

# Fixing Funding by the Mile

A PRIMER AND ANALYSIS OF ROAD USER  
CHARGE SYSTEMS

## ABOUT THE NATIONAL LEAGUE OF CITIES

The National League of Cities is the nation's oldest and largest organization devoted to strengthening and promoting cities as centers of opportunity, leadership, and governance. NLC is a resource and advocate for our 49 state municipal leagues, representing 19,000 cities and towns and more than 218 million Americans. NLC's Center for City Solutions provides research and analysis on key topics and trends important to cities, creative solutions to improve the quality of life in communities, inspiration and ideas for local officials to use in tackling tough issues, and opportunities for city leaders to connect with peers, share experiences and learn about innovative approaches in cities.

## ABOUT THE PUBLICATION

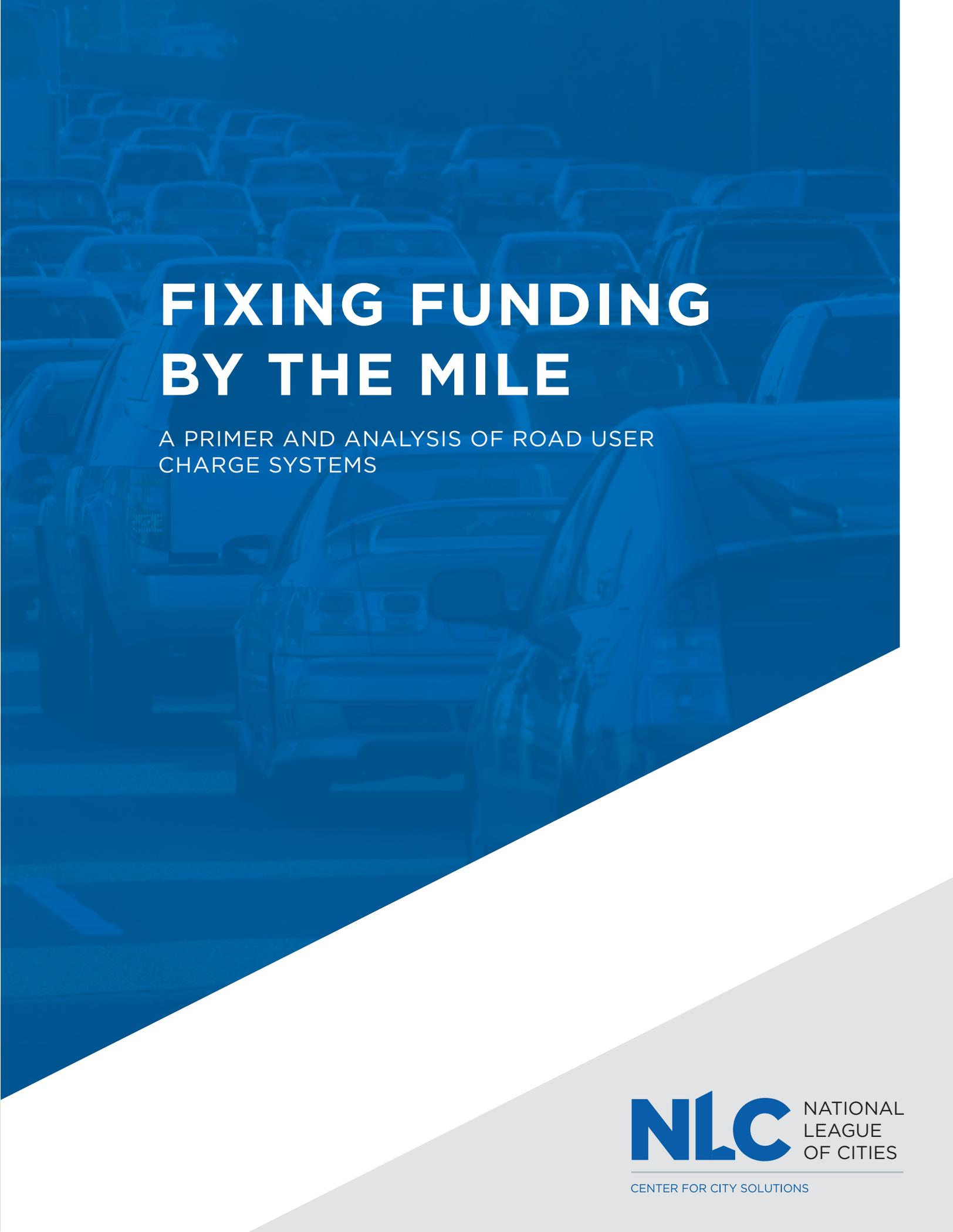
Research for this guide and the original draft of the document were completed by graduate students at the American University Department of Public Administration and Policy. Contributors include **Sarah Brown, Jill Eanett, Petti Matila** and **Naomi Miguel**. These students worked in partnership with **Brooks Rainwater** and **Nicole DuPuis** at the National League of Cities (NLC) to prepare an analysis of an alternative infrastructure funding model commonly referred to as road user charge (RUC) systems.

## ACKNOWLEDGEMENTS

The authors would like to acknowledge the guidance of the NLC Transportation and Infrastructure Services Committee in this report. Thank you to all of the government officials, thought leaders and experts who took the time to speak to us about RUC pilots. Thanks to **Jeffrey Poirier**, adjunct professor in the Department of Public Administration and Policy at American University, who facilitated this partnership.

We also would like to recognize the outside reviewers of this report, **Paul Salama** and **Federic Charlier**, and our colleagues who offered their time and expertise, including **Lucy Perkins, Brittney Kohler**, and **Connor Klein**. Finally, thank you to **Dany Green**, who designed the report and **Laura Cofsky** for editing the report.

All images Getty images, 2018 (unless otherwise noted).



# FIXING FUNDING BY THE MILE

A PRIMER AND ANALYSIS OF ROAD USER  
CHARGE SYSTEMS

**NLC** NATIONAL  
LEAGUE  
OF CITIES

CENTER FOR CITY SOLUTIONS

# Table of Contents

- 1 Letter from NLC's CEO & Executive Director
- 3 Executive Summary
- 7 Advantages and Challenges of RUC Systems
- 9 Road User Charge Programs in Action
- 21 Elements of Implementation
- 27 RUC Systems and Cities
- 35 Addressing the Barriers Towards Implementation
- 39 Conclusion and Recommendations
- 42 Appendix I: Policy Questions to Consider





**M**obility is central to individual prosperity, commerce and the growth of communities. When it comes to city streets, commuter highways, rail lines and ports, cities need transportation networks that run like clockwork. But the costs of congestion and maintenance backlogs are ever-growing, and the funding model the nation uses is not keeping pace with our needs.

“

**Thankfully, with the rise of smart cities, autonomous technology and much more, cities know the U.S. is more prepared than ever to update how we pay for the transportation options our residents and businesses want and need for the future.**

Today’s model for funding transportation, the Highway Trust Fund, was established in the 1950s — a time when autonomous cars and smartphones were mere science fiction. Times have changed — GPS is built into cars and phones, and vehicles are more fuel-efficient. But the funding model is stuck using yesterday’s gas prices. Cities want to work with Congress to find a rational way forward, and this report explores one of the most viable ideas.

In “Fixing Funding by the Mile,” we explore how road user charge (RUC) systems can become a practical funding alternative to

keep up with the nation’s transportation and mobility projects. Autonomous vehicle technology, app-based mobility models and promises of smart city connectivity now make road user models more practical for the future. These systems could charge a driver for their use of a roadway and provide sustainable funding for America’s transportation. Through the real-world examples in the pages that follow, you will learn more about the concept and technology behind RUC systems, review the different pilot programs and see potential advantages and barriers to implementing a RUC program in the U.S.

There are so many exciting possibilities with technology, but we must be prepared to invest in and maintain the most critical arteries of our cities if we want to see it reach its full potential. We can build mobility that’s easy, equitable, efficient and enjoyable, but as a country, we need to look at our funding options for the future of transportation in America.



