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Road Usage Charges in Utah

MARCH 2021

MEASURING THE MILES ROAD USAGE CHARGES IN UTAH

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INTRODUCTION

Utah has joined about a dozen states in exploring a new kind of revenue for road maintenance that charges drivers for miles driven, rather than fuel consumed. Traditional transportation funding, both at the state and federal levels, has relied heavily on fuel taxes as a primary revenue source. But economic and technological factors are making fuel taxes less sustainable, and states are exploring alternatives. The rise of electric and hybrid vehicles has intensified this interest, and Utah's new road usage charge is specifically aimed at this market.

This new revenue concept goes by several names: road usage charge, road charge, mileage-based user fee or vehicle miles traveled tax. While many states have conducted research and pilot projects on road usage charges, Utah and Oregon are the only two states with currently operating programs.

This report examines: 1) the broader movement toward road usage charges among the states; 2) how these charges can be implemented; 3) the advantages and disadvantages of the types of implementation; and 4) Utah's new road usage charge program for electric and hybrid vehicles.

It should be noted that there are many ways to fund roads. This report focuses on road usage charges because policymakers are currently examining them as a replacement for or as an expanding complement to Utah's motor fuel tax.



KEY FINDINGS OF THIS REPORT

- As structured, fuel taxes have become financially unsustainable as increased vehicle efficiency has led to lower revenue per mile driven; for the past 15 years, states have experimented with road usage charges as an alternative approach.
- Two states currently have road usage charge programs in operation: Oregon and Utah. In both states, the programs are targeted at electric and hybrid vehicles, which pay less or no fuel tax.
- The track record of road usage charge pilot projects and existing programs suggests that they are a feasible transportation funding mechanism.
- The costs and complexity of implementing a full-scale road usage charge program can be significant; policymakers must be careful to ensure that the cost in achieving their revenue and policy objectives is worthwhile.
- While road usage charge programs are primarily meant to address the deficiencies of the motor vehicle fuel tax as a revenue generator, they can be crafted to address other policy objectives as well, such as improvements to traffic congestion and air quality.
- While road usage charge programs pose potential fairness and privacy issues – and could disincentivize fuel efficiency – they hold the potential to be fairer in some respects than gasoline taxes.
- The somewhat experimental nature of road usage charges suggests a gradual approach to full implementation would be prudent, so that policymakers can learn as the program advances and modify it accordingly. Government vehicles can serve as guinea pigs for more robust implementation.



RUC IN THE 2021 LEGISLATIVE SESSION

During the 2021 Utah General Session, lawmakers created the “Road Usage Charge Program Special Revenue Fund” within the state’s Transportation Fund. Revenues from Utah’s RUC program and any other appropriations or contributions will be used to cover administrative costs and other transportation purposes.

The Utah Legislature rejected another bill (H.B. 209), which sought to reduce the state RUC to 1.0 cent per mile, and then increase the RUC 0.1 cent per year back up to 1.5 cents per mile by 2026. In addition to setting RUC charges, it sought to increase registration fees for electric vehicles and other alternative fuel vehicles from \$120 to \$300 over five years and plug-in hybrids from \$52 to \$260 over five years. It also sought to increase the fee for hybrid electrics from \$20 to \$40. The bill sponsor suggested that the increased registration cost outlined in the bill “encourages people to start going on the ... road usage charge program,” stating that about 3,600 Utahns are currently participating in the RUC program, though there are about 45,000 electric vehicles on the road in the state. The bill died on the House floor.

Sources:

Utah Legislature, S.B. 82 Road Usage Charge Program Special Revenue Fund, <https://le.utah.gov/~2021/bills/static/SB0082.html>.

Utah Legislature, H.B. 209 Vehicle Registration Fee Revisions, <https://le.utah.gov/~2021/bills/static/HB0209.html>.

Utah Legislature, House Floor Audio, Day 30, February 18, 2021, 3HB209, <https://le.utah.gov/av/floorArchive.jsp?markerID=114296>.

WHAT IS A ROAD USAGE CHARGE?

A road usage charge (RUC), sometimes called a mileage-based user fee, vehicle miles traveled (VMT) tax, or simply road charge, is a fee or tax levied on drivers based on miles driven. Modern technology provides several methods for counting miles driven, and states have been experimenting with demonstration projects to prove viability of the concept since the early 2000s. Road usage charges are meant to make up for the deficiencies in motor fuel taxes, either as a funding source or as a fair means of charging drivers for road usage.

RUCs are still in their infancy, with only a few states operating voluntary programs for passenger vehicles, although some other countries have more experience with RUCs levied on commercial trucking.

WHAT’S WRONG WITH THE GAS TAX?

For many years, fuel taxes served as a reliable user charge to fund road maintenance. The more miles you traveled on local roads and highways, the more fuel you consumed, and the more you paid to help maintain the roads.

However, there was always a problem of inflation eating away at the purchasing power of the tax. Since fuel taxes are levied on a per-gallon basis, they typically do not automatically change to counter the effects of inflation. To address this problem, 13 states have indexed their fuel taxes to a measure of inflation, some with automatic annual increases.

But there is a thornier problem with fuel taxes as a funding source: Vehicles have gotten much more fuel-efficient over time, burning less fuel per mile. This is good for consumers and for the environment, but for departments of transportation, this means

fewer dollars generated per mile traveled, and miles traveled is an indicator of road maintenance and repair needs.

Figure 1 illustrates how this problem plays out in Utah. It shows fuel tax revenue per mile from new cars each year since 2000. As the fuel efficiency of new car models increases in response to market conditions and EPA regulations, the revenue yield of the fuel tax continues to decline, even after tax increases.

Inflation and fuel-efficiency impacts create a need for periodic increases in fuel taxes, and these often prove unpopular with voters. Consequently, many state legislatures and Congress have left old tax rates in place for decades and supplemented transportation funds with large transfers from general funds, placing a significant strain on available resources for other programs. This is certainly the case in Utah.

In addition to those challenges, the growing adoption of electric and hybrid vehicles is causing further breakdown of the relationship between miles driven and road funding. Although they are still a small share of the market overall, electric vehicle (EV) sales are growing quickly, and consulting firm Deloitte projects that they will make up 32 percent of global new vehicle sales by 2030. Obviously, EVs pay no motor fuel taxes, and there does not yet seem to be a practical method to tax the electricity used to charge them – particularly for EVs that are typically charged at owners’ homes.

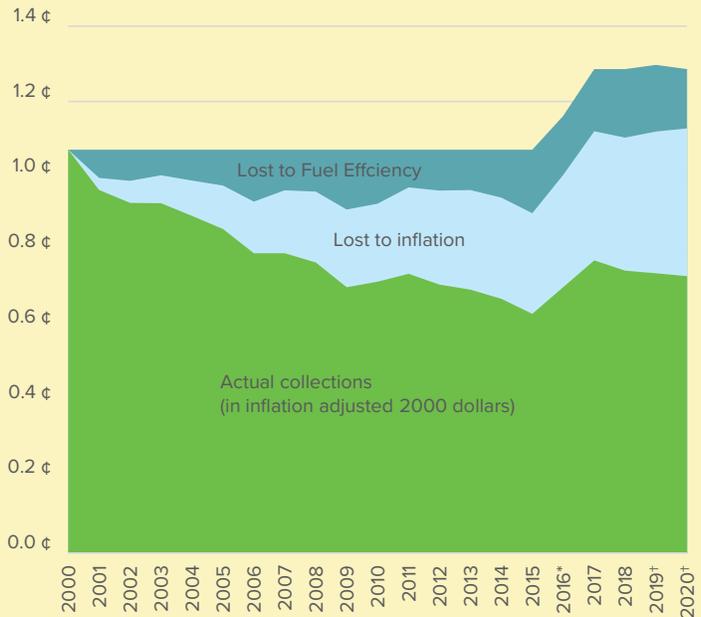
Many states provide incentives, such as tax credits, to consumers for EV purchases. Utah offered a tax credit up to \$1,500 for EV and plug-in hybrid purchases that ended in 2016. A federal tax incentive up to \$7,500 is still available, but only for manufacturers that have not yet sold 200,000 EVs (which now excludes Tesla and General Motors).

