Equity and Fairness Considerations in a Mileage-Based User Fee System

This Technical Memorandum (Tech Memo) discusses some of the issues that are frequently mentioned regarding the equity and fairness of a mileage-based approach to funding the transportation network. This memo has been prepared under Task 3.2 (Potential Equity Issues and Solutions) of the I-95 Corridor Coalition Mileage-Based User Fee (MBUF) Study funded under the U.S. Department of Transportation (US DOT) Surface Transportation Systems Funding Alternatives (STSFA) grant program. These issues involve the relative impact and fairness of MBUF as it relates to different population, demographic, and vehicle groups, including commuters that drive longer distances, low income drivers, owners of highly fuel-efficient and battery electric vehicles (BEV), and urban and rural drivers.

BACKGROUND

In many respects, the MBUF concept is based on providing greater fairness and equity as compared to the gas tax. MBUF is based on the “user pays” principle whereby those who use the transportation network pay an amount proportional to how much they use it. For many years, the gas tax was an excellent surrogate for the “user pays” approach. Gas was relatively cheap – at least until the oil crises of the 1970’s, which led to the passage of the nation’s first Corporate Average Fuel Economy (CAFE) standards in 1975 – and most cars got about the same fuel economy. As such, the amount of fuel consumed was highly correlated with the number of miles driven. With the introduction of highly fuel-efficient vehicles (e.g., high-mileage imports, and subsequently hybrids and electric vehicles) on the one hand, and the continued marketing of sport utility vehicles and pickup trucks (which typically get less miles per gallon [MPG] than the current CAFE standards) on the other hand, the difference between the most and least fuel efficient vehicles has widened significantly, resulting in a situation where different users pay varying amounts for using the road, even if they drive the same number of miles.

The MBUF concept was developed to correct this widening gap between what individuals pay for using the road, even when they drive the same number of miles. This is analogous to a utility where your bill is largely based on how much of the particular commodity – such as electricity, heating fuel, and water – you use. Nevertheless, as the MBUF approach has been discussed, studied, and tested in pilot systems, concerns with MBUF’s equity and fairness have arisen, particularly in the context of charging a single per-mile rate applied to all vehicles.

The Oxford online dictionary provides the following definitions:

- **Equity** – The quality of being fair and impartial.
- **Fairness** – Impartial and just treatment or behavior without favoritism or discrimination. The dictionary also relates this to “justice,” which is defined as “the quality of being fair and reasonable.”
The National Cooperative Highway Research Program (NCHRP)\(^1\) analyzed three sources of information on public opinion about mileage fees: (1) qualitative research studies, such as focus groups; (2) quantitative public opinion surveys; and (3) media stories covering mileage fees. A prominent theme in the qualitative studies and media stories was fairness (second only to privacy), with the MBUF system framed as both fair and unfair. In the summary of media stories, the NCHRP report includes several statements and concerns – sometimes in conflict with one another – regarding fairness, as noted in Table 1.

### Table 1. Comments Regarding Fairness and MBUF

- Everyone paying their fair share (e.g., hybrid vehicles)
- Hybrid/electric vehicle owners paying an MBUF because they do not pay a gas tax
- Hybrid/electric vehicle owners should not be taxed because they are helping the environment
- Rural drivers having to pay more because they drive greater distances
- Commuters may have to travel greater distances to work
- Lower-income commuters already must travel greater distances to work
- Funding burden shifting to urban drivers (higher prices for congestion zones)
- People paying more for the roads if they drive more

Source: Media stories as summarized in NCHRP\(^2\)

As part of the Phase 1 MBUF Pilot, pilot participants were surveyed at both the beginning and the end of the 4-month pilot. The initial survey was administered after participants had enrolled and received their mileage reporting device and the second survey was administered after the pilot had concluded. Both surveys included questions about fairness and equity. Over the course of the pilot, participants’ thoughts on the fairness of MBUF changed (see Figure 1). The largest change in opinions on the fairness of MBUF was related to very fuel-efficient vehicles. The number of pilot participants who believed MBUF was “less fair” for very fuel-efficient cars increased from 27% at the beginning of the pilot to 38%; while the number of participants who said MBUF was “more fair” for fuel-efficient vehicles went down from 39% at the beginning of the pilot to 24% following the pilot. With respect to fairness for urban and rural drivers, most participants in the Phase 1 Pilot believed MBUF would be the same (38 to 40%) for both urban and rural drivers. However, at the end of the pilot, the number of people who felt it was “more fair” for urban drivers compared to rural drivers increased from 30 to 36%.

