RUC Evasion, Prevention, and Enforcement

Final Report

Prepared for RUC West by Milestone Solutions
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1. Introduction

Road Usage Charging (RUC) for light vehicles is a relatively new fee or tax to the US, and RUC inherently involves payments by individual vehicle owners instead of fuel distributors. For these reasons, some agencies that could potentially be tasked with implementing RUC programs have expressed concerns about deploying RUC evasion prevention and enforcement measures. In order to address these concerns, this report for RUC West explores:

- potential means by which users and account managers may evade a RUC system,
- strategies agencies can employ to prevent evasion, and
- enforcement measures appropriate for RUC programs.

The following definitions provide background for the goals of this report:

Compliance is the agency process to ensure that individuals voluntarily submit to the applicable rules and regulations, and involves three steps: education, assistance, and enforcement. Generally, people must have knowledge of what is expected, and they generally gain this knowledge through educational efforts. In some cases, people may have knowledge but lack resources to submit to the process, which may result in the agency providing some type of assistance to help the person comply.

Evasion occurs "when a person purposefully or intentionally is in non-compliance and underpays its obligations".[1] Unintentional noncompliance differs from evasion. Unintentionally noncompliant individuals who rectify their noncompliance after there are notified should be treated differently from intentional evaders.

Prevention efforts include all measures to reduce evasion, including making a system more user friendly and making evasion activities difficult or undesirable for potential evaders.

Enforcement includes all activities to detect and correct evasion, in particular:

- Detection activities, to observe evasion, including internal controls and account manager audits
- Penalties, such as warnings, fines, wage garnishment, or vehicle registration holds
- Adjudication, offering accused evaders a way to dispute a penalty

Further, throughout this report the term "vehicle owner" is used to refer to the person or people who is the registered owner, and therefore responsible for paying the RUC for a given vehicle. In the case of leased vehicles, it is likely that RUC programs will require vehicle lessees to pay the RUC, because lessees are the ones actually using the vehicle on the road. However, the term "vehicle owner or lessee" is rather cumbersome, so the report uses the term "vehicle owners." "Vehicle owner" includes owners of many vehicles—vehicle fleets such as rental cars.

[1] RFP for this project

This report has the following goals:

- To characterize potential means of RUC evasion:
    - general evasion methods applicable to all mileage reporting methods
    - evasion methods specific to five mileage reporting methods a
    - methods Account Managers might use to evade RUC payments;
- To explore operational policies that prevent or reduce evasion by increasing voluntary compliance;
- To explore operational policies to detect evasion, both directly and through internal controls;
- To explore operational policies for enforcement when evasion is detected, including potential penalties, adjudication, and recovery measures; and
- To propose legal and regulatory measures necessary to enable implementation of those policies.

To date, there has been relatively little study of RUC evasion, compared with other operational aspects of RUC programs. That is due in part to the fact that it is difficult to study evasion in pilots – pilot participants tend to be compliant individuals. Now that two RUC West states are operating RUC programs (Oregon and Utah), the time is right to examine the possibilities for preventing RUC evasion and enforcing RUC programs.

The project team undertook three distinct activities to study RUC evasion:

1. Literature reviews. Research on RUC evasion is scant, because studying enforcement in pilots is very difficult due to the fact that pilot volunteers tend to be compliant participants. However, some literature does exist, as well as literature on related topics.
2. Interviews with experts from related fields. These interviews included RUC account managers, manufacturers of plug-in devices, providers of odometer image reporting software, tolling agencies, departments of motor vehicles, and other related fields.
3. Legal research. This activity included a scan of laws in potentially relevant areas in RUC West states, and specific recommendations for laws and regulations supporting the enforcement of a RUC system.