But one of the strongest incentives for EV purchase is that costs of operation are lower, both in fuel/energy and maintenance expenses. As production of EVs has risen, the cost of EV technology is falling, and some expect EV costs to be comparable to gasoline- and diesel-powered vehicles by 2025. Some states are continuing to promote EV adoption with other policies; perhaps one of the most aggressive is a recent executive order by California’s governor requiring all new passenger vehicle sales to be EVs by 2035.

All of these factors point to a need to replace or supplement fuel taxes with a revenue source that is more sustainable. States may try to do this by tweaking the motor fuel tax – such as indexing it to inflation. Others may use revenues from other tax sources to supplement the motor fuel tax. However, one of the most equivalent methods to generate sustainable revenues is to tax vehicle miles traveled.

Utah’s fuel tax yield per mile is in long-term decline.

Figure 1: Utah Fuel Taxes in Cents Per Mile; 2000 Baseline for Inflation and Fuel Efficiency



* Taxes increased.

† Inflationary adjustment.

Sources: Utah State Tax Commission, Utah Department of Public Safety. Utah Foundation calculations.

Notes: The maximum amount collected per mile is constant at 1.07 cents from 2000 to 2016 because without losses to both fuel efficiency and inflation the amount of tax revenue per gallon is dependent only on the number of miles traveled.

All the calculations in this figure – using fuel efficiency, inflation and gallons of fuel sold – are based on the ratios of each as of 2000.

The maximum amount collected per mile increases from 1.07 cents beginning in 2016 because the tax rate changed in 2016, 2019 and 2020, which would change the amount of tax revenue per mile based on the 2000 ratios.



The European programs focus on reducing or compensating for environmental impacts, rather than road damage, with higher charges on trucks with older, less efficient engines.

INTERNATIONAL ROAD USAGE CHARGE EXAMPLES

Road usage charges have been implemented in a handful of countries, generally levied on heavy trucks. New Zealand is credited as the pioneer of the concept, instituting a RUC in 1977 for diesel-powered vehicles and heavy trucks. The New Zealand RUC focuses on the marginal costs of large trucks on roadways, which due to their weight and weight distribution can do significant damage to roadways. For instance, compared to some other heavy vehicles, trucks with more axles distribute weight more efficiently and do less damage – and therefore pay a lower charge per mile. New Zealand also levies a lower-cost RUC on passenger vehicles that are diesel-fueled, because the fuel tax is not applied to diesel, due to a high proportion (30% to 40%) of diesel fuel in that country being used off of public roads, including farms, manufacturing, industrial and commercial ventures, and ships.

New Zealand's RUC for diesel light-duty (passenger) vehicles is about 7 cents per mile (when converted to U.S. dollars). This is significantly higher than the RUC rates generally discussed in the U.S. and explored in state pilot projects, but New Zealand also has much higher fuel taxes, currently around \$1.75/gallon (U.S. dollars). RUC rates for heavy trucks (greater than 6 metric tons) are higher, from 11 cents to 39 cents per mile (U.S. dollars).

Austria, Germany, Switzerland and a few smaller European countries also levy a RUC on heavy trucks. The European programs focus on reducing or compensating for environmental impacts, rather than road damage, with higher charges on trucks with older, less efficient engines. Some of these programs are more like tollways, only applying to certain classes of roads, while Switzerland charges its RUC for all miles driven within the country. These countries charge varying rates, from around 21 cents to \$1.33 per mile, as of 2016.

ROAD USAGE CHARGE POLICY IN THE U.S.

In the U.S., states began experimenting with RUCs in the mid-2000s, including groundbreaking pilot projects in the Puget Sound region of Washington, in Oregon and in a multistate project conducted by the University of Iowa. The Iowa team did much of the heavy lifting in early research, preparing for about a decade before beginning on-road testing. In the 2010s, Minnesota and California implemented projects, with a second project in Oregon and one Washington-wide, along with a Florida-to-Maine coalition.

The Puget Sound Regional Council ran the first significant American road test with RUCs, with 500 participants over 10 months in 2005-2006. The demonstration included congestion pricing, charging 5 cents per mile for non-peak travel and 50 cents for travel during peak traffic periods/locations. Because the study focused on behavior changes related to congestion pricing, a GPS-enabled on-board unit placed in each car had a digital display of current charges for the road being driven. Participants were given an “endowment account” funded by the pilot project at the beginning of the pilot, and tolls were deducted from the account. These accounts were calculated to approximate the

needs of each driver, based on a test phase that measured their typical driving needs, and some of the accounts exceeded \$4,000 for the 10-month period. Participants were allowed to keep excess funds from their endowment account at the end of the trial, creating an incentive to treat the funds as real money and adjust behavior in response to the variable road usage charges.

Oregon was close behind Puget Sound, running its first demonstration during 2006-2007. Oregon received some acclaim for its innovative use of fueling stations equipped with wireless devices that connected with GPS-enabled on-board units in vehicles. The units stored mileage information, read the mileage data since the last fill-up, calculated the RUC for those miles and replaced the state portion of fuel taxes in that fill-up with the road charge. All of this information was displayed on receipts the pumps produced. The road charge portion of each transaction was drawn from a state-funded endowment account, similar to the Puget Sound experiment. This helped to protect volunteers from incurring any actual costs for their participation and created an incentive to pay attention to the congestion charge component of the pilot and consider driving at other times. Participants kept excess funds in their endowment accounts at the end of the project.

Participants in this demonstration were divided into three groups. A control group that continued to pay fuel taxes, a flat-rate group that paid 1.2 cents per mile, and a congestion-charge group that paid 10 cents during rush hours and 0.43 cents at other times. The demonstration included 285 vehicles.

The University of Iowa conducted a national demonstration in 12 states with 2,650 participants from 2008 to 2010. The study also used GPS-enabled on-board units. One of the lessons learned from this and other early pilots is that custom on-board units created some challenges for the managers of the programs. Later demonstrations moved to using commercial off-the-shelf devices and many used the services of commercial account managers that had experience working with the devices for other services. Overall, the demonstration suggested that charging by the mile across many jurisdictions is feasible.

Minnesota conducted a demonstration in 2011-2012 with 500 participants. This project included congestion pricing on roads within the Twin Cities area during peak hours. Miles were counted using a custom smartphone application on phones provided to participants by the state. RUC rates varied from 1 cent per mile outside of peak times/areas to 3 cents per mile during peak congestion; however, the discounted rates were available only to those who volunteered to provide location data to the research team and only if they actively used the smartphone application during those trips. About 77% of the miles logged for the study received the discount, showing a strong willingness of participants to grant access to their location data in exchange for the discount.

Oregon's second demonstration in 2012-2013 employed several methods to count miles, allowing users to choose their preferred solution. In designing the options, Oregon was motivated by four goals:

1. *Adaptability.* Work within an open-architecture environment, setting standards but allowing private sector firms to create devices and software that meet the standards with flexibility that can adapt into the future as technologies change.
2. *Respect for privacy.* Motorists could choose a GPS or other location-enabled solution, but it would not be mandated, and a version of the service that does not require location data would be available.
3. *Respect for preferences.* Participants could have multiple choices for mileage reporting, payment processing and other account services.
4. *Private sector interface.* Private companies could market opportunities to create service packages that motorists might want, including other value-added services that utilize the same devices and accounts as the road usage charge system.

One option for Oregon users was an on-board unit.

Figure 2: Example On-Board Unit



Source: OReGO Pilot Program Final Report.

This approach allowed transportation officials to test whether multiple mileage reporting options would lead to increased user satisfaction as well as testing the utility and accuracy of different methods for counting miles traveled. This choice-centered, private-sector partner approach became a standard, with later demonstrations in other states following suit – which is thought to have increased user satisfaction in each of the trials.