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1 Synthesis Report 487: Public Perception of Mileage-Based User Fees; National Cooperative Highway Research Program (NCHRP); 2016.
2 ibid
A telephone survey of residents in Delaware and Pennsylvania also asked questions regarding the fairness and equity of the MBUF approach, specifically in terms of reasons to oppose MBUF and reasons to support MBUF. The results of the surveys are shown in Figures 2 and 3.

Figure 2. The Most Persuasive Messages to Oppose Mileage-Based User Fees
Figure 3. The Most Persuasive Messages to Support Mileage-Based User Fees

These potential fairness and equity issues in a MBUF system are discussed in greater detail in subsequent sections herein. Addressing and resolving these issues will be an important policy consideration, particularly if the decision is made to implement different per-mile rates for different types of vehicles and/or different population demographics in the interest of fairness and equity. The MBUF concept makes such a multiple rate structure possible; although having a MBUF system with a variety of different per mile rates will increase complexity, possibly increasing the associated administration and compliance costs. Moreover, many of these equity and fairness issues are closely coupled and interrelated, and approaches that seem obvious on the surface may not be that simple.

LONGER COMMUTES AND DRIVING DISTANCES

The NCHRP Synthesis Report 487\(^3\) quotes a member of a Metropolitan Transportation Commission who stated: “[My concern] is that you’re going to charge somebody for living a long distance from work.” Additionally, the telephone surveys conducted in Delaware and Pennsylvania indicate (Figure 2) that the greatest reason to oppose MBUF is “unfair to residents who drive longer distance.” In many respects, that is the whole point behind the MBUF concept! Just like the person who uses more electricity ends up with a higher utility bill, the person who uses the roadway network more (as measured by the number of miles driven) should also pay more. Moreover, in considering the fairness of MBUF on those individuals who drive long distances, it is important to note that these long-distance drivers are already paying

\(^3\) ibid
more in fuel tax (unless they have an electric vehicle) as compared to drivers with a shorter commute and a similar type of vehicle, as shown on Figure 4.

**Figure 4. Average Monthly Gas Tax Paid by Vehicles with Different Fuel Efficiencies (based on Delaware State Gas Tax)**

That said, the concept that it is fair for longer commutes to pay more MBUF – because these vehicles use the roadway more – may not be that straightforward! Rather, it may be that some of these longer-distance drivers have lower incomes, and their longer commute is because they cannot afford to live closer to places of employment, goods, and services. This is discussed in the next section.

**INCOME**

A study by the Brookings Institute⁴ indicated that between 2000 and 2012:

- As poor and minority residents shifted toward suburbs in the 2000s, their proximity to jobs fell more than for non-poor and white residents. The number of jobs near the typical

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⁴ “The Growing Distance Between People and Jobs in Metropolitan America;” Elizabeth Kneebone and Natalie Holmes; Brookings Institute; March 2015.
Hispanic (-17%) and black (-14%) resident in major metro areas declined much more steeply than for white (-6%) residents, a pattern repeated for the typical poor (-17%) versus non-poor (-6%) resident.

- Residents of high-poverty and majority-minority neighborhoods experienced particularly pronounced declines in job proximity. Overall, 61% of high-poverty tracts (with poverty rates above 20%) and 55% of majority-minority neighborhoods experienced declines in job proximity between 2000 and 2012. A growing number of these tracts are in suburbs, where nearby jobs for the residents of these neighborhoods dropped at a much faster pace than for the typical suburban resident (17 and 16%, respectively, versus 7%).