Because most, if not all states studying RUC see it as a replacement (not supplement) to the fuel tax, maintaining the fuel tax on liquid fuel provides an opportunity for states to refine RUC enforcement and compliance efforts. That is because while the fuel tax remains in place, most motorists' motivation to evade a RUC is low – provided fuel taxes paid are rebated as part of the RUC program. That in turn is because motor fuel tax is paid for all fuel consumed, and when motorists evade the RUC by not reporting miles or by not paying RUC owed, they pay less or no RUC, but they get a proportionately lower fuel tax rebate. That because the fuel tax rebate is only offered on miles reported or charges paid, so any RUC evasion attempt is balanced by a proportionate reduction in fuel tax rebate, meaning such vehicles are effectively still just paying the fuel tax. Vehicles that would pay more RUC than fuel tax might end up paying slightly less—perhaps as much as $10 to $20 less over a year, but so little that the risk of evasion would not

be worthwhile for such savings. Thus, so long as the fuel tax remains in place the motivation to evade the RUC remains low. While the number of vehicles paying RUC today is small, there will almost certainly be a long transition period, during which a large number of vehicles are paying the RUC, and many financial transactions are occurring, and it is during this transition period that agencies can refine their prevention and enforcement approach.

This situation—the need to operate both the RUC program and the fuel tax in parallel for a substantial time—creates an opportunity for states with RUC programs to deploy and refine RUC evasion prevention and enforcement programs while the risk of evasion losses is relatively small. States will learn lessons and implement system improvements during this period. With this approach a state will already be operating a relatively mature RUC enforcement system when its fuel tax is eventually removed.

Electric vehicles (EVs), of course, pay no fuel tax, but even as EV sales grow rapidly, they still comprise a relatively small portion of the vehicle fleet in the near term. As EVs gain market share in RUC states, more attention may need to be given RUC enforcement for these vehicles, as they do not have a fuel tax backup. In states in which a RUC is offered in lieu of a flat EV fee, a situation analogous to the fuel tax backup for RUC could be created by charging the EV fee up front and allowing the RUC reporting to earn the vehicle owner credits against future EV fees.

This report provides a basis from which to design basic evasion prevention and enforcement measures. Each state will need to establish its own measures in three stages:

1. First, in the law that creates the RUC program,
2. Second, in regulation that establishes the precise rules for RUC enforcement, such as late fee and penalty fine levels, and
3. Third, in the organizational and operational process design of the agency division and potential commercial account manager role for executing RUC evasion prevention and enforcement.

The choices made by each state will be impacted by state law and regulation. The information in this document should help guide all these activities. To the extent feasible, this document presents information that would be applicable to all states.

The remainder of this document is organized as follows:

2. Literature Review
3. Interviews Conducted and Primary Lessons
4. Scan of Relevant Laws
5. RUC Reporting Evasion, Prevention, and Detection
6. Account Manager Evasion, Prevention, and Detection
7. Aggregated Evasion Detection: Internal Controls
8. General RUC Evasion Prevention
9. RUC Enforcement
10. Recommendations

2. Literature Review

This literature review covers evasion, prevention, and enforcement in five road charging categories related to Road Usage Charging (RUC):

- RUC
- Relevant applications of all-electronic tolling
- European highway vignettes
- IFTA
- Vehicle registration

Each section of the literature review includes an introduction with commentary on the relevance of the lessons from the road charging category to RUC enforcement and a summary of the most relevant articles from the category. Following each of the five categories, a conclusion summarizes the overall implications of the literature review for RUC evasion, prevention, and enforcement.

2.1 RUC Evasion Literature

Literature that discusses RUC evasion, prevention, and/or enforcement in a substantive way is quite limited. That is because RUC itself is an emerging area, and because studying enforcement in pilots is very difficult due to the fact that pilot volunteers tend to be compliant participants. Even the operational programs, such as OReGO and the Utah RUC program, have included limited enforcement activities to date. The world's largest RUC program for light vehicles, in New Zealand, provides some lessons about enforcement activities. From the literature that exists, it is clear that there are both general evasion activities (late payment or nonpayment, failure to register a vehicle in a RUC charging state, etc.), and mileage reporting method-specific evasion activities.