**CLARENCE E. ANTHONY**

CEO & Executive Director  
National League of Cities



# LETTER FROM NLC'S CEO & EXECUTIVE DIRECTOR

---



# EXECUTIVE SUMMARY

---



---

**The current model for funding transportation infrastructure is broken. As innovative new transportation technologies like autonomous vehicles rapidly move forward, solutions to this broken funding model must catch up.**



**T**oday, funding for road improvement, expansion and new projects comes from a variety of federal, state and local government sources that rely mainly on gasoline excise taxes. This federal tax has been static and will not change without Congressional action. As costs for construction have risen and vehicles have become more fuel-efficient, the flat gas tax, which funds the Highway Trust Fund (HTF), has fallen short of meeting the nation’s repair and maintenance needs.

As cities and states deal with the immediate consequences of the HTF shortfall, they have ramped up efforts to explore other revenue sources and technologies to ensure the future of infrastructure funding. Since 2007, various state governments have conducted pilot programs to assess the feasibility of wide-scale implementation of road user charge (RUC) programs. A RUC system, also commonly referred to as a Vehicle Miles Traveled (VMT) tax or a Mileage Based User Fee (MBUF) system, would charge a driver for their use of a roadway. This system is often touted as a potential sustainable funding solution for America’s transportation infrastructure deficit and an answer to the inadequate HTF.

This primer reviews six road user charge pilot programs, each featuring unique implementation methods, with an analysis of the advantages and potential barriers

to implementing a RUC program. The study relies on a comprehensive review of the available literature from the various state department of transportation (DOT) evaluation reports, data sets and pilot project summaries, along with reports from the U.S. Department of Transportation, think tanks and relevant professional organizations. After a discussion of the pilot programs, we identify opportunities for cities and local governments to utilize the lessons learned in these pilot studies.

---

**Local leaders will play a progressively more significant role in RUC adoption and implementation as pilots expand.**

---

# The Problem

**G**asoline taxes have generally been flat taxes set at a fixed rate, and because of inflation, the revenue collected does not buy as much as it used to. Compounded by improved fuel efficiency in vehicles as well as the expansion of the hybrid and electric vehicle markets, which use less or no gasoline, **the funding reserved for infrastructure is shrinking while the needs are growing.**

Currently, a federal gas tax of 18.4 cents per gallon is the primary source of income for the federal Highway Trust Fund (HTF). However, the HTF has faced years of declining revenue alongside increasing demands for funding road maintenance and new construction projects. The latest assessment of America's infrastructure by the American Society of Civil Engineers (ASCE) in 2017 gave roads, bridges, airports, water treatment facilities and other critical features of infrastructure across the country a grade of D+, indicating they are in poor

condition and at risk of failure.<sup>1</sup> ASCE estimates that by 2025, the U.S. will see a \$1.1 trillion-dollar shortfall for transportation funding at the federal, state and local levels. Without a long-term solution to fund the nation's transportation system, the Highway Trust Fund (HTF) will continue to fall far short of meeting our nation's needs.

At the local level, local option fuel taxes are authorized in sixteen states; however, only cities in eight states use this funding option.<sup>2</sup> Raising these taxes remains politically unpopular and the additional fees and revenue sources used by some local governments to supplement these funds are increasingly insufficient to meet the challenge of rebuilding and maintaining transportation infrastructure.

# In Search of a Solution

**I**n 2015, the U.S. Congress passed the Fixing America's Surface and Transportation (FAST) Act, reauthorizing the highway program and providing a much-needed influx of money to the HTF, but long-term solutions are still required to address funding gaps in infrastructure investment. In recognition of the need for alternative and innovative funding sources for the highway program, the FAST Act authorizes federal funding to support "large-

scale pilot studies by states or groups of states to demonstrate user-based revenue systems to maintain the solvency of the HTF."<sup>3</sup> The federal government recently committed to providing individual states and a coalition of sixteen states plus the District of Columbia (I-95 Corridor Coalition) with funding to support additional pilot programs. Such pilot programs are not new: Several state governments have already conducted small-scale studies to determine

the feasibility of charging individuals for miles traveled on state roads. Studying programs launched in the I-95 Corridor, Minnesota, Nevada, Oregon, California and Washington provides insight into ways cities and local governments can support

state efforts to launch their own RUC pilot programs. The lessons learned from these studies are presented here as a resource for local officials contemplating the benefits and potential applications of an RUC system in their cities and states.

## What are Road User Charge Systems?

**R**oad user charge systems, also known as vehicle miles traveled (VMT) fees and mileage-based user fees (MBUF), require drivers “to pay based on distance driven and, perhaps other costs of road use, such as wear and tear on roads, traffic congestion, and air pollution.”<sup>4</sup> These programs rely on tracking miles traveled either through manual odometer readings or using onboard devices to track location and/or distance traveled. Based on the needs and resources of the government agency

conducting the study, additional benefits of RUC systems can be incorporated into the program design, such as implementing tiered-fee systems to charge a higher rate for travel during peak traffic hours in congested areas.

A RUC program can be designed to meet the unique needs of each state and city searching for innovative infrastructure funding sources. With this flexibility in design, however, comes numerous administrative challenges.



# ADVANTAGES AND CHALLENGES OF RUC SYSTEMS

---



For every new or forthcoming initiative such as the implementation of RUC systems, some benefits and challenges must be weighed to make well-informed decisions.



**R**UCs present a sustainable revenue source for states and local governments and offer value-added services not easily accomplished through other means, such as reducing traffic congestion.

These opportunities also present complex policy questions to be addressed that may impact communities in different ways.

Methods for overcoming potential barriers to implementation and commonly identified concerns are discussed in the “Addressing Barriers to Implementation” section.

**Table 1** provides a list of advantages and challenges often faced by states and cities as they conducted feasibility studies and launch pilot programs to evaluate potential uses of RUC in their communities.

**Table 1 : Advantages and Challenges of Mileage-Based User Fee Programs**

Advantages	Disadvantages
A sustainable source of revenue available to governments (city/state)	Administrative cost burden to set-up and implement fee collection systems
An eco-friendly option that increases the efficiency of toll collection and encourages the reduction of traffic congestion and road wear and tear	Public resistance and negative perceptions, specifically equity implications and political acceptability
More travel data to support future infrastructure planning and operations	Perceived intrusion of privacy caused by collection and possession of individual locational data
Utilizes innovative technology (onboard computer)	Fee evasion and its “vulnerability to fraud” <sup>5</sup>
Nationally endorsed by various infrastructural experts	Intergovernmental collaboration can present a challenge

# ROAD USER CHARGE PROGRAMS IN ACTION

The programs evaluated herein are among the first of their kind and offer the most comprehensive records publicly available. The I-95 Corridor Coalition, Minnesota, Nevada, Oregon, Washington State and California all conducted small-scale studies to determine the feasibility of charging individuals directly for miles traveled on their roadways.

---





## EMERGING INTER-STATE PILOT I-95 CORRIDOR COALITION PROJECT

**T**he I-95 Corridor Coalition is a partnership of state, city and regional transportation entities including State Departments of Transportation, Metropolitan Planning Organizations, and Transportation and Tolling Authorities. For over two decades, the Coalition's focus has been on accelerating innovation and improvements in freight and passenger movement from a multimodal regional perspective.

Every state's Department of Transportation (DOT), toll and turnpike authorities, along with the associated metropolitan planning organizations, make up the coalition. Thirty-seven percent of America's population and 42 of the nation's 100 metropolitan areas are within the I-95 corridor region, causing roadways to be highly congested.<sup>6</sup> Simply put, the I-95 Corridor Coalition has a high demand for ongoing infrastructure

maintenance and operations expansion that cannot be covered by the existing fuel tax.

In May 2016, the coalition, in partnership with the Delaware Department of Transportation, submitted a request for funding under the Surface Transportation Systems Funding Alternatives (STSFA) grant program authorized in the FAST Act Section 6020. The Corridor Coalition was awarded \$580,000 in federal funding, resulting in a total of \$1.16 million for the I-95 Corridor Coalition MBUF project (with a 50 percent match requirement). The grant application outlined the process for conducting a three-month regional pilot to explore the feasibility of replacing the fuel tax with a MBUF approach. This pilot program was centered in Delaware but included over 150 stakeholders from 13 different states within the Corridor Coalition.

## Fixing Funding by the Mile

---

The main purpose of the MBUF pilot was to get folks first-hand experience with how MBUF might work in real life. Each participant chose from three different approaches for collecting mileage and other information: a plug-in device with location, a plug-in device without location or a smartphone app using the phone's GPS. Participants received monthly "faux" invoices showing the MBUF less a credit for gas taxes paid. Participants were also able to take advantage of several value-added amenities including visual trip logs, driving scores and vehicle health monitors. The pilot examined key regional issues necessary for the national adoption and implementation of MBUF — issues that have not been addressed in other pilot systems — such as calculating out-of-state mileage, addressing cross-state transfer of MBUF funds and revenues between states, and addressing interoperability and synergies between MBUF and the many toll facilities along the eastern seaboard.

