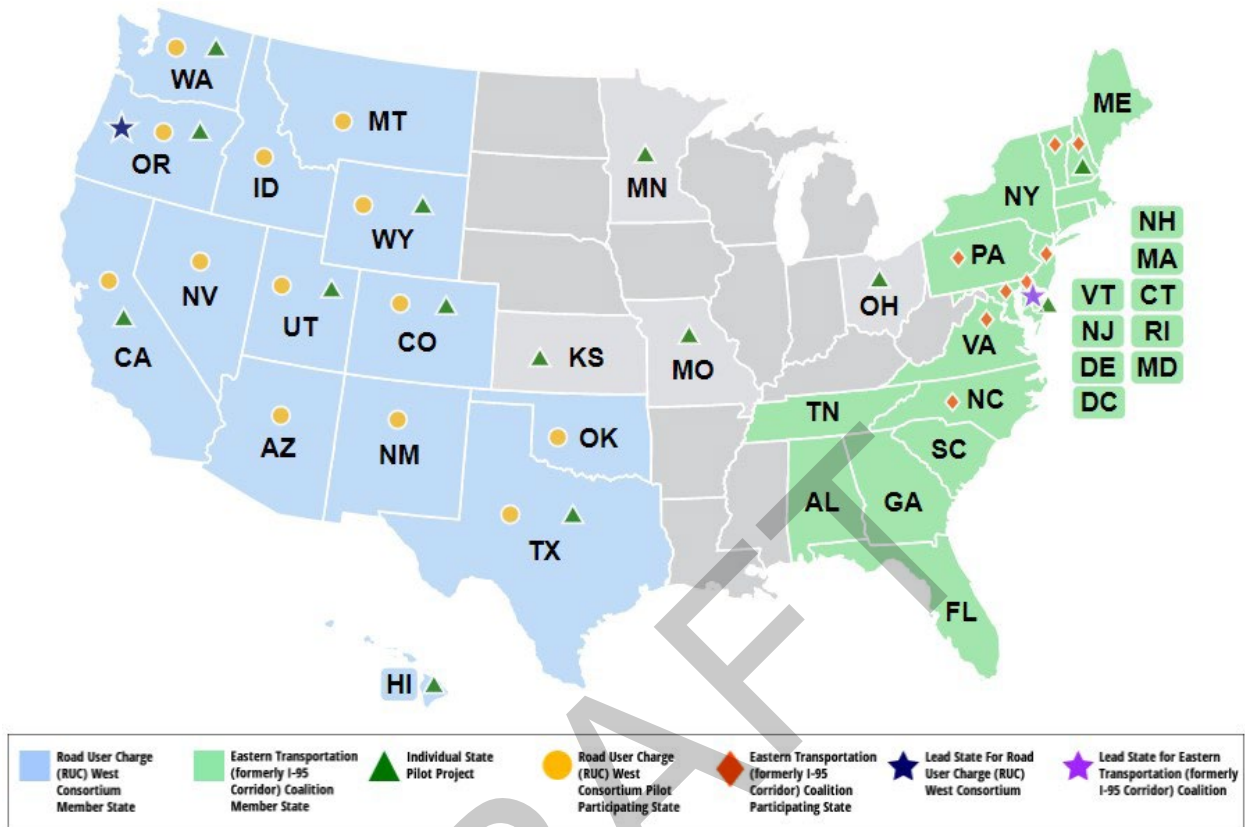
The FAST Act established the Surface Transportation System Funding Alternatives (STSFA) Program to provide grants to states or groups of states “to demonstrate user-based alternative revenue mechanisms.” Fourteen states (California, Colorado\*, Delaware, Hawaii, Kansas, Minnesota, Missouri, New Hampshire, Ohio, Oregon, Texas, Utah, Washington, and Wyoming) and regional pilots have received federal grants to explore alternative funding mechanisms.<sup>74</sup> See map 7.

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<sup>74</sup> NCSL “State Road Usage Charge Toolkit.” \*Colorado was awarded funds that they subsequently returned.

Map 7. STSFA Pilot Project States.



Source: FHWA “Surface Transportation System Funding Alternatives Program.”

Six states have ongoing pilot programs funded by STSFA. Oregon and Utah have the most advanced pilot projects, where drivers can avoid paying registration fees by opting instead to pay mileage-based user fees, with revenue still directed to transportation infrastructure projects. California tested various fee technologies. Washington conducted a 12-month pilot. Grants in the remaining states were used primarily for planning and research. The United States Government Accountability Office (GAO) published a report in January 2022 that highlighted some challenges and lessons learned from these programs:

- Many of the states reported that public acceptance of mileage fee systems remains limited by concerns about protecting privacy and achieving equity.
- Some state DOT officials stated that the public perceived that rural drivers may pay more under a mileage fee system than under the current fuel tax structure.

- In the two states that currently operate active mileage fee systems, Oregon and Utah, costs to date have exceeded revenues.<sup>75</sup>

*Pilot Programs in the Infrastructure Investment and Jobs Act*

The Infrastructure Investment and Jobs Act (IIJA) directs the U.S. Department of Transportation to establish a national per-mile road usage fee pilot program while continuing to support existing STSFA pilots. The extension of STSFA expands eligibility to include local governments and metropolitan planning organizations and increases the federal cost share.

Fifty million dollars over five years is allocated for a new “National Motor Vehicle Per-Mile User Fee Pilot.” USDOT is directed to carry out a nationwide pilot with volunteer participants from all 50 states, including commercial and passenger vehicles. The legislation requires the pilot program to offer different methods for participants to track their mileage and directs USDOT to set annual per-mile fees for different types of vehicles.<sup>76</sup>

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<sup>75</sup> US Government Accountability Office 2022.

<sup>76</sup> Bipartisan Policy Center “Mileage-Based User Fee Pilot Programs and the IIJA.”

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