1. **Road User Charge: Applying Lessons Learned in New Zealand To the United States**[2] This NCHRP report summarizes lessons learned during a study tour of US RUC experts to New Zealand in 2018. In addition to all heavy vehicles, diesel-powered light vehicles have been subject to New Zealand's RUC system since 1978. In 2016, over 400,000 light vehicles participated in the RUC system. All vehicles in the system have two options for paying RUC: (a) pre- purchase distance permits, which clearly state the start and final odometer value of validity, or (b) through post-payment to a commercial account manager (CAM), which professionally installs an in-vehicle onboard unit (OBU) that measures and securely reports distance traveled. The CAMs charge a significant monthly

[2] Binder, S. Road User Charge: Applying Lessons Learned in New Zealand To the United States. Transportation Research Board: February, 2019. http://onlinepubs.trb.org/Onlinepubs/NCHRP/docs/NCHRP2024(121)_NZ_RUC_Lessons_Learned_Report.pdf

fee for their service, which typically includes fleet-management support, so CAMs are used almost exclusively by heavy vehicles.

Enforcement of the pre-paid distance permit occurs at traffic stops and weight checks of heavy vehicles, and at annual vehicle safety inspections of light vehicles. Among RUC West states, only Hawaii has an annual vehicle safety inspection. Further, the paper continues, "The RUC system in New Zealand has a high degree of personal trust built into the system, and since the RUC relies (to an extent) on the honesty of the vehicle owner, it has been difficult to accurately quantify the level of evasion." Based on the authors' conversations with New Zealand RUC administrators during the study tour, there is no routine checking for digital odometer rollback in New Zealand, further complicating efforts to understand the level of evasion among light vehicles.

2. **Washington Road Usage Charge Pilot: RUC evasion tabletop exercise**[3]
   As part of the WARUC pilot, a consulting team conducted an RUC evasion tabletop exercise—brainstorming possible methods of RUC evasion, and how they could be detected, prevented, penalized, and mitigated. The team pointed out that unintentional noncompliance is different from evasion—RUC systems should not treat unintentionally noncompliant participants as if they were intentional evaders. This paper identifies the difference between general evasion (failure to register, late or no payment) and mileage reporting method-specific evasion. Main lessons for the following types of evasion are the following:
   a. Failure to register a vehicle (thereby "hiding" it from the RUC system): increase vehicle registration enforcement
   b. Late or no payment: encourage Account Managers to provide easy payment options, and to pursue nonpayment
   c. Plug-in device evasion: devices must be electronically secure, and extended device unplugs should be followed up on by CAMs
   d. Odometer image evasion: a range of electronic measures, such as detecting photo manipulation and photos of photos, should be in place.
   e. Odometer rollback: in cases of suspected odometer rollback limited audits using VIN lookup services such as CARFAX should be conducted.

   Finally, the exercise pointed out that there are some limited evasion cases that cannot be detected, such as for vehicles that are never serviced publicly and thus generate no VIN lookup records. However, it concludes that such cases are very rare and should not impact overall evasion detection or enforcement of RUC payments.

3. **Implementable Strategies for Shifting to Direct Usage-Based Charges for Transportation Funding**[4]

[3] Milestone Solutions. RUC Evasion Tabletop Exercise. Presented at Washington State Road Usage Charge Steering Committee Meeting. Washington State Transportation Commission: May 19, 2019.
[4] Sorenson, P. et al. Implementable Strategies for Shifting to Direct Usage-Based Charges for Transportation Funding. RAND: June, 2009. https://www.rand.org/content/dam/rand/pubs/reprints/2009/RAND_RP1395.pdf