Oregon's second demonstration was small, with only 88 participants. Participants could choose from four options to record mileage: use of a GPS-enabled on-board unit, a non-GPS on-board unit, a smartphone app with GPS recording that could be enabled or disabled by the driver, or a flat charge for unlimited miles (priced at the equivalent of 3,000 miles per month). If a user chose a GPS-enabled option (including whenever they enabled the GPS feature of the smartphone app),

they would not be charged for out-of-state miles. Other plans charged for all miles. The rate was a flat 1.56 cents per mile across all options, with no congestion-pricing surcharges. The project also recruited some participants from Nevada and Washington to test cross-border capabilities.

California conducted a large, multi-faceted demonstration project in 2016-2017.¹ Significant goals of the project included demonstrating the feasibility of a road usage charge with multiple choices of mileage recording options, multiple commercial account managers and a wide variety of vehicle types.

The demonstration was active for seven months. It included more than 4,400 private vehicles, 333 government fleet vehicles, 261 light commercial vehicles and 55 heavy commercial vehicles. Rural drivers made up 11% of the participants, and a handful of out-of-state and tribal participants tested the ability to exempt road usage outside the state or on tribal lands. RUC rates were set at 1.8 cents per mile for light and heavy-duty vehicles, with mock invoices that included credits for estimated fuel taxes paid.

Participants with light-duty vehicles could choose among eight mileage reporting options:

1. GPS-enabled on-board units.
2. Non-GPS on-board units.
3. A smartphone application with GPS logging.
4. A smartphone application without GPS, relying on submitted photos of odometers.
5. Built-in vehicle telematics
6. Manual odometer inspections.
7. A flat-rate bulk permit for 1,000, 5,000 or 10,000 miles (with odometer verification).
8. A flat-rate time permit for 10, 30 or 90 days, priced as if the user were driving 3,000 miles per month.

Those enrolled in the automatic mileage recording plans could choose between two commercial account managers with experience in mileage recording with plug-in devices or smartphone apps. The heavy trucks all used a commercial electronic logging device and service provided by Eroad, one of the companies providing RUC services for trucking in New Zealand.

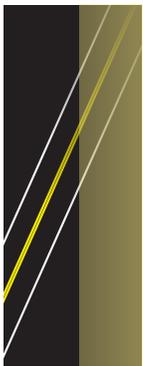
The State of Washington conducted a large RUC demonstration in 2018-2019 with 2,000 participants.² Like the Oregon and California pilot projects, Washington offered participants several choices for measuring miles traveled. These included GPS-enabled on-board units, non-GPS on-board units, smartphone apps with GPS logging, odometer reading and bulk mileage permits with odometer verification. This pilot also recruited out-of-state drivers to test cross-border functionality. Participants received mock invoices charging 2.5 cents per mile, with credits for estimated fuel taxes paid.

The Eastern Transportation Coalition (formerly the I-95 Corridor Coalition) is an interstate collaboration of states from Maine to Florida along the eastern seaboard. The organization has completed two small pilot projects that explore significant new ground in interstate functionality and the ability to interface with tolling systems. The phase-one pilot enrolled 155 light-duty vehicles, and phase two worked with 55 heavy trucks.

The light-duty vehicle Phase 1 pilot allowed drivers to choose mileage reporting options, including a GPS-enabled on-board unit, a non-GPS on-board unit and a smartphone app with GPS logging.³ This demonstration was largely a policymaker education and outreach project, with participants invited to join, selected from elected officials and their staff, transportation department staff, trucking industry officials, journalists, and various policy experts. Rates for each state's road usage charge were calculated to approximate that state's average gas tax per mile, ranging from 0.76 cents to 2.65 cents. These were simulated rates, with mock invoices sent to participants, including a credit for estimated fuel taxes paid.

The heavy-duty truck Phase 2 pilot enrolled 55 trucks from four companies.⁴ One technology solution was used – a sophisticated on-board unit from EROAD, a company that provides regulatory compliance, fleet management and other services to trucking firms. RUC rates varied by state, designed to replace the average diesel fuel taxes generated per mile, ranging from 3.33 cents to 12.35 cents. As in the light-duty pilot, these were simulated charges, with mock invoices that included estimated fuel tax credits. The participating firms were headquartered in coalition member states, operated across state lines, and employed a range of truck sizes and types.

Both of these demonstrations are noteworthy for their focus on interoperability among states with different tax rates and for their exploration of harmony with existing toll roads. The coalition plans to expand its exploration in the coming year with larger, additional pilots of both light-duty vehicles and heavy trucks.



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Demonstrations across the U.S. showcase a wide variety of approaches to road usage charges.

Figure 3: State/Regional Demonstrations of Road Usage Charges

State/Jurisdiction	Years Tested	Vehicle Count	Mileage Reporting Methods	Actual Money Exchanged?	Rate(s) per Mile	Comments
Puget Sound Regional Council	2005-2006	500	- GPS-enabled on-board unit	Yes, with a pre-funded "endowment account"	Varied: 5 cents - 50 cents	Not a RUC, but a congestion pricing pilot that laid groundwork for RUC pilots
Oregon	2006-2007	285	- GPS-enabled on-board unit with pay-at-pump	Yes, with fuel tax removed at pump and RUC drawn from a pre-funded "endowment account"	Two groups: a) 1.2 cents flat rate, b) 10 cents during "rush hours" and 0.43 cents otherwise	This was the first pilot to receive widespread attention, noted for its innovative approach
Iowa	2008-2010	2,650	- GPS-enabled on-board unit	No, mock invoices issued	Varied by state	12-state study conducted by Univ. of Iowa
Minnesota	2011-2012	500	- State-supplied smartphone with GPS	Yes, with a stipend	1 cent - 3 cents	Congestion pricing included in Twin Cities area
Oregon, Second Pilot	2012-2013	88	- GPS-enabled on-board unit - Non-GPS on-board unit - Smartphone app - Flat rate	Yes, with credit for calculated fuel taxes paid	1.56 cents	Out-of-state participants also recruited to test cross-border capabilities
California	2016-2017	5,100	- GPS-enabled on-board unit - Non-GPS on-board unit - Smartphone app with GPS - Smartphone app without GPS - In-vehicle telematics - Commercial truck electronic logging device - Odometer reading - Bulk mileage permit with odometer verification - Bulk time permit	No, mock invoices issued	1.8 cents	Participants could choose between two commercial account managers (CAMs) for the automated methods, one heavy truck CAM, or direct state management for manual methods
Washington	2018-2019	2,000	- GPS-enabled on-board unit - Non-GPS on-board unit - Smartphone app with GPS - Odometer reading - Bulk mileage permit with odometer verification	No, mock invoices with credits for calculated fuel tax	2.5 cents	Out-of-state participants also recruited to test cross-border capabilities
I-95 Corridor Coalition (now The Eastern Transportation Coalition) Phase 1 (Cars)	2018	155	- GPS-enabled on-board unit - Non-GPS on-board unit - Smartphone app with GPS	No, mock invoices with credits for calculated fuel tax	Varied by state, from 0.76 cents to 2.65 cents	Noteworthy for interstate testing (16 states + DC). Phase 1 involved light-duty vehicles. Participants included, elected officials and staff, DOT staff, and media.
I-95 Corridor Coalition (now The Eastern Transportation Coalition) Phase 2 (Trucks)	2018-2019	50	- GPS-enabled, multi-function on-board unit	No, mock invoices with credits for calculated fuel tax	Varied by state, from 3.33 cents to 12.35 cents	Interstate pilot with four trucking companies. Noteworthy for interstate (16 states + DC) and trucking aspects.

Utah Foundation analysis.

These precedent-setting road-usage-charge demonstrations is summarized in Figure 3. Together, they show 15 years of in-depth trials that suggest the concept is feasible. These examples also show how the exploration is evolving over time, providing greater choice of mileage reporting methods to drivers, testing additional concepts such as interoperability among states, congestion pricing, integration with tolling, and working to secure users' privacy.