These statistics are not uniform. Individual metro areas experienced wide variations in both employment trends and in changing proximity to jobs for the typical resident, as shown on Figure 5.

Figure 5. Percentage Change in the Number of Jobs Near the Typical Resident, 96 Largest Metro Areas, 2000 to 2012

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5 “The Growing Distance Between People and Jobs in Metropolitan America,” Elizabeth Kneebone and Natalie Holmes; Brookings Institute; March 2015
A Congressional Budget Office report\(^6\) notes that fuel taxes tend to be regressive; that is, they impose a larger relative burden on low-income than on high-income households. The same situation may also exist for a MBUF system, particularly for low-income families that have longer commutes, although the exact impact relative to the fuel tax would depend on the fuel economy of the vehicles driven by those in lower income groups. If, for example, those in lower income groups drive older, less fuel-efficient vehicles, the adverse impact may be negated.

A study on the impacts of changing from the gas tax to MBUF on different income groups – based on Oregon data\(^7\) – indicated that, on average, those in the lowest income groups would pay more per year under a MBUF (as compared to the fuel tax), with the higher income groups paying less under MBUF. This change in incidence as percent of income for the lowest income groups was 0.02% to 0.08%.

One way to possibly mitigate potential adverse impacts on low income families from MBUF is to tailor the MBUF system such that low-income families would be charged a lower per-mile rate, receive a discount, or obtain assistance from the government in paying their MBUF. Such discounts could be based on actual reported income, household size, and / or location of their residence. Going back to the utility analogy, such an approach would be very similar to the discounts many electric and fuel companies offer low income customers along with government-assistance programs for lower income families. Examples include:

- The Federal Low-Income Home Energy Assistance Program (LIHEAP), managed by the U.S. Department of Health and Human Services, can help pay monthly energy bills and provide finance aid in an emergency to help prevent a disconnection.

- The Delaware Energy Assistance Program (DEAP) can help pay utility bills, including heating and cooling. The Division of State Service Centers runs this program and offers it in combination with weatherization programs. Additionally, legislation in Delaware requires Delmarva Power and Light to collect approximately $800,000 annually from customers to be forwarded to the Department of Health and Social Services, Division of State Service Centers, to be used to help fund these low-income fuel assistance and weatherization programs.

- In Pennsylvania, PECO's Customer Assistance Program (CAP) provides a monthly credit for eligible low-income customers. The credit is based on the customer’s total household gross income and energy usage. For example, to be eligible for this program, the monthly household income cannot exceed $3,138 for a four-person household.

Similar assistance approaches could conceivably be used for MBUF to make it fairer for low-income commuters. It should also be noted that very little existing research documents MBUF

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\(^6\)“Alternative Approaches to Funding Highways;” Congressional Budget Office; March 2011.

\(^7\)“Distributional Impacts of Changing from a Gasoline Tax to a Vehicle-Mile Tax for Light Vehicles: A Case Study of Oregon;” B. Starr McMullen, Lei Zhang, and Kyle Nakahara; 2010
opinions among these groups. Moreover, these groups have been under-represented in the MBUF pilots conducted to date.

**VEHICLE TYPE AND FUEL EFFICIENCY**

By and large, the MBUF concept was developed in response to the growing number of electric and other alternative fuel vehicles that pay little no fuel tax. As noted in the 2007 Final Report on Oregon’s Mileage Fee Concept and Road User Pilot Program⁸:

“That is the premise behind MBUF – everyone pays for the use of the roadway based on how much they use the roadway, and therefore contribute to the cost of operating and maintaining the infrastructure. As shown graphically on Figure 6, under the simplest application of MBUF – with a single per mile rate – all vehicle types pay an equal amount for the same miles traveled. As identified in Table 1 and in Figures 2 and 3 from the Delaware and Pennsylvania state-wide surveys, there are two conflicting arguments when it comes to charging electric and other high-efficiency vehicles for using the roadway.