### **In addition to the MBUF pilot, other important project activities include:**

- Increasing public awareness of transportation funding issues and assessing the acceptance of MBUF concepts via an education and outreach campaign.
- Investigating other issues and potential barriers to a successful implementation of MBUF, including privacy and data security, fairness and equity, and the costs of implementation and administration.

The second phase is scheduled to begin in 2019 and will include an expanded pilot with 800 volunteer participants and a multi-state truck pilot. The latter will focus on reporting requirements for commercial vehicles and how RUC might work in that context. <sup>7</sup>

The I-95 Corridor Coalition is neutral regarding MBUF as the ultimate solution for transportation funding, but wants to ensure that the voices of citizens along the I-95 corridor are part of the national discussion. Results from studies across the country will help policy-makers decide on next steps.



# A STATEWIDE PILOT PROGRAM WITHOUT IMPLEMENTATION

## MINNESOTA

**B**etween 2007 and 2013, the Minnesota Department of Transportation (MnDOT) conducted a multi-phase road fee test in the Minneapolis area. The MnDOT study assessed public perception, determined the required level of administrative and operational support to manage the fee program, and gauged public interest in value-added services such as in-vehicle safety signage. During the twelve-month pilot phase, 500 drivers used a GPS-enabled smartphone application to track miles driven in and outside of Minnesota. A non-technology fee of \$0.03 per mile was assessed for any miles traveled without the device turned on to encourage all

participants to regularly use the smartphone application. Participants were also charged varying rates per mile based on time of day and location of travel (for reference see Table 2). The road fee pilot generated \$40,000 over the test period, with each participant being charged an average of \$20 per month.

Ultimately, the Minnesota State Legislature did not proceed with expanded road fee tests or wider implementation of a mileage-based user fee to fund road projects. Despite this outcome, the MnDOT study contributed to a broader understanding of the feasibility of a RUC program and highlighted what features might help to contribute to a

**Table 2: Minnesota Department of Transportation Fee Structure for Test**

	<b>Peak Times</b> <b>Monday- Friday 7AM-9AM</b> <b>4PM-6PM</b>	<b>Off Peak Times</b>
Outside of Minnesota	\$0.00	\$0.00
Outside of the Twin Cities Metro Zone	\$0.01 per mile	\$0.01 per mile
Inside the Twin Cities Metro Zone	\$0.03 per mile	\$0.01 per mile

*(Source: Connected Vehicles for Safety, Mobility, and User Fees: Evaluation of the Minnesota Road Fee Test, 2013.)*

successful deployment. The pilot showed that drivers support an “opt-in” approach to using technology to collect road use fees, and they indicated that privacy was not a paramount concern.

The general attitude toward a mileage-based user fee was favorable. Additional key findings include the importance of “simplicity in the design of any alternative transportation funding program” to increase driver acceptance and participation.<sup>8</sup>



# A DISSOLVED PILOT PROGRAM

## NEVADA

In 2008, Nevada began a three-phase pilot program to study if a mileage-based user fee system is a viable solution to the current fuel tax system. This program was primarily funded by federal aid and support from the University of Nevada and the University of Nevada Las Vegas. The Nevada Department of Transportation oversaw the multi-phase study.

Phase I consisted of six major components, with a focus on public outreach, privacy issues and design of protocol for future Vehicle Miles Travelled (VMT) pilot programs. Phase II consisted of 40 volunteers in a field test that emphasized privacy protection and used a pay-at-the-pump revenue collection method.<sup>1</sup> Phase IIA was meant to examine

equity issues, gauge public opinion about alternative transportation funding methods, analyze the feasibility of a low cost/low tech VMT system, and expand future field tests to include several hundred volunteer vehicles to collect data and assess, evaluate and develop recommendations on the major components of the pilot program.

In 2010, the Nevada Department of Transportation published a report on Phase I. This initial report predicted that it would take at least a decade for the state to transition into a RUC structure, and that the negative public perceptions about these systems could change once they are proven to be equitable.

<sup>1</sup>Although the second phase ended in June 2011, there is no publicly available update on the planned final phase of the pilot.



# PIONEERING A NEW FUNDING MODEL

## OREGON

In 2001, the Oregon Legislature established the Road User Fee Task Force (RUFTF) “[t]o develop a design for revenue collection for Oregon’s roads and highways that could replace the current system for revenue collection.” In 2006, Oregon became the first state to develop a pilot project specifically to evaluate the technical feasibility of a distance-based road user fee. A single payment method was provided through a device installed into pilot cars to communicate with specialized fuel pumps, simultaneously calculating the road use charge and subtracting the fuel tax. Though the pilot successfully demonstrated technical feasibility, concerns were raised over data privacy and the capitol costs of retrofitting or replacing existing fuel pumps.

The first pilot was completed in 2007 and followed up by the Road Use Charge Pilot

Program (RUCPP) which operated from 2011 to 2013. RUCPP aimed to evaluate an open architecture system that provided driver choice in mileage reporting options in an effort to address the concerns raised during the first pilot.<sup>9</sup>

During pilot design, three critical points were identified for which participant satisfaction could be significantly influenced. These points include 1) selection of mileage reporting plan, 2) installation of mileage reporting devices, and 3) invoicing and payment of the road usage charge. Inadequate performances of any of the three factors negatively impacted participant acceptance of the road user charge system.<sup>10</sup> After the pilot project, surveys indicated that 92 percent of participants in the pilot found the “overall system” to be either ‘easy’ or ‘very easy.’<sup>11</sup> Further, the evaluation found

---

that the per-mile charges fee generated 28 percent more revenue than the fuel tax over the 121,371 miles traveled by the participants in the RUCPP.<sup>12</sup>

The second pilot project included 88 participants comprised of local officials and transportation decision makers from Oregon, Washington and Nevada.<sup>13</sup> With this selective participation, the second pilot project focused on demonstrating the fundamentals of developing a reliable usage fee system to stakeholders.<sup>14</sup>

The second pilot led to the adoption of Senate Bill 810 by the Oregon Legislature in 2013. That same year, the OReGO program was established by the legislature as the nation's first mileage-based revenue program for light duty vehicles<sup>15</sup> and has been operating smoothly since July 2015. Participants have the option of using a commercial account manager or reporting mileage to ODOT as well as choosing whether or not their reporting device collects location data. Commercial account managers offer value added services such as 'find my car,' engine diagnostics and driving quality evaluation.<sup>16</sup> Participants are charged for all miles driven, including those outside of Oregon, unless they use a device that collects location data.

The initial rate was set at 1.5 cents per mile, but was raised to 1.7 cents per mile in 2017 to reflect an increase in the state fuel tax. OReGO continues to operate with over 600 participants and ODOT is continuously testing further functionality through local and regional pilots.

The success of the program has helped to spread road user charge testing into multiple other states, including Washington, California, Colorado and Utah. From their

pilots, Oregon learned that their system works; charging drivers by the mile is not only financially and administratively possible but also an effective and equitable way to collect fees for road infrastructure development that is proportionate to use.

The ODOT estimates when the number of road usage charge payers reaches about one million, operating costs will drop to below five percent of gross revenues per annum. For these cost savings to occur, other states need to become as involved as Oregon with a road user charge platform.<sup>17</sup> Pilots in Washington, California and Colorado have built off the lessons from the Oregon pilots, and a collective organization of western states known as RUC West is currently working on multiple projects to advance the viability of a road user charge system.<sup>18</sup> The State of Oregon has worked for more than a decade to create a comprehensive plan for a RUC system, and its experience with coordinating multiple pilot projects continues to influence pilots in other states.



# PLANNING AHEAD

## WASHINGTON

**F**rom 2005 to 2006, the Puget Sound Regional Council conducted a Traffic Choices Pilot Program consisting of 275 vehicles to study the “driving behavior and public acceptability of using GPS-enabled onboard devices to measure distance traveled by zones, with differential pricing by location and time of day.”<sup>19</sup> Following this pilot program, the state of Washington conducted a series of studies within the span of a decade to assess mileage-based user fees as an alternative and sustainable source of revenue for local infrastructure funding. These studies also led to the development of a 10-year transportation funding strategy called Connecting Washington, managed by a public-private sector task force appointed by Governor Gregoire in 2011.