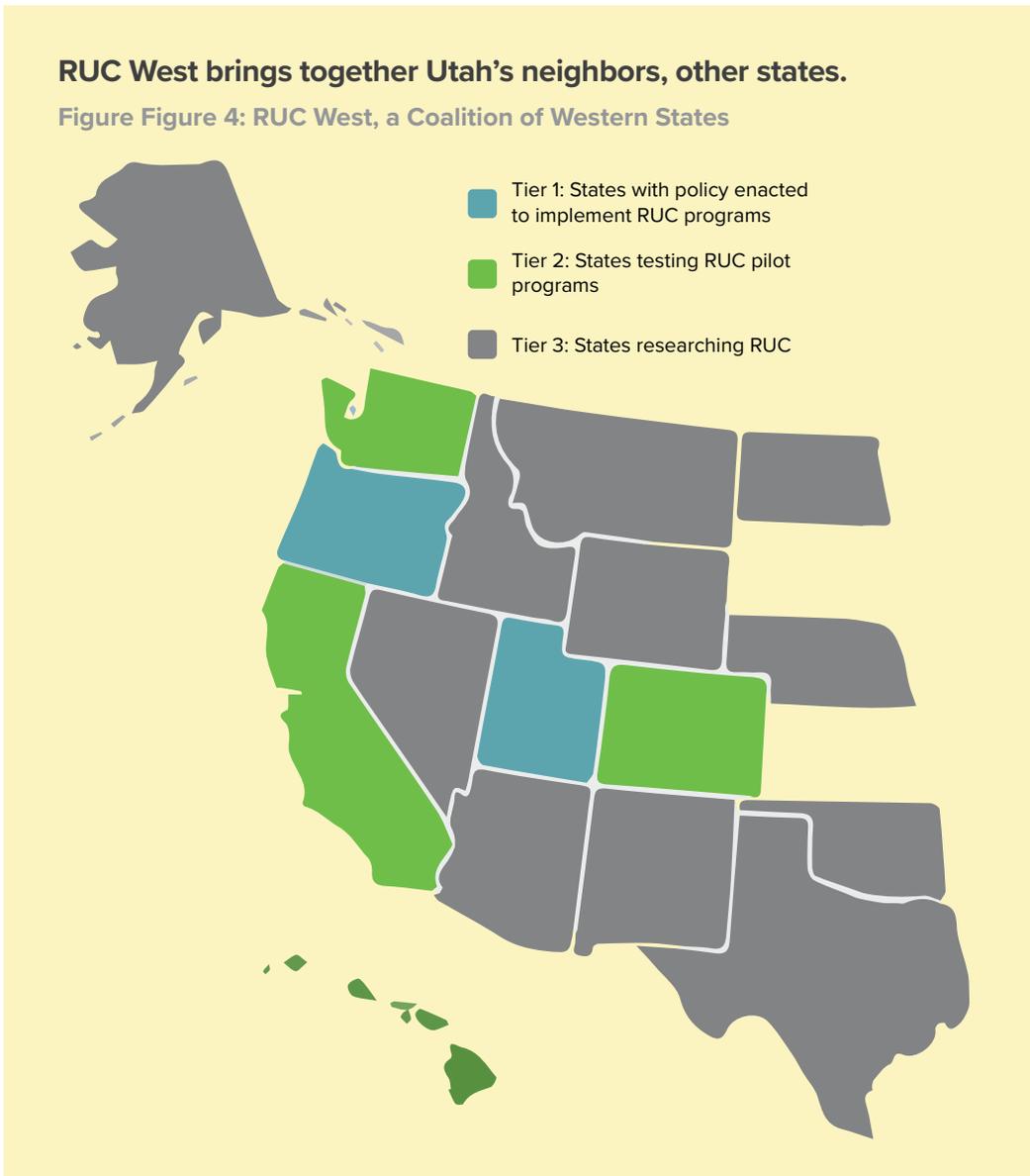
Federal Involvement

In late 2015, Congress approved the five-year Fixing America's Surface Transportation Act (FAST Act). It included a new grant program – the Surface Transportation System Funding Alternatives program – providing \$95 million in funding over five years for state and regional pilot projects that test user-based alternatives to the gas tax.

The funding alternatives program provided funding for state-level projects nationwide, including pending projects in California, Colorado, Hawaii, Minnesota, Missouri, New

RUC West brings together Utah's neighbors, other states.

Figure Figure 4: RUC West, a Coalition of Western States



Hampshire and Wyoming. Some of these projects will test new solution to road-usage charging, including pay-at-the-pump or electric charging stations, integration with ridesharing and usage-based insurance, and utilizing onboard telematics in autonomous vehicles. This grant program also provided funding to Utah's RUC program.

Additionally, the alternatives program funds interstate projects with the Eastern Transportation Coalition and RUC West – the latter of which is a collaboration of 17 western states, including Utah. (See Figure 4). RUC West supports its member states with research and collaborative forums on RUC policy developments and technical possibilities. The consortium will soon conduct an interstate pilot project, testing the interoperability of RUC systems among many of its states. Utah joined RUC West in 2013.

Whether the funding alternatives program will continue is uncertain, as Congress has not yet passed a replacement five-year transportation funding bill. These five-year federal funding bills had been standard practice for many years, but difficulty achieving consensus in Congress had led to stopgap measures between 2010 and 2015 until passage of the FAST Act.

WHAT HAVE WE LEARNED FROM RUC DEMONSTRATION PROJECTS?

Altogether, the state and regional demonstration projects have logged millions of miles with more than 10,000 participants, using a range of technologies to report mileage. Some have involved the exchange of actual money, providing useful insights on behavior changes prompted by road usage charging (such as those in Puget Sounds, Oregon and Minnesota), while others have used transaction simulations to test the feasibility of data and management systems. Many of the demonstrations have involved public outreach to assess the opinions of demonstration participants as well as the general public on the pros and cons of implementing a road usage charge. Much has been learned in the past two decades regarding the feasibility, efficiency, revenue sustainability, environmental effects, fairness and privacy of a potential move to mileage-based transportation funding.

Feasibility

The projects conducted to-date suggest that a RUC is a feasible funding approach. Whether assessed by manual methods like odometer reading or fully automatic systems with GPS logging that can exclude out-of-state roads, or even pay-at-the-pump systems that mimic the ease of the gas tax, RUCs are technically practicable.

Efficiency

The current fuel tax system is very efficient, with low administrative costs. A replacement revenue like a RUC is almost certain to be more complicated and expensive than fuel taxes, which will reduce administrative efficiency. The question is whether the benefits of a RUC sufficiently offset the costs.

Gasoline taxes in Utah are submitted to the state by fuel distributors who pass the tax on to retailers, who recapture the expense from motorists when they buy fuel. For diesel fuel, the system is simpler, with the refiner/supplier paying the tax when the fuel is sold to a distributor. This allows the state Tax Commission to work with a small number, about 200, licensed fuel-tax payers, providing ease of administration.

In contrast, collecting a RUC may require more regular interaction with all or many of Utah's two million drivers. Instead of a tax conveniently included in the retail price of fuel, a RUC would require periodic, perhaps monthly, invoicing to each driver for miles driven. Another method, similar to many tolling programs, is to have a bank account linked to a "wallet" that contains a minimum specified balance that is debited on a regular schedule for all miles driven that period. Whenever the wallet falls below a set balance, an automatic transfer is made from the linked bank account. Utah's Express Lane program, which charges a toll to solo drivers willing to pay to use carpool lanes, uses such a system. Some of the account managers in Oregon's OReGO program (discussed in detail on page 15) also utilize a wallet approach.

These accounts can be operated by a commercial account manager which then can aggregate payments for thousands of motorists and submit payments to the state. This



Collecting a RUC may require more regular interaction with all or many of Utah's two million drivers. Instead of a tax conveniently included in the retail price of fuel, a RUC would require periodic, perhaps monthly, invoicing to each driver for miles driven.

could control administrative costs by reducing the number of payers who interact with the state, similar to the way distributors pay the fuel tax for large quantities of fuel. However, unlike with fuel taxes, enforcement of RUC payments by individual motorists will be much more complicated.

Enforcement of fuel taxes on individual motorists is simple – you cannot buy fuel without paying the tax. If you cannot afford your tax payment, you cannot afford to drive. In some RUC models, motorists would pay monthly after the mileage has been incurred. If they cannot or do not pay the tax bill, how will the state enforce payment? To prevent them from driving would involve potentially complicated police actions to identify and cite drivers who have not paid, and even after a citation, they may continue to drive illegally unless their car is impounded – as is the case for those who shirk paying their annual registration. As with annual registration amounts, these enforcement options would add to the administrative costs of utilizing a RUC and may in some cases push enforcement of collecting a state revenue source to the local level – while providing an opportunity for local revenue.