- On one hand, MBUF is fairer than the gas tax because with MBUF, all drivers using the roadway, including highly fuel-efficient and alternative-fuel vehicles, pay similar amounts of tax to maintain and operate the roadway network they all benefit from (as shown on Figure 6).

⁸ “Oregon’s Mileage Fee Concept and Road User Fee Pilot Program – Final Report,” James Whitty; November 2007
The counter argument is that switching from the gas tax to MBUF is unfair to electric vehicle and hybrid vehicle owners, penalizing them for “doing their part” to protect the environment and reduce greenhouse gas emissions. Moreover, fuel-efficient vehicle owners will pay comparatively more in MBUF than they pay under the gas tax system, while owners of less fuel-efficient vehicles will pay comparatively less (assuming a single per-mile rate applied to all vehicles and drivers) with MBUF as compared to the gas tax.

This latter argument was included in a recent Op-Ed in Crain’s Chicago Business⁹, noting that: “a vehicle-miles traveled (VMT) tax would “penalize modern new clean hybrid and electric vehicles that pollute much less than old internal combustion engine and diesel vehicles. These cleaner cars produce air quality, public health and other environmental

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⁹ “6 reasons why this tax is a crummy way to improve Illinois’ roads and bridges;” Howard Learner; Crain’s Chicago Business; October 25, 2018. https://www.chicagobusiness.com/opinion/6-reasons-why-tax-crummy-way-improve-illinois-roads-and-bridges
quality benefits for everyone. With federal tax credits incentivizing purchases of electric vehicles, why create a new VMT tax system that charges people more?”

In addressing this issue, it is not important not to merely look at vehicle pollution from the singular perspective of the exhaust pipe. Rather, the life-cycle of a vehicle’s emissions should be addressed, including those pollutants created by the mining of material for batteries, during the construction of the vehicle, the production of fuel and the generation of electricity, the operation of the vehicle (including the “muck that actually comes out of the exhaust”)10, and the vehicle’s subsequent disposal. Several studies have analyzed these life-cycle emissions – what is also referred to as “well to wheel” – some of which are summarized as follows.

A 2015 study by the Union of Concerned Scientists11 found that over its lifetime, a battery electric vehicle (BEV) generates about 50% fewer global warming emissions (i.e., carbon dioxide) than a comparable gasoline car as shown on Figure 7. BEV production results in higher emissions than the making of gasoline cars – mostly due to the materials and fabrication of BEV lithium-ion batteries – but these are negated by reduced carbon dioxide emissions from driving.

Figure 7. Life-Cycle Global Warming Emissions from the Manufacturing and Operation of Battery Electric Vehicles

Source: Union of Concerned Scientists12

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10 “Cleaner Than What;” The Economist; December 17, 2014
12 ibid
The “operation” results on Figure 7 are based on the average electricity grid emissions in those states where most of the BEVs were being sold at the time of the analysis. As shown on Figure 8, the states where most BEVs have been sold – as a percentage of all vehicle sales in the state, such as California (which represented over half of all BEV sales in 2016), Oregon, Washington, Hawaii, and Vermont – also tend to have the cleanest sources of electrical power (e.g., from natural gas and hydro). What then of a BEV that plugs into an electrical grid that primarily uses coal for power generation?

**Figure 8. Most Prevalent Utility-Scale Electricity Generation Fuel by State**

A recent report by the European Environment Agency (EEA)\(^\text{13}\) assesses climate change impacts (based on carbon dioxide emissions) by combining the different phases of the vehicles’ life. The report concludes that BEVs emit less greenhouse gases (GHGs) and air pollutants over their entire life cycle than gasoline and diesel cars. Emissions are usually higher in the raw materials extraction and production phases of electric vehicles, but these increased emissions are more than offset by lower emissions in the operational and use phase over time. The report does note that the extent to which the GHG emissions advantage is realized during the in-use stage of a BEV depends strongly on the electricity mix. As shown on Figure 9, a BEV charged with electricity generated from coal has higher life-cycle GHG emissions than internal combustion engine vehicles (ICEV) whereas, the life-cycle emissions of a BEV could be almost 90% lower than an equivalent ICEV using electricity generated from wind power. The report notes that

\(^{13}\) “Electric Vehicle from Life Cycle and Circular Economy Perspectives;” European Environment Agency (EEA); 2018
with the current European electricity mix, the GHG emissions from electric vehicle life cycles are some 17 to 30% less than that of ICEVs.