From November 2012 to January 2013, the State of Washington participated in the Road

Usage Charge Pilot Project (RUCPP) with Oregon and Nevada, in cooperation with the Federal Highway Administration. The RUCPP was a two-month “trial of various approaches and technologies for motorists from participating states to measure and report mileage as the basis for a per-mile road usage charge” in Washington, where invoices were issued regularly to motorists indicating their road usage and associated charges.<sup>20</sup> As part of a public education campaign, Washington drivers were also provided information on the difference in the amount they would have to pay in fuel taxes, as estimated by the system.

In 2012, a steering committee was formed with support from the state’s legislative and executive branches to not only pursue the sustainable, revenue-generating capabilities of a road user charging (RUC) program

---

but to also help the “state’s transportation system to transition from the current gas tax system.”<sup>21</sup> To date, Washington State’s RUC program is a ‘work in progress’ and the state is launched a yearlong RUC pilot program in 2018. The Washington State Transportation Committee (WSTC) is leading this pilot and will provide the public a chance to test-drive the per-mile charge system for free. The approximately 2,000 volunteers will have an early opportunity to contribute feedback to stakeholders, the state legislature and the governor about their experiences, which will influence the future of a RUC system in Washington. Although the state worked with Oregon and Nevada in the RUCPP, the amount of planning Washington is doing to develop their project is commendable and should be observed for future planning recommendations.



## SCALING UP IN SIZE

### CALIFORNIA

**T**he California State Legislature passed Senate Bill (SB) 1077 in 2014, “to explore alternative revenue sources that may be implemented instead of the antiquated gas tax structure now in place,”<sup>22</sup> which signaled the state’s desire to study a road charge as an alternative to the gas tax. The bill provided general policy direction and design parameters to guide the development of the pilot and an evaluation process.

The California Road Charge pilot, conducted by the Department of Transportation (Caltrans), focused on four essential principles: feasibility, complexity, security and acceptability. The pilot launched in July 2016 with over 5,000 vehicles reporting

over 37 million miles traveled over a nine-month period, making it the largest road user charge pilot program in the U.S. to date. In an effort to create an open system, the pilot used third party “account managers” to administer any reporting method equipment, deliver road charge value-added services and maintain communication with volunteers. Another key factor of the California pilot was the variety of mileage reporting and fee collection methods that volunteers could choose from. Providing both low-tech and high-tech mileage reporting options was an essential component to creating a program that could provide services and administer mock fees equitably to as much of the population as possible.

---

Reporting mileage included methods like odometer checks and time permits on the low-tech side, and automated reporting using onboard diagnostics devices (OBD-II) and in-vehicle telematics on the high-tech side, with multiple other options in between. California found that offering a variety of reporting methods increased participants' satisfaction with the option they chose, which allowed for increased compliance.

An additional feature of the California pilot, that distinguishes it from others, is its inclusion of 55 heavy commercial vehicles. Heavy commercial vehicles make up a significant portion of road users and potential contributors to infrastructure funding. Their inclusion in a developed road charge system in the future is a necessity to any program that wants to provide adequate and equitable funding for transportation infrastructure.

California confirmed that a user-based transportation revenue mechanism is viable. However, issues related to the cost of administration, enforcement, revenue collection and the ever-evolving technology indicate that additional research and testing need to be completed.<sup>23</sup>

# ELEMENTS OF IMPLEMENTATION

---



# Potential Legislative Issues

**A**lthough there is a desire for the federal government to lead the charge for providing policies, frameworks and financial support for implementing a RUC system, states and localities can transition to an RUC system at a faster pace.<sup>24</sup> When crafting legislation to authorize an RUC system, state and local lawmakers will need to carefully consider the language and specifically address issues concerning mileage-based user fee revenues and rate setting, and account for enforcement and adjudication processes. Traditionally, revenue from a road user fee would only cover the relevant costs associated with road use. On the other hand, tax revenues can often be used for multiple purposes (i.e. general revenue).<sup>25</sup> Both options can potentially offer financial stimulus for infrastructure maintenance and expansion. However, a user fee helps to recirculate funds created from infrastructure use back into infrastructure development.

Legislative and executive stakeholder buy-in is crucial to the success of pilot programs. Both Texas and Nevada had interests from their respective state universities and Departments of Transportation to study the feasibility of RUC; however, their pilots never fully took off due to the lack of interest and legislative inertia. In some cases, state legislation allocates funding for the study or planning of an RUC pilot at the regional or local level. Several states, such as Illinois, have proposed legislation that would provide a certain amount of money in competitive grants to local organizations and groups to establish pilot programs, collect mileage data and support other necessary functions for pilots.<sup>26</sup>

When implementing intergovernmental RUC partnerships, similar to the Western Road User Charge Consortium (RUC West) or the I-95 Corridor Coalition, constitutional concerns regarding the Commerce Clause may arise. As long as the fee does not violate the Commerce Clause within the U.S. Constitution, it is unlikely that a single or multi-state RUC system would encounter any insurmountable legal or state constitutional issues.<sup>27</sup> Direct user fees, even mileage-based user fees, have been upheld by the U.S. Supreme Court and new fee systems can be set up to comply with Constitutional requirements.<sup>28</sup>

Nonetheless, a multi-jurisdictional RUC program will encounter additional issues requiring further analysis. These issues include rate setting, enforcement and penalties, data sharing and privacy, the differences and nuances of diverse laws and regulations, and the variety of state registration and other charges associated with vehicle use. Though untested for RUCs, financial clearinghouses, which maintain a centralized record of transactions, are used across the banking and tolling industries and have been suggested for regional RUC implementations.<sup>29</sup> Careful examination of regulations and laws within a multi-state, regional or multi-jurisdictional RUC is required before proceeding with a coalition; however, the primary focus of coalition partners should be passing clear and precise legislative language for the RUC system.

# Equity Considerations

**A**lthough no tax or fee program will be completely equitable, concerns about equity should be immediately addressed while developing an implementation plan for a RUC program. Minnesota, Nevada and Oregon conducted extensive focus group research to accurately identify the public's general perceptions of RUC before launching pilot programs. The results from these focus groups showed that RUC was commonly seen as a fair and reasonable alternative to the fuel tax. Nevertheless, perceived fairness does not mean acceptance. There remain concerns over how a RUC system could disproportionately affect rural and low-income drivers. The most inequitable version of RUC is also the easiest to implement in an administrative context — the flat fee structure (see Table 3 for a discussion of common fee structures).

Legislators from rural areas assert that if fees based on actual miles traveled are enacted (such as a flat fee), this structure would be financially burdensome to their constituents. There are several possible solutions to mitigate these effects, such as structuring the fee system into zones that separate rural and urban roads and charging fees according to which zone(s) the travel occurred. Complementary policies could be created to devote a percentage of revenues toward the development and improvement of rural transit options, which would further incentivize support for RUCs.<sup>30</sup>

The effect of a flat-fee structure on low-income drivers is not as apparent as the effect to rural drivers. If a flat fee structure is set in place, low-income drivers will still

pay an income-regressive tax just as they do currently with the fuel tax. Low-income drivers are also affected by several other elements of RUC structures.

### **Potential issues that could arise are based on the type of RUC system implemented, and include:**

- Fees being billed electronically. Some drivers may not have bank accounts or credit cards to easily collect revenues from.
- Fees based on fuel economy that might have an adverse impact on low-income and rural drivers who tend to drive older, less fuel-efficient vehicles.

Despite these challenges, it can be argued that rural and low-income drivers might be better off with RUCs, since they are more likely to be driving less fuel-efficient vehicles and are thus already paying more in fuel taxes. Additionally, RUCs could be structured in a progressive manner or even be eliminated for drivers who live in households under a specified income level. While there are valid concerns about social equity in an RUC system, there are plenty of policy options and levers available to address them.



## Administration

**W**hen setting up an RUC system, local authorities have two options: they can either integrate an administrative structure into an existing framework, such as a state DMV, or build a completely new administrative structure. Both approaches would leave numerous issues and concerns to be addressed before implementation.