The administrative cost of collecting fuel taxes is around 1% of the tax revenue. A major national report in 2009 estimated a federal RUC using GPS technology would cost 1.7% of revenues.⁵ New Zealand estimates administrative costs for its RUC are about twice as high as costs for administering fuel taxes.⁶ This cost may be worth incurring if the benefits of a RUC are significant enough, particularly if states are able to stop the erosion from inflation/fuel efficiency. And benefits may be found elsewhere. For example, a RUC system could reduce other transportation system costs, such as toll road administration and local government parking meter management.⁷

Implementation of road usage charges will likely require overlap with the current fuel tax system, partly to allow a gradual phase-in of the RUC for some drivers while others might continue paying fuel taxes. Keeping a fuel tax would allow continued taxation of out-of-state travelers, older vehicles that may not have compatible technology, or other outliers that do not fit into the new RUC system. Keeping a fuel tax could also be useful in improving air quality by continuing to tax heavy polluters via their corresponding fuel consumption.

Depending on policy preferences, Utah may want to consider methods for crediting or refunding fuel taxes to motorists who also pay the RUC. As outlined above, levying both a RUC and a motor fuel tax has its benefits. However, if the RUC is applied only to a EVs and hybrids, owners of hybrid vehicles might find themselves paying both RUC and motor fuel taxes, while EV owners only pay RUC and traditional internal combustion vehicle owners only pay motor fuel taxes. Most of the state demonstration projects included methods for providing such credits, usually involving formula-based calculation of fuel consumption based on EPA fuel efficiency ratings for each vehicle model. This becomes less of an issue if all vehicles are subject to both charges, although states may still elect to unify the revenue streams by allowing RUC charges to offset motor fuel taxes.



Implementation of road usage charges will likely require overlap with the current fuel tax system Keeping a fuel tax would allow continued taxation of out-of-state travelers, older vehicles that may not have compatible technology, or other outliers that do not fit into the new RUC system. Keeping a fuel tax could also be useful in improving air quality by continuing to tax heavy polluters via their corresponding fuel consumption.

Revenue Sustainability

As described earlier, fuel taxes have developed major financial sustainability problems as vehicles become more fuel-efficient and powered by alternative fuels, including electricity. The fuel tax revenue yield per mile driven is in long-term decline, yet miles driven are a significant indicator of road maintenance and repair needs. The primary motivation behind recent explorations of road usage charges is to create a sustainable revenue source for transportation that is linked to road usage.

A RUC is more fiscally sustainable in that fuel efficiency will not erode tax revenues. However, inflation still has the potential to erode RUC revenues. States will need to periodically decide between inflationary erosion or increases in RUC rates. It would be straightforward to link rates to inflation, as some states have done in recent years with regard to their fuel taxes. In addition, revenue sustainability would be improved if rates reflected the differential impact of heavy-duty vehicles.

Environmental Effects

Revenue sustainability, above, is not the same concept as environmental sustainability, which would be improved by a decline in fossil fuel usage to reduce air pollution and greenhouse gases. In fact, by moving from a tax on fuel to a tax on mileage, a portion of the incentive to drive more fuel-efficient vehicles could be lost.

For example, if a 2015 Ford F-150 with a 5-liter V8 engine gets 18 miles per gallon overall, and a 2020 Toyota Prius gets 56 miles per gallon, the Prius driver is currently paying about a third of the fuel tax per mile compared to the F-150 driver. Economists generally agree that taxes on products reduce the consumption of those products, so current fuel taxes provide an incentive to drive more fuel-efficient vehicles (as well as simply driving fewer miles). However, a flat-rate road usage charge would reduce taxes on the F-150 driver and increase taxes on the Prius driver. Recognizing that price of fuel itself is a significantly higher financial burden than the tax on the fuel, it is not clear how much influence fuel taxes have on fuel consumption, but the tax likely has some impact. Nevertheless, if this becomes a significant issue in public acceptance of a RUC or in environmental strategy, policymakers could design RUC rates that differentiate between types of vehicles and charge lower rates to more efficient vehicles. This would increase the complexity of the system, however, which could increase administrative costs. Furthermore, too heavy of an incentive may lower revenues to an unsustainable level.

Another factor to consider is that taxes that are more visible are more likely to influence behavior. With current fuel taxes embedded in the price of fuel, they may not be as visible as a monthly RUC invoice would, and it is possible that the increased visibility of a RUC would cause motorists to drive less. Indeed, Oregon found a reduction in miles traveled among participants in its first pilot project, especially those participating in the congestion pricing portion of the pilot.⁸ This could have positive impacts on environmental sustainability and a reduced need to expand highway in-



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frastructure over time. Such a decline in travel would also reduce RUC revenues, and if the trend were to lead to insufficient revenues for road maintenance, RUC rates may need to be increased.

Fairness

Initial reactions to road usage charges often include assumptions about inequity for rural or low-income drivers, primarily because rural drivers travel long distances for necessities and tend to drive larger vehicles like pickup trucks, and because lower-income drivers often use older, less fuel-efficient vehicles. Several studies have examined these and other fairness issues, finding only slight differences from current fuel taxes.

Most of the RUC pilot projects have set the per-mile charge at a level meant to be financially neutral for the average vehicle on the road. They generally determined the average vehicle gets around 20 miles per gallon, and a RUC set to equal fuel taxes for such a vehicle would cost between 1.2 cents and 2.6 cents per mile, depending on that state's fuel tax rates. Considering the average American drives 13,500 miles per year, this could cost about \$160 to \$350 per year.⁹

If a RUC is set at a flat rate that is also revenue neutral, those driving vehicles with worse gas mileage would pay less than under the current gas tax, and those with more fuel-efficient vehicles would pay more, as described earlier. While it is true that rural drivers log more miles and have fewer options than urban residents to avoid driving (such as transit, walking or biking), compared to fuel taxes, rural drivers would typically benefit from or have a neutral impact from a flat-rate RUC.¹⁰ However, this would not be the case if a RUC charged more for less fuel-efficient vehicles.

As to fairness issues with regard to lower-income drivers, the conventional wisdom is that they would benefit from a RUC due to the lower fuel-efficiency of their presumably older cars. If this was true in the past, it no longer appears to be true. Oregon's exploration of this topic found that "fuel efficiency of vehicles did not vary by income levels at a statewide level ..."¹¹ Other research on this issue found a RUC would not differ significantly from a fuel tax in impacts on low-income drivers in part because of "increased homogeneity in the distribution of the fuel economy of low and high income households."¹² This trend has been influenced by the increasing popularity of SUVs and light trucks among higher-income motorists buying new vehicles.

Privacy

In most of the pilot projects, participants expressed some concerns about privacy. Policymakers have also focused on this issue, writing specific requirements for privacy protections into statutes authorizing RUC pilots and programs. In 2016, the Oregon Department of Transportation surveyed statewide residents and participants in the OReGO program, comparing their opinions on a number of RUC-related questions. The surveys found that 64% of the general public was "very" or "moderately" concerned about "privacy and the security of data collected by the OReGO program"



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while only 25% of volunteers using the OReGO program expressed those levels of concern.¹³ This may reflect positive experiences of those using the program, but residents who are less concerned about privacy are also more likely to volunteer to use the program.

The primary privacy concern is that government agencies would have access to GPS location data and be able to track where and when people drive. Without user permission, this could be a violation of the U.S. Constitution's Fourth Amendment prohibition on unreasonable searches. Some states also have additional privacy guarantees in their constitutions and statutes. While Americans regularly sacrifice privacy to private companies in exchange for benefits (for example, allowing Google Maps to track where you travel in exchange for access to driving directions, traffic congestion information, etc.), allowing a government agency to have access to such data is an entirely different matter.