**Figure 9. Climate Change impacts - Comparison of Electric Vehicles and Internal Combustion Engine Vehicles**

A study conducted by the University of Minnesota evaluated the air quality-related human health impacts of various vehicle types and power options. The focus of this analysis was on ozone ($O_3$) and fine particulate matter (PM$_{2.5}$), with the paper indicating that such “non-GHG air pollution damage externalities generally exceed those from climate change.” Overall, the research shows that **electric cars are cleaner than those that rely on internal-combustion**

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14 ibid
Engines only if the power used to charge them is also clean. As shown on Figure 9 (reproduced from the *Economist*16), BEVs whose batteries are topped up from wind, solar, or hydroelectric sources came out cleanest. BEVs recharged with power from natural-gas-fired stations were also a lot less lethal than petrol-driven ones. But if those same BEVs are recharged ultimately by coal, they would be responsible, according to the analysis, for just over 3,000 deaths.

From a financial and transportation revenues perspective, consideration might be given to the concept of a variable MBUF rate structure that charges a higher per-mile rate for vehicles with lower fuel efficiencies such that these vehicles pay no less than they currently pay in gas tax (ignoring the possibility that many of these vehicles may be owned by low-income and/or rural residents). A lower rate would be charged for those vehicles with fuel efficiencies at about the average MPG – in essence, a “revenue-neutral” rate. In this manner, there would be no reduction in transportation revenues from these vehicles relative to what is currently collected from the gas tax. Highly fuel-efficient and electric vehicles would still be charged MBUF – thereby slightly increasing revenues – but at the lowest per-mile rate, recognizing their “contribution” to the environment. The result would be something like that shown on Figure 11. Of course, how “green” the EVs actually are, and the associated MBUF charge under a variable rate structure, might depend on what section of the country the BEVs are mainly driven and the predominant electrical power source in that region – a potentially significant increase in system complexity and a potential challenge for the education and outreach effort.

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16 “Cleaner Than What;” *The Economist*; December 17, 2014
It should be noted that 18 states have implemented increased registration fees for BEVs and for plug-in hybrid electric vehicles (PHEV). This includes a number of states along the eastern seaboard, including Virginia ($64 for BEV / PHEV), North Carolina ($130 for BEV / PHEV), South Carolina ($120 for BEV, $60 for PHEV), and Georgia ($200 for BEV / PHEV). Vermont and New Hampshire are considering such additional registration fees. A study conducted by the University of California, Davis on the impact of California’s $100 annual registration fee on zero-emission vehicles (commencing in 2020) indicates that while the such a fee recovers part of the decrease in gas tax revenue, the “registration fee in the long term is unsustainable.”

17 “Assessing Fees for Electric Vehicles Under SB1;” Alan Jenn, PhD; Institute of Transportation Studies, University of California, Davis; Presentation give at the quarterly MBUFA meeting on February 26, 2019.
URBAN AND RURAL

A recurring equity issue with MBUF involves the potential impacts on rural households relative to urban households, with the greatest concern being that rural drivers will have to pay more MBUF because they drive greater distances. As previously noted in the section on “Longer Driving Distances,” this same argument of unfairness can also be applied to the current gas tax – more miles driven equates to more gas purchased and more gas tax paid. Moreover, rural drivers tend to use vehicles that have lower fuel economies, and therefore pay more for each mile driven.