Integrating a RUC system within the existing DMV structure would need to account for the agency's institutional and systems capacity along with limitations, the maintenance of privacy and personal information on government databases, and the potential

diversion from the agency's core task.<sup>31</sup> Although the DMV appears to be the better choice to administer an RUC system due to the coordination required between enrollment and vehicle registration, this agency may not have the capacity to do so.

### **Any RUC administrative structure is responsible for the following processes and functions:<sup>32</sup>**

1. Enrolling participants and their vehicles in the program,
2. Accumulating accurate mileage information and subsequent charges due,

3. Calculating and billing charges to users,
4. Maintaining customer interface and communication,
5. Monitoring and enforcing the RUC system,
6. Securing data, and
7. Distributing revenue.

The more sophisticated the technology used to record mileage, the more expensive the startup and administration costs will be. As an example, in the Oregon pilot project, economists estimated the initial setup would cost \$33 million, which included purchasing and installation of the On-Board Devices (OBDs).<sup>33</sup>

Another factor to consider is if the RUC system will be housed within one or multiple jurisdictions. Single jurisdiction systems, such as those in a single city, will most likely use a public institution for administrative functions, while multiple-jurisdiction systems will tend to favor private entities due to the complexity of the administrative infrastructure.<sup>34</sup> Regardless of where a RUC system is implemented, there is ample opportunity to partner with the private sector. During their pilot, the state of Oregon relied almost exclusively on the private sector for the many aspects of system operations and administration.<sup>35</sup> Depending on the program structure, the private sector could provide mileage metering devices, as well as the fee collection and distribution. How a city or local government decides to administer their RUC system largely depends on their program goals and how they will collect the mileage data.

## Fee Structures

In the initial research phase conducted by the Nevada pilot program, researchers determined six possible fee structures that could be implemented in a RUC system. Table 3 features their original findings and expands on the various types of fee structures and methods to determine revenue intake. Fee structures can be designed to address the specific goals of a RUC program. For example, if the goal of the program were to reduce emissions, the fee structure would target a vehicle's fuel efficiency. Table 3 is a useful guide to the various fee options available.

## Methods of Mileage Reporting

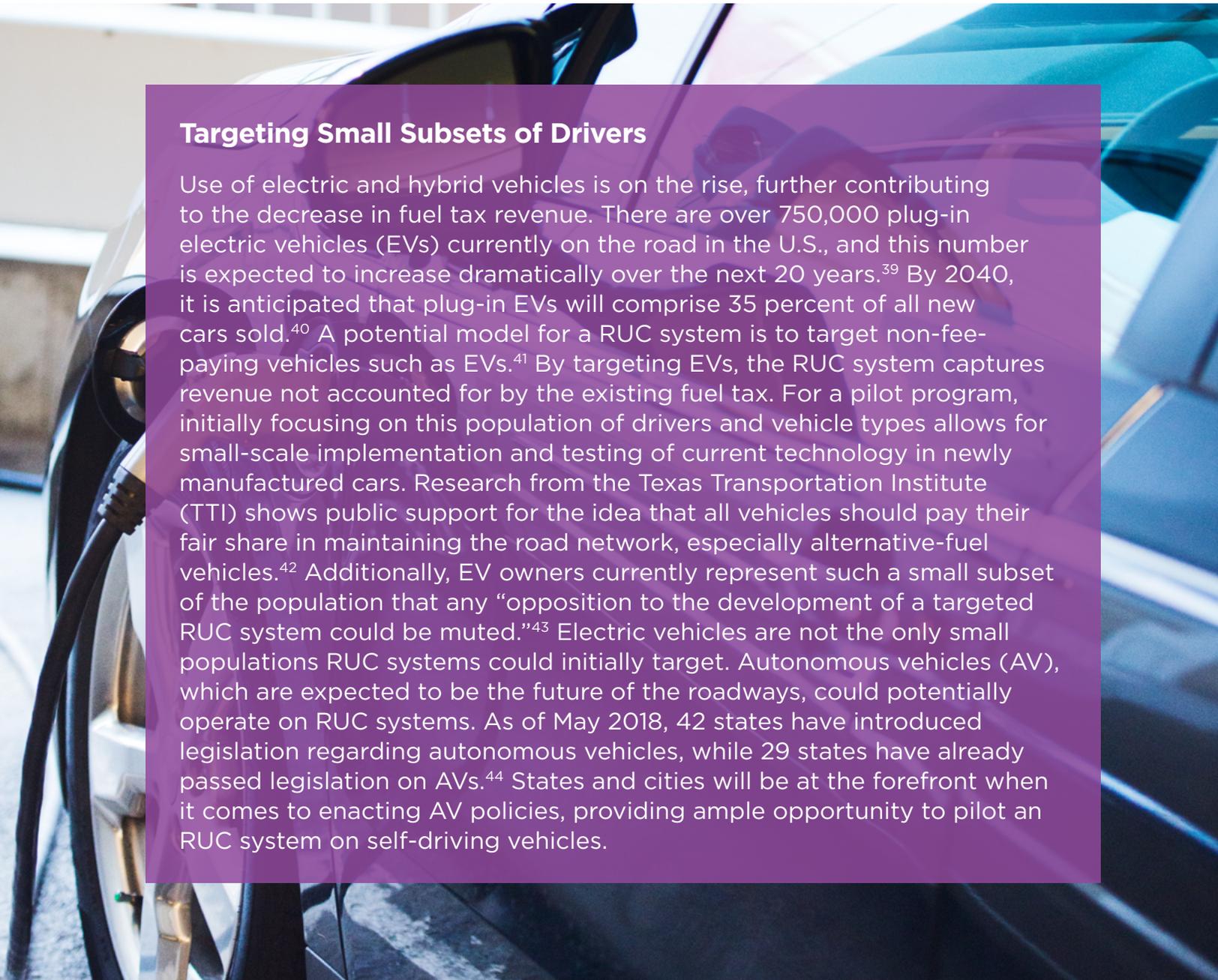
There are a variety of metering methods, ranging from low-tech odometer readings to high-tech smartphone applications. Consumer choice is critical when implementing a road use charge system and generating public buy-in.<sup>36</sup> However, vehicles made prior to 1996 do not support the plug-in mileage reporting devices enabled by the OBD port. Although this is a diminishing problem since the number of older vehicles on the road and in service is decreasing annually,<sup>37</sup> creative and alternative solutions are feasible in the short-term, such as asking drivers to use the location services of their smartphones, or non-plugin devices.

When implementing a RUC system, multiple reporting options are necessary to promote user compliance and buy-in.<sup>38</sup> In their pilot programs, Oregon and Minnesota provided various metering options to participants.

---

These choices ensured greater compliance among drivers with varying levels of technology knowledge and helped to overcome early issues with deployment of smartphone applications. Tables 4 and 5 highlight the diverse metering methods available for RUC implementation along with the advantages and disadvantages of each method. The metering methods have

been divided into low-tech and high-tech to provide a reference to the technology required.



### Targeting Small Subsets of Drivers

Use of electric and hybrid vehicles is on the rise, further contributing to the decrease in fuel tax revenue. There are over 750,000 plug-in electric vehicles (EVs) currently on the road in the U.S., and this number is expected to increase dramatically over the next 20 years.<sup>39</sup> By 2040, it is anticipated that plug-in EVs will comprise 35 percent of all new cars sold.<sup>40</sup> A potential model for a RUC system is to target non-fee-paying vehicles such as EVs.<sup>41</sup> By targeting EVs, the RUC system captures revenue not accounted for by the existing fuel tax. For a pilot program, initially focusing on this population of drivers and vehicle types allows for small-scale implementation and testing of current technology in newly manufactured cars. Research from the Texas Transportation Institute (TTI) shows public support for the idea that all vehicles should pay their fair share in maintaining the road network, especially alternative-fuel vehicles.<sup>42</sup> Additionally, EV owners currently represent such a small subset of the population that any “opposition to the development of a targeted RUC system could be muted.”<sup>43</sup> Electric vehicles are not the only small populations RUC systems could initially target. Autonomous vehicles (AV), which are expected to be the future of the roadways, could potentially operate on RUC systems. As of May 2018, 42 states have introduced legislation regarding autonomous vehicles, while 29 states have already passed legislation on AVs.<sup>44</sup> States and cities will be at the forefront when it comes to enacting AV policies, providing ample opportunity to pilot an RUC system on self-driving vehicles.