To address these concerns, states have employed two main strategies:

- Place a third-party, private account manager between the user and the state. The account manager is required to use technology and processes that separate travel data and other personally identifiable information (PII) from financial information submitted to the state. Account managers also may be required to delete travel data periodically or when triggered by an action, such as payment of the monthly RUC invoice.
- Allow motorists to choose mileage recording options that do not involve GPS technology, such as bulk mileage permits, or devices that record only miles without location. However, some benefits, such as exempting out-of-state mileage, are not available with those options.

OReGO provides a useful example of how it requires privacy protections from account managers:

- Account managers must pass a rigorous certification process of their system architecture that confirms the security of their devices and network.
- Account managers are required to have audited security processes in place to manage security risks.
- All personally identifiable OReGO account information must be destroyed within 30 days after payment, dispute resolution or noncompliance investigation.
- Account managers must submit weekly, monthly and quarterly reports to the Oregon Department of Transportation to monitor any anomalies and verify system security measures.¹⁴

BEYOND DEMONSTRATIONS

Only two states are operating ongoing RUC programs: Oregon and Utah. Oregon's voluntary OReGO program now has five years of experience, plus 15 prior years of intensive research and pilot projects. Utah began its program early in 2020 as a voluntary alternative to higher fees paid at registration for electric vehicles and hybrids. These programs will generate valuable experience that will aid other states in crafting future RUC policies and programs. Washington State also recently published a useful set of guidelines for implementing a RUC, based on its experience with pilot projects and research.



TRUCKING INDUSTRY CONCERNS

Only a few RUC pilot projects have included heavy trucks, and one theme that emerges is the complexity of a RUC on American trucks. While the oldest RUC in operation internationally is New Zealand's program that applies mainly to heavy trucks, it is difficult to draw solid conclusions for the U.S. from that program, because trucking regulations differ from nation to nation.

In surveys, many U.S. truckers express concern that a new RUC would be layered on top of existing fuel taxes, much like a toll, and create greater expense and regulatory burdens. The American Trucking Association has strongly opposed RUCs.¹⁵

However, the association and other trucking interests have participated with the Eastern Transportation Coalition in its interstate trucking RUC pilots. After the first truck pilot, the coalition offered these viewpoints:

Bringing the trucking industry's voice to the table is essential. Opinions in the industry vary about whether a RUC would be a useful evolution in transportation funding. Their experience with their unique operating environments is crucial for informing policy choices.

Trucks cannot simply be treated as big cars in a mileage-based user fee system. Trucks are operated for far longer distances and longer times than passenger vehicles. Their regulatory environment is complicated and expensive, with many overlapping requirements, and new funding mechanisms should not add to the regulatory load.

Existing regulations provide guidance for mileage-based user fee implementation. Significant regulations, including the International Fuel Tax Agreement and the International Registration Plan were designed to reduce burdensome state-by-state reporting requirements, and policymakers should follow a similar approach to mileage-based fees.

One rate for all trucks does not work. Vast differences in truck operations, types, ages, performance, and miles traveled would lead to a potentially unfair level of cost disparity if a single mileage rate were adopted for all heavy trucks.

There is need for further education and outreach. This will equip policymakers with data-driven, industry-informed analysis to make pragmatic decisions on the viability of future RUC concepts.

The coalition is about to launch a more extensive RUC pilot with 200 tractor-trailer rigs traveling through the lower 48 states. The project will examine weight-based variable rates, how to incorporate road usage charges with existing tolls and other system features that could generate operational efficiencies.

The OReGO Program

Oregon has implemented the first ongoing RUC program in America. Starting in 2015, volunteers could enroll in OReGO, begin paying a mileage-based charge, and receive rebates or credits against their RUC for fuel taxes paid. Despite the innovative nature of Oregon's earlier pay-at-the-pump demonstration, the state did not offer that option for OReGO. The demonstration featured a limited set of volunteers who agreed to use two fueling stations outfitted with experimental equipment to provide the pay-at-the-pump service. Going statewide with OReGO required simpler solutions that would not require all filling stations to add new technology to their pumps.

The OReGO charge was initially set at a flat 1.5 cents per mile, which was calculated to approximate the fuel tax on a vehicle with fuel efficiency of 20 miles per gallon. The rate has since been increased to 1.8 cents per mile, in keeping with increased fuel tax rates from recent years. Setting a flat rate like this means that any vehicle with a higher

Oregonians have four options for their RUC program.

Figure 5: OReGO methods of Counting Mileage

Account Manager	GPS Device	When Drivers Pay	Charged for Out-of-State Miles
Commercial (Azuga)	Yes – plugs into the vehicle’s on-board diagnostics port	Pay as you drive*	No
Commercial (Azuga)	No – an on-board unit is used but does not include GPS	Pay as you drive*	Yes
Commercial (Emovis)	Yes – plugs into the vehicle’s on-board diagnostics port	Pay for miles at the end of each quarter	No

*Uses an online “wallet” that periodically tops up from a connected bank account.

fuel efficiency will pay more under the road charge than with a gas tax, and any vehicle with lower fuel efficiency will pay less. Consequently, the legislature initially set limits on how many lower-efficiency vehicles could enroll, with no more than 1,500 vehicles rated at less than 17 miles per gallon and no more than 1,500 vehicles rated between 17 and 22 miles per gallon.¹⁶

However, in implementing the program, Oregon decided that lower-efficiency vehicles would receive only credits for fuel taxes paid, not refunds. Recently, Oregon excluded any new enrollments for vehicles with lower-than-average fuel efficiency. This policy may limit the program’s reach – essentially, only those who will pay more under a RUC are allowed to sign up.

However, these recent changes to the program dovetail with increased vehicle registration fees for electric vehicles – an attempt to capture some revenue for road maintenance from vehicles that pay no fuel taxes. But if enrolled in the program, electric vehicle drivers pay only a basic registration fee and avoid the increased registration fees. OReGO users can choose from four methods of counting mileage (as shown in Figure 5).

Because OReGO is voluntary and now limited to only vehicles rated at 20 miles per gallon or higher (those that will pay more than with a gas tax), not many drivers are participating. The program had 715 active participants as of November 20, 2020.¹⁷ However, enrollment may rise as owners of electric vehicles and very fuel-efficient vehicles now face higher registration fees that can be avoided by paying the RUC.

Utah’s Road Usage Charge

Recognizing that electric, hybrid and other alternative-fuel vehicles were only partially contributing to road maintenance funds, the Utah Legislature in 2018 passed a schedule of fees added to annual vehicle registration costs to capture some of the missing revenue. The annual fees have been phasing in over three years, and in 2021 amount to:

- \$120 per year for electric vehicles.
- \$20 for hybrids.
- \$52 for plug-in hybrids.
- \$120 for any other vehicle not fueled by gasoline, diesel, natural gas or propane.



SHOULD LOCAL GOVERNMENTS BE ALLOWED TO LEVY ROAD USAGE CHARGES?

Most of the road usage charge pilot projects were conducted by state departments of transportation, and almost all the policy discussion assumes these will be state revenues. After all, fuel taxes are almost exclusively federal and state revenues, although a few states allow local add-ons. Considering the potential transition to road usage charges, this may be a time to rethink the distribution of the resulting revenues.

UDOT is currently testing a local overlay concept to see how road usage charging can integrate with local road funding needs. For example, some cities receive significant through traffic from commuters, but the state's primary method of sharing funds with local agencies for road maintenance – the Class B & C Road Fund – only provides funding for local roads based on population and lane miles. Determining how many miles are traveled through a jurisdiction's roads could be a more accurate way to fund its road maintenance and repair needs. Of course, any change to a revenue sharing formula can create winners and losers and would require significant study and policy discussion among affected agencies.

In addition to using the RUC system as a platform for determining formulas for sharing existing revenues, state policymakers could allow cities and counties to levy their own road usage charges to meet unique local needs.

In 2019, the Legislature directed the Utah Department of Transportation (UDOT) to create a road usage charge program on an aggressive schedule, to be operating by January 1, 2020. The resulting program dovetails with the additional fees for electric and hybrid vehicles, and participation is voluntary. Motorists enrolled in the RUC program pay a per-mile charge until they reach the level of annual fees described above.