It is easy to think of the I-95 Corridor – particularly between Virginia and Maine – simply as the most populous “megalopolis” in the western hemisphere. But the states comprising this corridor have a significant rural and agricultural-based population. For example:

- Agriculture is Delaware’s number 1 industry, worth $8 billion. About 2,500 farms spread across 510,250 acres of farmland. These agricultural products must be taken to market using the roadways for part of that process.

- Pennsylvania has 48 rural counties and 19 urban counties (Figure 12). In 2010, nearly 3.5 million residents, or 27% of the state’s 12.7 million residents, lived in a rural county. Pennsylvania’s highway system consists of 72,577 linear miles in rural areas with a daily VMT of nearly 94 million, and 47,875 miles in urban areas with a daily VMT of 183 million.

The issue of the relative impact of MBUF on urban and rural households has received a significant amount of study, particularly in the western states. Perhaps the most comprehensive study is the one conducted for RUC West on the financial impacts of road user charges on urban and rural households. Several of these studies and their results and conclusions are summarized as follows.

RUC West: Financial Impacts of Road User Charges on Urban and Rural Households

This report18 provides an analysis of the financial impacts of a revenue-neutral RUC for drivers in urban and rural counties for eight states in the RUC West Consortium – Arizona, California, Idaho, Montana, Oregon, Texas, Utah, and Washington. The analysis conducted for this study was applied uniformly to all eight participating states so that a clearer and more comprehensive assessment of the impact of RUCs could be developed, and so that any differences in financial

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18 “Financial Impacts of Road User Charges on Urban and Rural Households;” Economic Development Research Group Inc. April 2017
impact on a state-by-state basis could be understood. Census tracts – designated as urban, rural, or mixed – were used for the analysis to fully reflect the variation in travel characteristics for some of the larger, more diverse counties that characterize the member states. VMT was estimated for each census tract in the participating states using household characteristics. Fuel type mixes and efficiencies were estimated with the vehicle registration data provided by the states, as shown in Table 2, which indicates consistency in fuel efficiency for urban, mixed, and rural locations across all eight states, with urban areas having the highest average fuel efficiency, decreasing across mixed areas, with the lowest value in rural areas.

To better understand the financial impact a revenue-neutral RUC would have on urban, mixed, and rural households the report looked at driving patterns. Using National Household Travel Survey (NHTS) data, the study found little difference between urban and rural households nationally in terms of trip frequencies, but the NHTS showed much longer trip lengths for rural households, including nearly twice as much travel for shopping trips.

### Table 2. Average Fuel Efficiency (MPG) for Vehicles in Urban, Mixed, and Rural Census Tracts of Project States – Gas-Taxed Vehicles Only

<table>
<thead>
<tr>
<th>State</th>
<th>Urban</th>
<th>Mixed</th>
<th>Rural</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arizona</td>
<td>22.7</td>
<td>22.1</td>
<td>20.9</td>
</tr>
<tr>
<td>California</td>
<td>27.0</td>
<td>26.3</td>
<td>25.2</td>
</tr>
<tr>
<td>Idaho</td>
<td>21.7</td>
<td>21.2</td>
<td>20.8</td>
</tr>
<tr>
<td>Montana</td>
<td>23.8</td>
<td>23.6</td>
<td>22.9</td>
</tr>
<tr>
<td>Oregon</td>
<td>21.3</td>
<td>20.3</td>
<td>19.9</td>
</tr>
<tr>
<td>Texas</td>
<td>21.6</td>
<td>20.5</td>
<td>19.9</td>
</tr>
<tr>
<td>Utah</td>
<td>22.8</td>
<td>21.8</td>
<td>21.1</td>
</tr>
<tr>
<td>Washington</td>
<td>22.6</td>
<td>21.5</td>
<td>21.2</td>
</tr>
</tbody>
</table>