# RUC SYSTEMS AND CITIES

---



**M**ileage-based user fees have been exclusively a state-led effort to this point, primarily due to the state budget concerns related to the gas tax and the availability of federal grants through the FAST act.<sup>45</sup> States differ in how they apportion the gas tax revenue between city, county and state. State governments may try to extend existing rates to RUC, but the GPS-capture component provides opportunities for municipalities to negotiate more favorable revenue sharing models based on actual usage.

Except for the largest cities, requiring GPS or mileage tracking will be a difficult proposition for individual municipalities given the enforcement challenges of out-

of-jurisdiction drivers. Therefore RUC, like the gas tax which it is aiming to replace, is expected to be administered at the state level.

Even if not administered by the local municipality, cities should still consider RUC as an opportunity to implement local- or metro-area policies. For example, as part of the OReGO RUC pilot, surcharge per-mile fees will be assessed to participants driving in and around Portland starting in 2019.<sup>46</sup> The more technologically advanced mileage reporting solutions can enable sophisticated usage pricing schemes in cities, as described in the Full-Cost Fee System section of Table 3.

## Consideration of New Modes and Technologies

The emergence of new modes and mobility technologies has prompted a discussion about how they might be included in future road user charge models. A shared roadway is now the aspiration for urban planners and policymakers alike. In cities of all sizes and geographies, local leaders promote visions of multi-modal mobility corridors rather than single-occupancy vehicle centric roadways, where cars, public transit vehicles, bikers and pedestrians all have fair and equal access to road and curb space. Shifting the way we think about street space, who has the right to occupy it and how it is oriented to accommodate different modes and travelers can have a significant impact on a community's mobility system as well as the state of its infrastructure. This raises the question of how new modes might fit into a road user charge system that has traditionally been focused on charging the drivers of single occupancy vehicles. We must consider how transit, shared rides and new micromobility options like electric bikes and scooters should be charged to use the roadways. Electric and autonomous vehicle technologies also force us to reconsider the administration of user fees. Some policy proposals suggest implementing user fees for commercial vehicles like long-haul and delivery trucks only, or implementing those fees in certain high-congestion zones.

## **Table 3 :** **Fee Structures**



Fee Type	Description	Fee Determination
<p><b>Flat Fee (also known as Uniform VMT Fee)</b></p>	<p>A flat fee is charged per mile traveled regardless of vehicle type, time or location of travel. This could replace the fuel tax and maintain current revenue levels.</p>	<p>The current fuel tax rate divided by the statewide, countywide or citywide average vehicular fuel efficiency levels.</p>
<p><b>Dual Fee</b></p>	<p>Two flat fees per mile traveled — one for passenger vehicles and a separate one for light trucks. Light trucks would be charged more since they use more fuel and cause more wear to the road network. Like the Uniform VMT Fee, drivers of the same class would be charged the same price regardless of time or location of travel.</p>	<p>The current fuel tax rate for passenger vehicles and light trucks divided by statewide, countywide or citywide average vehicular fuel efficiency for the vehicle's fuel efficiency level.</p>
<p><b>Multiple Fees</b></p>	<p>Multiple flat fees per mile traveled based on vehicle make and model. The fee would vary based on the fuel efficiency and type of vehicle. For example, a Ford F-150 with 19 miles-per-gallon (mpg) could be charged at a higher rate than a Ford Focus with 30 mpg.</p>	<p>The current fuel tax rate divided by the fuel efficiency of the specific make and model of the vehicle.</p>
<p><b>Generalized Variable Fee</b></p>	<p>A fee based on the vehicle's make and model as well as the type of roadway the vehicle travels on, such as highways, country roads or freeways.</p>	<p>The value of the variables (vehicle make and model's fuel efficiency, road conditions and traffic levels) would have to be determined by administrative officials.</p>
<p><b>Pay-as-you-go Fee</b></p>	<p>Pay-as-you-go is essentially an ad valorem tax, meaning the fee is determined by the estimated budget of future transportation costs, such as road maintenance, clean-up, etc.</p>	<p>Estimate of direct transportation system costs (such as maintenance and expansion costs) divided by statewide, countywide or citywide vehicle miles traveled.</p>
<p><b>Full-cost Fee System</b></p>	<p>Fees on miles traveled with the rate being set to account for the total cost of travel regarding road damage, emissions, accidents and traffic delays.</p>	<p>Estimate of direct transportation system costs (such as maintenance and expansion costs) as well as indirect transportation system costs (such as emissions, accidents and traffic delays) divided by statewide, countywide or citywide vehicle miles traveled.</p>



**Table 4:**  
Metering Methods —  
Low-Tech

Metering Method	Description	Advantages	Disadvantages
<b>Time Permit</b>	<p>A flat number of miles is pre-established for a defined period of time. Drivers don't have to report their actual mileage and can drive as many miles as they want during the period.</p>	<ul style="list-style-type: none"> <li>• Paper-based option with no mileage reporting.</li> <li>• Avoids privacy concerns raised by on-board units.</li> </ul>	<p>Difficulty determining the right pricing as the number of miles is unlimited. As a reference, Oregon used 35,000 miles and California 25,100 miles per year. The mileage value is usually high to discourage drivers from using this approach.</p>
<b>Self-Reported Odometer Checks</b>	<p>Drivers report current mileage on a periodic basis (such as each year during their annual registration process or every quarter). Odometer capture apps are available that enable the extraction of mileage data from a picture of the odometer.</p>	<ul style="list-style-type: none"> <li>• Administratively cost-effective and minimizes the creation of additional support structures.</li> <li>• Easy to understand for the drivers.</li> </ul>	<p>Increased potential for fee evasion unless a certified odometer picture is submitted with the odometer reading.</p>
<b>Required Odometer Checks</b>	<p>Drivers submit to periodic (likely annual) readings at certified stations as the basis for assessing mileage fees.</p>	<ul style="list-style-type: none"> <li>• Avoids privacy concerns raised by On-Board Units (OBUs).</li> <li>• Drivers would not have to install additional technology.</li> </ul>	<ul style="list-style-type: none"> <li>• Burdensome to driver and high operational costs.</li> <li>• Would be impossible to determine fees based on travel to other taxing jurisdictions.</li> <li>• If the odometer reading is done once a year during the registration process, then it would be a single large fee to the driver.</li> </ul>

**Table 5:**  
**Metering Methods —**  
**High-Tech**



Metering Method	Description	Advantages	Disadvantages
<b>Fuel-Based Estimates</b>	Vehicles are equipped with an automatic vehicle identification (AVI) device that transmits the vehicle fuel economy rating to the fuel pump; this rating is multiplied by total gallons purchased to estimate mileage, and the resulting fee is added to the price.	Could co-exist with the existing fuel tax and allow drivers to pay one or the other.	<ul style="list-style-type: none"> <li>Systems without GPS devices cannot charge rates based on when or where the vehicle was driven, i.e. times of peak traffic.</li> <li>Would require a transponder or GPS device to be installed in vehicles.</li> <li>Administratively complex and challenging to administer at the local level.</li> </ul>
<b>Radio Frequency Identification (RFID) Tolls on Road Networks</b>	Vehicles are equipped with an AVI device that communicates with devices set up along the most heavily traveled segments of the road network. This is similar to mileage-based toll systems that exist on some U.S. roadways today.	<ul style="list-style-type: none"> <li>Multiple types of RFID devices are available (active/passive tags).</li> <li>Similar experience to what drivers are already familiar with, such as E-ZPass.</li> </ul>	<ul style="list-style-type: none"> <li>In 2010, RFID devices were about \$2 a piece.</li> <li>Implementation could cost millions of dollars depending how many vehicles need the devices to be installed.</li> <li>Additional upfront costs, if a tolling system is not already in place.</li> </ul>
<b>On-Board Devices (OBD)</b>	<ul style="list-style-type: none"> <li>Vehicles are equipped with an OBD connected to the Onboard Diagnostic port to estimate mileage.</li> <li>Can be equipped to sync with cellular communications technology, GPS or a pay-at-the-pump scheme.</li> </ul>	<ul style="list-style-type: none"> <li>Can pair with insurance companies to provide discounts for safe driving.</li> <li>Can be installed and purchased at a low cost.</li> <li>Some OBD devices do not include GPS to avoid the privacy concern.</li> </ul>	<ul style="list-style-type: none"> <li>Vehicles manufactured before 1996 do not have the capabilities to connect to OBD devices.</li> <li>Mobile plans for cellular OBD devices can be substantial compared to the actual RUC fees collected.</li> </ul>
<b>Smartphone Application</b>	The mileage amount is metered and reported by a Smartphone Application that is synced with cellular communication systems and GPS.	<ul style="list-style-type: none"> <li>Applications are easily downloaded by drivers and do not require OBDs.</li> <li>Increases the value-added service for drivers.</li> <li>Enhances user compliance.</li> </ul>	There are some technical challenges regarding the accuracy of the mileage. To overcome this issue, a beacon can be included in the car or an odometer reading picture can be required periodically for reconciliation.
<b>In-Vehicle Telematics</b>	The mileage reporting technology is built into the vehicle. No external device or smartphone is required.	<ul style="list-style-type: none"> <li>Seamless experience for users.</li> <li>High level of accuracy.</li> </ul>	Only available for some of the newest makes and models.