As of October 2020, the program had enrolled 2,882 activated vehicles. This includes 1,034 electric vehicles, 320 plug-in hybrids, and 1,303 other hybrids. Since January 1, 2020, participating motorists had logged 2.1 million billable miles, generating nearly \$32,000 in revenue at 1.5 cents per mile.¹⁸ The program is operated by Emovis, which has experience in the OReGO program.

Users receive an on-board unit (at no cost, unless they lose the device) that plugs into their vehicle's on-board diagnostics port and communicates by a cellular data connection with Emovis to record mileage driven. Drivers install a smartphone app (DriveSync) that connects to the on-board unit, providing information about their account and charges. The app also offers information about how, where and when they drive, with maps and other information. Alternatively, drivers of the Tesla Model 3 employ the vehicle's built-in telematics to communicate mileage information and use the Emovis website for information on their account.

Emovis creates a prepaid wallet account, drawing funds in \$10 increments from users' bank accounts to top off the account whenever its balance falls below \$5. Utah's flat rate of 1.5 cents per mile has a ceiling at the level of annual fees described above. This allows UDOT to gain experience operating a RUC program and testing its capabilities while no drivers face a risk of paying higher charges than they otherwise would have. Motorists who drive few miles will save money compared to the annual fees. Currently the program charges for all miles driven, with no exemption for out-of-state miles.

Washington State Guidelines for Implementation

After experience with a large demonstration project and much research, the Washington State Transportation Commission in 2019 and 2020 published a comprehensive set of reports with detailed findings and recommendations. The commission's recommendations are useful guidelines for other states considering RUC implementation. Figure 6 provides an abbreviated version of this list, leaving aside several that are specific to Washington statutes and noting whether Utah is following each guideline.

Washington State has developed useful implementation guidelines.

Figure 6: Washington State RUC Guidelines

Guideline	Is Utah Following This Guideline?
Allow RUC to gradually scale up, offering drivers an opportunity to try the system and recommend further improvements while RUC is still in an early-implementation stage.	Yes, by applying the RUC only to electric and hybrid vehicles, which are expected to gradually scale up in market share.
Conduct additional research on differential RUC rates based on driver, vehicle or infrastructure characteristics.	Yes, as part of the local overlay demonstration.
Conduct research in collaboration with other states that are implementing RUC to better understand compliance gaps and potential enforcement measures.	Yes, by participating with RUC West.
Develop and test compliance and enforcement mechanisms in an initial start-up stage of RUC.	Not at this time.
Consider existing delivery mechanisms (e.g., public-private partnerships) to most efficiently develop a RUC system without developing new technologies, thereby potentially reducing the cost of collections.	Yes, by partnering with a commercial account manager with experience in this field and integrating with Utah's current tolling program.
Test cost reduction strategies on a limited set of vehicles in an initial start-up stage of RUC.	Yes, through research for now, not in active demonstration.
Conduct interstate border-area testing in an initial start-up stage of RUC.	No.
Develop specific statutory changes to protect personal privacy in a RUC program.	Not at this time.
Test new personal privacy protections during an initial start-up stage of RUC.	Not at this time.
Deploy state agency vehicles as test subjects for privacy protection testing.	No, but this option is being considered for future demonstration.
During a transitional period while the gas tax remains in place, the same policy-setting and oversight roles between the Legislature, other agencies and the private sector should be retained.	Yes.

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IS IT A TAX OR A FEE?

Road usage charges have gone by various names in demonstration projects around the country, including mileage-based user fees. Whether this charge is labeled as a fee or tax is more than semantic. Utah law requires that fees either provide a direct benefit to the payers or compensate the government for the costs of regulating the payers in the public interest. Fuel taxes are often informally labeled as user fees because they are proportional to the payers' use of public roads, but this appellation is often simply a rhetorical device for those who favor increased road funding but do not want to be seen as advocating for tax increases. Rhetoric aside, these levies are part of the state tax code and are legally considered taxes. Most advocates for road usage charges see them as an eventual replacement for fuel taxes, and to allow the greatest legal flexibility in using the revenues, they should be clearly defined as taxes in statute and practice.

To define a road usage charge as a fee could create significant risks; for example, would redistributing revenues from payers in an urban county to a crucial highway project in a rural county violate the principle that fees must benefit the payer of the fee? Or would the state be allowed to vary the road usage charge for purposes of air quality improvement, mitigating traffic congestion, or other policy goals?

MOVING FORWARD IN UTAH

As Utah and other states consider wider adoption of RUCs, some lessons can be learned from the many state pilots and research efforts conducted in the past 20 years in terms of policy considerations and phase-in strategies.

Policy Considerations

Shifting from taxing fuel to taxing mileage requires attention to several crucial policy choices. It also provides new tools that can address other policy goals in ways that have not been feasible or practical before.

RUCs can be calibrated to cover the costs of wear and tear on roads. Many states and the federal government currently add significant monies from general funds to transportation budgets because fuel taxes have not been maintained at a level sufficient to pay for all road maintenance and repair needs. States could consider employing the best research available to estimate the actual costs of wear and tear on roads and set RUC rates to better approximate these costs per mile driven.

Utah has committed significant state general funds to transportation in the past two decades, indicating insufficiency in existing transportation revenues (primarily fuel taxes). As Utah considers expanding its RUC in the future, addressing the appropriate rates to more adequately cover transportation maintenance costs would be useful.

Vehicle weight matters, but primarily for heavy trucks. A common question about RUC rates is whether large personal vehicles like pickup trucks or large SUVs should pay more than small, light cars. Engineers often cite work by the American Association of State Highway and Transportation Officials, finding that vehicles between 2,000 and 7,000 pounds produce about the same wear and tear on roads. Formulas for estimating road wear attach an exponential increase based upon a vehicle's axle weight, so the damage done by heavier trucks is measured, not linearly with weight, but with a steeply rising curve.¹⁹ Remarkably, while a 40-ton truck weighs about the same as 20 mid-sized cars, it may have the same impact on highways as hundreds or perhaps thousands of those cars – depending upon numerous road and vehicle factors.²⁰

New Zealand recognizes that the distribution of a heavy truck's weight also matters, charging a lower RUC rate for equivalently heavy trucks and trailers with more axles. If Utah eventually applies its RUC to heavy trucks, careful consideration of weight and impacts should be considered.

Rates can be set to achieve other policy goals, such as air quality improvements. In Austria, Germany and Switzerland, a primary goal of RUCs on trucks is to encourage lower greenhouse gas emissions and air pollution. Therefore, the rates are higher for trucks with older, less efficient engines.

Utah might consider a similar approach with regard to air quality, at least in certain areas of the state where air quality is a greater challenge, such as the Wasatch Front. Current practice involves public alerts to convince Utahns to drive less during winter inversions or other periods of high air pollution. For a stronger incentive to reduce driving, a local surcharge could be added to road usage charges at these times. The additional funds from the surcharge could help pay for mitigating programs that help clean the air, including enhanced transit service, incentives to purchase cleaner new vehicles, etc. In response to experience with American pilot projects, some environmental advocates call for lower RUC rates on more fuel-efficient vehicles. This would preserve some of the tax advantages those vehicles currently receive in paying less fuel tax, but it would also work directly against the goal of having all vehicles pay for their share of road wear and tear. The public is also more likely to oppose RUC systems that are complicated – more complication in rates and policy goals will undoubtedly lead some to feel unfairly treated by new RUC laws. In crafting RUC systems, policymakers will need to balance which goals are their highest priorities.



ROAD USAGE CHARGES AND POLICY CHOICES

Most of the discussion around road usage charges focuses on their potential as a replacement for fuel taxes. But perhaps implicit in that framing is the notion that the gas tax has already addressed crucial issues of fairness, efficiency and effectiveness. Reforming transportation funding could provide an opportunity to address broader issues than simply replacing a fuel tax with an equivalent mileage tax.