Analysis of the financial impacts when replacing the gasoline tax with a revenue-neutral RUC showed that households in rural census tracts will generally pay less under a road user charge than they are currently paying in gasoline taxes. In most states, households in mixed census tracts will also pay less under a RUC. Households in urban areas in all eight states could see a slight increase in payments. Table 3 shows the estimated percent reduction in payments for each state’s urban, mixed, or rural areas under a revenue-neutral RUC. The net reduction in MBUF payments in rural areas is due to the lower average fuel efficiency of the vehicles in rural areas, even though rural drivers accrue more mileage than their urban counterparts.
Table 3. Increase in Payments Under RUC Compared to a Gas Tax

<table>
<thead>
<tr>
<th>State</th>
<th>Urban</th>
<th>Mixed</th>
<th>Rural</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arizona</td>
<td>0.7%</td>
<td>-1.7%</td>
<td>-6.1%</td>
</tr>
<tr>
<td>California</td>
<td>0.3%</td>
<td>-2.4%</td>
<td>-6.3%</td>
</tr>
<tr>
<td>Idaho</td>
<td>1.0%</td>
<td>-0.9%</td>
<td>-3.1%</td>
</tr>
<tr>
<td>Montana</td>
<td>1.4%</td>
<td>-0.4%</td>
<td>-1.9%</td>
</tr>
<tr>
<td>Oregon</td>
<td>1.0%</td>
<td>-2.9%</td>
<td>-4.8%</td>
</tr>
<tr>
<td>Texas</td>
<td>0.5%</td>
<td>-1.6%</td>
<td>-3.1%</td>
</tr>
<tr>
<td>Utah</td>
<td>0.6%</td>
<td>-3.4%</td>
<td>-5.5%</td>
</tr>
<tr>
<td>Washington</td>
<td>1.0%</td>
<td>-3.6%</td>
<td>-4.8%</td>
</tr>
</tbody>
</table>

Note: Negative percentages represent a decrease in payments.

Washington State

The 2014 Washington State Legislature directed the Washington State Transportation Commission (WSTC) to study the urban and rural financial and equity implications of a potential RUC system in Washington. In the overall conclusion of the Final Report,\(^{19}\) the modeling found that the tax burden for rural and urban households does not appear to significantly change with a switch from fuel taxes to a hypothetical RUC. The results of a fuel consumption and VMT allocation modeling effort showed that with RUCs, rural drivers would benefit slightly from the change and urban drivers would likely pay slightly more than they do in fuel taxes. The model produced this result because it found that, on average, rural residents, even though they drive more miles, tend to drive less fuel-efficient vehicles than those residents living in an urban area.

The RUC West study reached a similar conclusion as shown on Figure 13. The increased payments are clearly focused in the greater Seattle area and all around the Puget Sound region, with lesser increases in Clark County, around Spokane, and near Pullman. Much of rural Washington households are estimated to pay less when transitioning to a RUC.

\(^{19}\) Road Usage Charge Assessment - Financial and Equity Implications for Urban and Rural Drivers; Washington State Transportation Commission (WSTC); January 2015
California

The California Department of Transportation (Caltrans) launched the 9-month California Road Charge Pilot Program (RCPP) in 2016, with more than 5,000 participating vehicles statewide, to test the feasibility “road charging” (as it is called in California). The pilot used a revenue neutral per-mile rate (based on the statewide average MPG and current gas tax). Of the pilot program’s participants 11% were designated as rural state residents. The evaluation and analyses concluded:

- Rural participants drove 19% more miles per month than urban participants.
- Rural participants also drove less fuel-efficient vehicles on average—10% worse than urban participants (23.1 vs. 25.7 MPG).

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20 “Financial Impacts of Road User Charges on Urban and Rural Households,” Economic Development Research Group Inc. April 2017
Both urban and rural participants paid more in both estimated road charges compared to gas taxes (average MPG of participant vehicles was greater than the statewide average), but the increase in the amount of road charge paid by rural residents (relative to gas tax) represented an 18% increase as compared to 31% increase paid by their urban counterparts.