# ADDRESSING THE BARRIERS TOWARDS IMPLEMENTATION

---



---

Analysis of the pilot projects revealed five barriers to implementation common to emerging RUC systems.



## **Administrative Cost of Startup and Operations**

Governments must conduct cost estimates and projections for administrative expenses associated with startup and operations.

Additionally, once the road user fee payment operation is successfully running, with an increase of users in the program, there is potential for higher revenue and a lower percentage of costs for operations. Potential pilot projects should use small target populations while conducting their project to address administrative costs for implementation.

## **Public Resistance and Negative Perception**

The second barrier is public resistance and negative perception toward road user charges. This barrier can be overcome by establishing an educational outreach or marketing campaign. RUC program designers can utilize or partner with national organizations, such as the American Road and Transportation Builders Association and the Mileage-Based User Fee Alliance, to

develop public opinion campaigns, maintain a comprehensive website about road user fees, inform local communities and civic groups about the pilot projects through presentations, develop short educational videos about the program for local media networks, and conduct interviews with local media.

## **Privacy and Fear of Big Government**

This barrier closely relates to the issue of public resistance and negative perception of RUC pilot projects. To address this obstacle, government agencies may benefit from consulting with privacy watchdog organizations, such as the American Civil Liberties Union (ACLU), to alleviate the public's concerns about potential abuses of collected personal data. Incorporating input from organizations who represent public interests will help create parameters for the state DOTs and state Department of Motor Vehicles (DMVs) as well as associated public entities responsible for protecting personally identifiable information (PII). Without privacy protections in place, it is difficult to assuage the public's concern about potential violations. Beyond incorporating data security policies as part of their implementations, potential pilot projects should work to assure the public that the data used for the project would not transmit personally identifiable information.

## Potential Fee Evasion and Enforcement

Fee evasion encompasses the public's ability to avoid paying the user fee, which is certain to be attempted once RUCs move beyond the pilot phase. RUC systems should incorporate redundancies, whether with annual odometer readings through the vehicle registration process, comparing the odometer and fuel consumption via OBD devices, or interfacing with other vehicle capture systems such as tolls or cameras along the road network.

A greater enforcement issue may be capturing the road usage of out-of-state (or out of jurisdiction) drivers. This cannot be accomplished without a multi-state RUC program.

## Lack of Intergovernmental Collaboration for Implementation

By creating a multi-state, multi-county or regional system, local authorities will have less of a burden to initiate, administer and monitor the RUC system. Such collaboration would be beneficial to develop and implement a structure that can be transferable to another state, county or local government. However, intergovernmental collaboration adds another layer of complexity to the administrative system. Any RUC system with intergovernmental collaboration will also need to determine how revenues are dispersed among each partner and a proper calculation of miles traveled in each jurisdiction.



# CONCLUSION AND RECOMMENDATIONS

---



**M**ileage-based user fees can supplement existing state and local revenue sources for infrastructure maintenance and development. Designing, testing and implementing an RUC program requires buy-in from key stakeholders, a functioning administrative structure and specific project goals, such as increasing revenue, reducing emissions or addressing traffic congestion.

These four broad recommendations reflect the lessons learned from six RUC pilot programs and can be used as a general framework for city officials to design or engage in a program that meets their specific needs:

## Encourage Collaborative Efforts

Government agencies and national organizations need to collaborate to overcome several barriers to implementation such as the cost burden of operating a program, as well as reducing the likelihood of fee evasion. Intergovernmental support can also lead to the sustained success of an RUC system. As demonstrated by the I-95 Corridor Coalition, coordination among multiple state, regional and local governments is required to meet the infrastructure funding needs for metropolitan areas.

## Gain State Legislative Buy-in

The most successful pilot projects are reinforced by authorizing legislation or public support from key decision-makers. Many projects without this executive

stakeholder support failed to be completed or implemented on a statewide scale. In the case of the Nevada pilot program, a lack of clear legislative support likely contributed to the project's incomplete state as of 2017. Additionally, cities considering an RUC revenue program will need to obtain legal authority to collect a road use charge on their own or as part of state implementations.

## Understand Public Opinion

All of the RUC pilot programs reviewed devoted a significant amount of time to public perception studies. These surveys serve to shape the design of the final road user fee tests and set parameters for technology, and offered useful insights into the need for value-added features. For example, Oregon's pilot programs surveyed participants throughout the test phases to gain information on the usability of the system. Ultimately, by understanding public opinion, pilot projects can create communication efforts to educate the public about RUCs and establish public trust.

## Provide the Public with Options

Potential RUC pilot projects should accept public input on program design as well as on the technology and reporting devices used. Multiple low-tech and high-tech options exist for mileage reporting. Government officials should make their decisions based on public feedback and available resources like program funding and personnel.

# APPENDIX I: POLICY QUESTIONS TO CONSIDER

---



---

**These questions are presented to help city officials considering an RUC system in their community to address several of the unique policy issues posed by this model.**



**E**ach RUC pilot program evaluated for this primer answered these questions in different ways. As more pilot projects are completed over the next several years, additional solutions to these policy questions will be available for evaluation.

1. How are Road User Charge (RUC) systems a better alternative to the Highway Trust Fund (HTF) and other existing infrastructure funding sources?
2. How can RUCs disproportionately affect low-income drivers?
3. What is the effect on rural drivers as compared to urban drivers?
4. How would tourists or people who do not live in the city's jurisdiction be charged?
5. What are the potential effects on local businesses and roadway users?
  - a. Taxi services, Uber, Lyft, and other ride-share programs
  - b. Delivery businesses
  - c. Trucking companies, distribution firms, etc.
6. How can cities ensure that the installation of an on-board devices (OBD) or a GPS would not be a violation of privacy?
7. Is there a correlation between states that have other user fee programs and the level of public acceptance identified for road user charges?