Highlighted throughout this report are key policy questions to consider, including:

- Are the burdens of paying for roads fairly distributed among the various users, from light-duty vehicles to heavy trucks, based on the damage those users cause to roadways?
- Should RUC revenue continue to be a state revenue, like the fuel tax, or should it be shared with local jurisdictions for their share of road costs?
- Significant general funds are added to the state transportation budget through sales tax earmarks, because fuel taxes pay a smaller share of overall transportation needs than in the past – should the basic RUC rate be higher than equivalent to the fuel tax so the transportation budget is closer to fully paid by users? Alternatively, what portion of the transportation budget is appropriately paid through general funds because of external economic, social and safety benefits provided by road systems to more than motorists?

Policymakers should recognize, however, that simplicity will tend to foster greater public acceptance of a new road user charge. The more complex the new system becomes, the more potential for opposition from parties who are disadvantaged by the policy changes or simply from constituents concerned about increasing regulatory or tax burdens.

RUCs offer myriad alternatives for policymakers.

Figure 7: Policy Alternatives with Road Usage Charges

Policy Objectives	Charge Structure	Potential Data Needs	Use of Funds
Finance road maintenance & repair	<ul style="list-style-type: none"> Charges in proportion to damage estimated for vehicle types 	<ul style="list-style-type: none"> Vehicle type and weight class Number of axles Miles traveled 	<ul style="list-style-type: none"> Typical road maintenance and repair expenditures
Finance new road construction or expansion	<ul style="list-style-type: none"> General charge levels sufficient to fund construction or to service debt 	<ul style="list-style-type: none"> Miles traveled Aggregate location data to identify bottlenecks 	<ul style="list-style-type: none"> New construction or expansion of roads, bridges, and related facilities
Reduce traffic congestion	<ul style="list-style-type: none"> Higher charges when roads congested Reduced charges for carpools 	<ul style="list-style-type: none"> Time of day Congestion at time of travel Vehicle location Miles traveled Number of vehicle occupants 	<ul style="list-style-type: none"> Expand transit and other alternative modes Incentivize employers to provide alternative work schedules or locations
Improve air quality	<ul style="list-style-type: none"> Higher charges for travel during bad air days Higher charges for heavy polluters Reduced charges for zero-emission vehicles 	<ul style="list-style-type: none"> Air quality conditions Vehicle type and weight class Engine size Engine age Fuel type Miles traveled 	<ul style="list-style-type: none"> Fund public health needs arising from poor air quality Provide incentives for employers and employees to avoid commuting on bad air days Provide incentives for cleaner engine upgrades, transition to electric vehicles or other changes

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A RUC program can provide a platform for achieving yet other policy goals. In recent years, New York and Los Angeles have begun exploring congestion pricing for roads with heavy traffic. This follows on the success of similar policies in Stockholm and London. These will be complicated endeavors, but if a RUC system existed in those regions, it may be easier to implement congestion pricing as an add-on to RUC billings. Tolling could also be an option added to RUC systems. These options do not necessarily change the RUC rates but could be layered on top and itemized separately on driver invoices.

A RUC system can also provide useful data to transportation planners, with real-time information on changing driving patterns and the impacts of growth and housing development, especially in a growing region like Utah. As mentioned earlier, UDOT is currently testing the ability of its RUC to facilitate local overlay charges or allocations of revenues and costs.

Ramping up RUC in Utah

Replacing the century-old fuel tax system with a new revenue source is certainly complicated. If Utah eventually decides to broaden its RUC to more than electric and hybrid vehicles, the following concepts and options may be useful.

Keep the fuel tax in place, with credits or refunds to RUC payers. Many of the pilot projects showed the feasibility of generating invoices with RUC charges and estimated fuel tax credits, using EPA estimates of vehicle MPG ratings to calculate how much fuel was consumed to travel those miles. Some of the pilots provided actual refunds of fuel taxes to those with low-efficiency vehicles that pay less under a mileage tax pegged to the average vehicle efficiency. However, while credits are simple to administer, refunds are expensive and create more administrative difficulty.

An alternative approach could include levying a road usage charge by bands of fuel efficiency. More efficient vehicles could pay a lower rate per mile and less efficient vehicles could pay a higher rate, making the road usage charge more closely

parallel to the distribution of fuel taxes among vehicle types, but would include fees for EVs and other alternative fuel vehicles that are currently excluded from paying motor fuel taxes. This could reduce or even eliminate the need for credits or refunds.

Keeping fuel taxes in place allows older vehicles and those who do not choose to transition to a RUC to continue contributing to transportation funds. It also captures travel by out-of-state vehicles. Over time, the proportion of vehicles paying the fuel tax would likely decline, making the RUC the primary funding mechanism for road maintenance. Utah's RUC (and the increased fees at registration) include a discount for hybrid vehicles, recognizing that they already pay some of their transportation obligation in fuel taxes. This is a formulaic calculation that is not as accurate as providing refunds for actual fuel taxes paid, but it is simple and inexpensive to administer.

Begin requiring a RUC for electric vehicles and others that do not pay fuel taxes.

This option is the approach Utah has taken, and it provides a method for capturing needed revenue from vehicles that are using the roads, while also gradually phasing in more RUC payers if EV and other non-gasoline technologies continue to grow in popularity. For example, if California succeeds in its goal of requiring all new vehicles to be EVs by 2035, and if a RUC is imposed on those vehicles soon, it will succeed in creating a gradual phase-in of RUC by the changing composition of vehicles on the road.

Begin applying a RUC to all vehicles after a specified model year. If this option is chosen, all new vehicles after a specified year will be required to pay the RUC. In time, a high proportion of vehicles will be part of the RUC system. If widely adopted across the U.S., automakers might include the necessary telematics in new vehicles to meet the demand without added devices. Many new vehicles already have such advanced telematics as standard equipment. Developing national standards for these telematics could ease road usage charge implementation as well as other interactive transportation programs.

This phase-in approach by model year could create fairness issues for those who cannot afford a newer vehicle, depending on whether the RUC is more or less burdensome than a fuel tax for their type of vehicle. Also, heavy trucks can often reach 750,000 miles or more in a useful life, making the phase-in take quite long as fleet replacement rates are lower than for passenger vehicles.

Focus a RUC on government vehicles first. State and local government fleets could serve as a useful testbed for RUC phase-in. After proving the concept with government vehicles, it could be expanded to other fleets, such as corporate vehicles and rental cars. However, Utah currently exempts all federal, state, local and tribal government vehicles from fuel taxes, so imposing a RUC on government fleets would be an entirely new intergovernmental tax.

Allow choice as a significant feature in RUC adoption. When motorists are given a choice regarding whether to participate and choices regarding their mileage reporting options, they have been more satisfied in pilot projects and in Oregon's OReGO program. The potential transition from fuel taxes to road usage charges is a major policy shift, and major policy change often fosters opposition. Public trust in government has declined significantly in recent decades, and some simply will not believe claims that the state cannot access their location data. Concerns about the privacy of location data have been a significant obstacle in pilot projects and public opinion surveys related to those projects. Offering participant options that do not rely on location data helps to neutralize that concern.



While much activity has been undertaken already, especially in Western states, **this policy arena is still in its infancy**, and much will be learned as further demonstrations are conducted and states begin to implement small-scale programs.

CONCLUSION

The erosion of revenue from fuel taxes will likely continue into the future, as increased numbers of electric vehicles and hybrids, along with increased internal combustion-engine efficiency, lead to lower transportation revenue collected per mile traveled. Through extensive pilot projects, states have shown that road usage charges are technically feasible. However, policy challenges will need to be addressed, including concerns about user privacy, fairness and costs of collection that are higher than collection costs for fuel taxes.

Oregon is the leader in this policy arena, with the first operating RUC program. In 2020, Utah became the second state, operating a small but growing program targeted at electric and hybrid vehicles. An implementation strategy employed by both states is that higher fees at registration for electric and hybrid vehicles can be avoided or replaced by the RUC.

Utah's RUC system could be expanded, thereby providing a platform that facilitates the implementation of a wide range of other transportation policies, including air quality management, congestion mitigation, tolling and potential improvements to transportation revenue sharing with local governments.

While much activity has been undertaken already, especially in Western states, this policy arena is still in its infancy, and much will be learned as further demonstrations are conducted and states begin to implement small-scale programs. If Utah is determined to remain at the frontier of RUC implementation, a gradual approach is warranted, with adjustments made as experience is gained.

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