The greatest increases in payments under a RUC are seen in the Bay Area and Los Angeles (see Figure 14). There is relatively high portion of hybrid vehicles in these areas, especially around San Francisco, that have above average fuel efficiency and will pay more under a RUC. Additionally, these areas have one of the highest concentrations of BEVs of all the participating states, which are currently not contributing to the fuel tax but will be subject to a RUC. Excluding high-VMT mixed tracts in the Los Angeles region, most of inland California households would pay less under a RUC.

Figure 14. Payments Under RUC in California Relative to Fuel Tax
National Interest

The MBUF concept is starting to get more attention at the federal level. Elected officials like House Transportation and Infrastructure Chairman Peter DeFazio have noted that a future mileage-based user fee approach should include congestion pricing to ensure urban/rural fairness, for example, making the per mile rate for rural roads lower than the rate for urban roadways. Based on the urban/rural analyses conducted to date, this may not be necessary to achieve urban/rural fairness. Moreover, to implement congestion pricing as part of MBUF (e.g., using a different per-mile rate for specific road types and locations), GPS or other location-based technology would be necessary (e.g., to determine what road a vehicle was on and when it was driving on that facility), which raises privacy concerns.

Protection of privacy represents one of the major concerns with the MBUF concept, and GPS or location-based MBUF approaches have the greatest privacy concerns. A guiding principle in all the MBUF pilots to date has been the concept of “choice” as to what approach the vehicle owner or lessee uses to record mileage, including not mandating a location-based approach. As such, including congestion pricing in a pilot (nationally or otherwise) – particularly if a location-based approach is mandated – could have a notable public backlash.

CLOSING

The MBUF concept allows equity issues and concerns – both real and perceived – to be addressed using different rates for different demographics and/or vehicle types. However, because these issues are often interrelated, and perceptions may not always match reality (refer to Table 4), such a variable rate approach can get very complicated. For example, if these western urban/rural results are also applicable to the eastern seaboard (i.e., rural drivers will likely pay less – either in absolute terms or relative to their urban counterparts), there shouldn’t be any need to develop and implement a separate rate structure for urban and rural areas or households. However, a variable rate structure based on vehicle efficiency (as shown in previous Figure 4), with the lowest efficiency vehicles being charged the highest per-mile rate, rural drivers would be negatively impacted as rural drivers typically get the fewest MPG. There is also the income variable to consider, for example, higher income drivers can afford to purchase more expensive vehicles (such as BEVs) and can therefore to pay more in MBUF relative to the near zero cost of the gas tax.

Finally, another potential equity issue is the relative impact on transportation finances between individual states. The MBUF concept is meant to stop the erosion of transportation funding as gas tax revenues continue to decrease with the increase in BEVs and other highly fuel-efficient vehicles on the roadway network. However, some states may be net revenue gainers, with
others being net revenue losers from switching from the gas tax to MBUF. These revenue scenarios depend on how much gas is purchased in the state by out-of-state drivers, and how much out-of-state mileage occurs.

Table 4. Summary of Impacts for Different Approaches for Promoting Equity

<table>
<thead>
<tr>
<th>Per-Mile Rate Approach</th>
<th>MBUF Costs Relative to Gas Tax</th>
<th>Comments / Potential Issues</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>Higher</td>
<td>Little Change</td>
</tr>
<tr>
<td>Single rate (“revenue neutral”)</td>
<td>Highly fuel-efficient vehicles (BEVs); Typically, urban drivers</td>
<td>Vehicles that get average MPG (+ / -)</td>
</tr>
<tr>
<td>Variable rate based on fuel efficiency (higher MPG = lower MBUF rate)</td>
<td>Highly fuel-efficient vehicles (BEVs); but not as high as single rate approach</td>
<td>Low-efficiency vehicles (“gas guzzlers”); Vehicles that get average MPG (+ / -)</td>
</tr>
<tr>
<td>Variable rate based on roadway type and location (urban/rural)</td>
<td>Urban drivers</td>
<td>Rural drivers</td>
</tr>
<tr>
<td>All of the above – concerns with income equity</td>
<td></td>
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</tbody>
</table>