### Endnotes

- 1** American Society of Civil Engineers (2017). ASCE: 2017 Infrastructure Report Card. Retrieved from: <http://www.infrastructurereportcard.org>
- 2** National League of Cities (2016). Paying for Local Infrastructure in a New Era of Federalism. Retrieved from: [http://www.nlc.org/sites/default/files/2016-12/NLC\\_2016\\_Infrastructure\\_Report.pdf](http://www.nlc.org/sites/default/files/2016-12/NLC_2016_Infrastructure_Report.pdf).
- 3** Congressional Research Service (2016). Mileage-Based Road User Charges. Retrieved from: <https://fas.org/sgp/crs/misc/R44540.pdf>, p. 2.
- 4** Ibid., p. 2.
- 5** The Dieringer Research Group (2007, August). Mileage-Based User Fee Public Opinion Study. Retrieved from: <http://www.dot.state.mn.us/funding/mileage-based-user-fee/opinionstudyreport.pdf>, p. 5.
- 6** Delaware Department of Transportation (2016). Grant Application for Surface Transportation System Funding Alternatives (DTFH6116RA00013) Mileage-Based User Fees in a Multi-State Region. Retrieved from: <http://php.delawareonline.com/news/assets/2016/07/grant.pdf>, p.2.
- 7** State of Delaware News. (2018). *I-95 Coalition and DelDOT Launch Mileage-Based User Fee Study*. [online] Available at: <https://news.delaware.gov/2018/05/01/95-Coalition-deldot-launch-mileage-based-user-fee-study/> [Accessed 29 May 2018].
- 8** Minnesota Department of Transportation (2013). Connected Vehicles for Safety, Mobility, and User Fees: Evaluation of the Minnesota Road Fee Test. Retrieved from: <http://www.dot.state.mn.us/mileagebaseduserfee/pdf/EvaluationFinalReport.pdf>, p. xxiii-xxxi.
- 9** Oregon Department of Transportation (2014). Road Usage Charge Pilot Project 2013 and Per-Mile Charge Policy in Oregon. Retrieved from: <http://www.myorego.org/wp-content/uploads/2017/07/RUCPP-Final-Report.pdf> p.3-4.
- 10** Oregon Department of Transportation (2014). Road Usage Charge Pilot Project 2013 and Per-Mile Charge Policy in Oregon. Retrieved from: <https://www.oregon.gov/ODOT/HWY/RUFPP/docs/RUCPP%20Final%20Report%20-%20May%202014.pdf> p. 17.
- 11** Ibid., p. 23.
- 12** Ibid., p. 23.
- 13** Ibid., p. 16.
- 14** Ibid., p. 16.
- 15** Ibid., p. 29.
- 16** Oregon Department of Transportation (2018). Oregon's Road Use Charge Program; The OReGO Program. Retrieved from: [https://www.oregon.gov/ODOT/Programs/RUF/IP-Road%20Usage%20Evaluation%20Book%20WEB\\_4-26.pdf](https://www.oregon.gov/ODOT/Programs/RUF/IP-Road%20Usage%20Evaluation%20Book%20WEB_4-26.pdf). P. 3-4
- 17** Ibid., p. 27. The newly formed Western Road Usage Charge Consortium has 14 member Departments of Transportation from western states indicating a potential for reaching a large pool of payers in a regional application of road usage charging.
- 18** RUC West (2018). RUC West New Paths to Road Funding. Retrieved from: <https://www.rucwest.org/>
- 19** D'Artagnan Consulting (2013). Road Usage Charge Pilot Project Final Evaluation Report for Washington State Participants. Retrieved from: <https://www.wsdot.wa.gov/research/reports/fullreports/8071.pdf>, p. 11.
- 20** Ibid., p. 11.

- 
- 21** Washington State Transportation Commission et. al., (2014, January). Washington State Road Usage Charge Assessment. Retrieved April 7, 2017.
- 22** Senate Bill 1077 (Statutes of 2017, DeSaulnier)
- 23** California Road Charge Pilot Program Final Report ([www.dot.ca.gov/road\\_charge](http://www.dot.ca.gov/road_charge))
- 24** University Transportation Center for Mobility (2009). Mileage-based User Fees: Defining a Path toward Implementation Phase 2: An Assessment of Institutional Issues. Retrieved from: [http://utcm.tamu.edu/publications/final\\_reports/Goodin\\_inst\\_09-39-07.pdf](http://utcm.tamu.edu/publications/final_reports/Goodin_inst_09-39-07.pdf). p. 45.
- 25** I-95 Corridor Coalition (2010). Final Research Report: Administrative and Legal Issues Associated with a Multi-State VMT-Based Charge System. Retrieved from: [http://i95coalition.org/wp-content/uploads/2015/03/Transportation\\_Financing\\_Phase1-ES.pdf?dd650d](http://i95coalition.org/wp-content/uploads/2015/03/Transportation_Financing_Phase1-ES.pdf?dd650d), p. 8-4, 8-5.
- 26** The state of Illinois proposed the Road Improvement and Driver Enhancement Act (RIDE), which proposed by July 1, 2017 all owners of motor vehicles will pay a distance-based road fee. The bill's status is currently Session sine die.
- 27** I-95 Corridor Coalition (2010). Final Research Report: Administrative and Legal Issues Associated with a Multi-State VMT-Based Charge System. Retrieved from: [http://i95coalition.org/wp-content/uploads/2015/03/Transportation\\_Financing\\_Phase1-ES.pdf?dd650d](http://i95coalition.org/wp-content/uploads/2015/03/Transportation_Financing_Phase1-ES.pdf?dd650d). p. 14.
- 28** Ibid., p. 8-10.
- 29** BATIC Institute (2018). Road Usage Charge Pilot Programs: Examples of Regional Collaboration. Retrieved from: [http://www.financingtransportation.org/pdf/events/piedmont\\_peer\\_exchange\\_qa\\_041918l.pdf](http://www.financingtransportation.org/pdf/events/piedmont_peer_exchange_qa_041918l.pdf)
- 30** University Transportation Center for Mobility (2009). Mileage-Based User Fees: Defining a Path toward Implementation Phase 2: An Assessment of Institutional Issues. Retrieved from: [http://utcm.tamu.edu/publications/final\\_reports/Goodin\\_inst\\_09-39-07.pdf](http://utcm.tamu.edu/publications/final_reports/Goodin_inst_09-39-07.pdf). p. 30.
- 31** I-95 Corridor Coalition (2010). Final Research Report: Administrative and Legal Issues Associated with a Multi-State VMT-Based Charge System. Retrieved from: [http://i95coalition.org/wp-content/uploads/2015/03/Transportation\\_Financing\\_Phase1-ES.pdf?dd650d](http://i95coalition.org/wp-content/uploads/2015/03/Transportation_Financing_Phase1-ES.pdf?dd650d). p. 9.
- 32** Ibid., p. 7.
- 33** The Council of State Governments (2010). Vehicle Miles Traveled Fees: A Trends in America Special Report. Retrieved from: [http://www.csg.org/policy/documents/TIA\\_VMTcharges.pdf](http://www.csg.org/policy/documents/TIA_VMTcharges.pdf). p.3.
- 34** University Transportation Center for Mobility (2009). Mileage-Based User Fees: Defining a Path toward Implementation Phase 2: An Assessment of Institutional Issues. Retrieved from: [http://utcm.tamu.edu/publications/final\\_reports/Goodin\\_inst\\_09-39-07.pdf](http://utcm.tamu.edu/publications/final_reports/Goodin_inst_09-39-07.pdf), p. 39.
- 35** Texas A&M Transportation Institute (2015). VMT Fee Assessment: Final Report. Retrieved from: <http://static.tti.tamu.edu/tti.tamu.edu/documents/PRC-14-02F.pdf>. p.36.
- 36** Ibid., p.39.
- 37** Colorado Department of Transportation (2013). *Colorado Mileage-Based User Fee Study*. Retrieved from: <https://www.codot.gov/programs/research/pdfs/2013/mbuf.pdf>. p. 67.
- 38** Texas A&M Transportation Institute (2015). VMT Fee Assessment: Final Report. Retrieved from: <http://static.tti.tamu.edu/tti.tamu.edu/documents/PRC-14-02F.pdf>. p. 39.
- 39** Raifman, Matthew. (2016, November). How Electric and Autonomous Vehicles are Destroying Our Roads, and Why Cities and States will have the Solution. Retrieved from: <https://govex.jhu.edu/how-electric-vehicles-and-autonomous-vehicles-are-destroying-our-roads-and-why-cities-and-states-will-have-the-solution/>.

## Fixing Funding by the Mile

---

**40** Ibid.

**41** Texas A&M Transportation Institute (2015). VMT Fee Assessment: Final Report. Retrieved from: <http://static.tti.tamu.edu/tti.tamu.edu/documents/PRC-14-02F.pdf>, p. 40.

**42** Ibid., p. 40.

**43** RAND (2013). Mileage-Based User Fees for Transportation Funding: A Primer for State and Local Decisionmakers. Retrieved from: [http://www.rand.org/content/dam/rand/pubs/tools/TL100/TL104/RAND\\_TL104.pdf](http://www.rand.org/content/dam/rand/pubs/tools/TL100/TL104/RAND_TL104.pdf). p.28

**44** National Conference on State Legislature (2018). Autonomous Vehicles/Self-Driving Vehicles Enacted Legislation. Retrieved from: <http://www.ncsl.org/research/transportation/autonomous-vehicles-self-driving-vehicles-enacted-legislation.aspx>.

**45** [http://www.financingtransportation.org/funding\\_financing/funding/state\\_funding/vmt\\_fees.aspx](http://www.financingtransportation.org/funding_financing/funding/state_funding/vmt_fees.aspx)

**46** <https://www.oregon.gov/ODOT/Programs/RUF/Item%20C%20-%20Draft%20RUF%20TF%20Minutes%20November%2016%202017.pdf>



**NLC** NATIONAL  
LEAGUE  
OF CITIES

---

CENTER FOR CITY SOLUTIONS