This NCHRP-funded study conducted by RAND in 2009 is one of the only general studies of RUC that discusses evasion and enforcement in a substantive way. The paper points out that the main differences between RUC and fuel tax is that RUC has many more downstream (end user or taxpayer) accounts. Thus, RUC generates many more opportunities for evasion than fuel tax. The paper points out that enforcement activities are necessary, or evasion will occur. It also points out that the enforcement approach, complexity, and cost varies by mileage measurement approach. It discusses a few enforcement options:

a. Enforcement based on odometer readings: this paper suggests physical inspection of odometers to detect odometer rollback. The RUC West Evasion project team notes that this approach is not foolproof and more importantly, only works for mechanical odometers—digital odometer rollback cannot be detected by physical inspection, and in 2021, is much more likely to occur than mechanical odometer rollback because there are relatively few active vehicles in the US fleet from prior to 2001, when most vehicles switched to digital odometers, and the fact that odometer rollback is still considered a widespread issue by police and the National Odometer and Title Fraud Enforcement Association (NOTFEA—see below in DMV subsection).
b. Enforcement based on use of Onboard Units (OBUs): the paper states that OBUs should be tamper-resistant and electronically secure, and OBU records should be compared to the odometer. The paper does not assume that Onboard Units will be OBD-II devices.

2.2 Relevant applications of all-electronic tolling (AET) in the US

The distinguishing enforcement mechanism for AET – what sets it apart from toll enforcement more generally – is the use of Automated License Plate Recognition (ALPR)—cameras that capture and digitize images of license plates of vehicles that are not registered for an electronic toll account. ALPR enforcement cannot determine miles traveled on vehicles, so ALPR alone is not relevant for RUC enforcement. However, lessons from all-electronic tolling enforcement aside from violation detection have some relevance to RUC.

Generally, following an incident of non-compliance, violators are mailed a penalty notification by the tolling agency. The ability to send such a notification by mail depends on having the correct mailing address for the violator, which in turn depends on the quality of the state's vehicle registry database. Drivers rarely update their addresses until the vehicle's registration must be renewed and sometimes, they do not do so then, which means that in some cases penalty notifications may take a long time to reach the violator. Because penalty fines may escalate when they remain unpaid for a sufficient length of time, care must be taken not to penalize violators who were unaware of the penalty.

Toll penalties on out-of-state vehicles are generally not enforceable unless there is a bilateral agreement between the state of the tolling agency and the state of the vehicle's registration. However, despite the lack of legal enforceability, many tolling agencies send violation notices to

out of state vehicles who have amassed a sufficient amount of penalty. Based on anecdotal evidence from toll operators, many such violators will pay these notifications, either because it was their intention to comply or because they are unaware that the penalties are not enforceable.

Most toll agencies offer a violation dispute process, sometimes called adjudication, by which suspected violators may dispute penalty notices that they believe to be incorrect. Offering such a process significantly reduces the number of tolling violation disputes that are escalated to state courts.

When penalties for a vehicle remain unpaid for a significant period of time, toll agencies generally sell the unpaid penalties to a private collections agency, which then attempts to recover the funds owed. That is because tolls are almost universally considered fees, not taxes—with taxes, a state may have the option for a tax lien or wage garnishment, but those options are not available with fees.

Some tolling agencies have the option to suspend the registration of vehicles with very significant outstanding toll penalties. This is one of the limited cases in which police may be involved in toll enforcement. Another such case is that of extreme habitual out-of-state offenders: police positioned at toll facilities may be notified if an out-of-state offender drives through, and attempt to pull over such an offender.

1. Motivations Behind Electronic Road Pricing. What is the Driving Force Behind the Worldwide Rise in Tolling? A Review of Innovative Road Pricing from Across the Globe.[5] This Caltrans-commissioned general tolling study indicates that evasion must be considered in all tolling systems, and that ALPR will remain the primary means of violation detection and enforcement for the foreseeable future.
2. An Evolution of Tolling.[6] This KPMG benchmarking study of international toll systems discusses the ongoing improvements in video tolling enforcement. It emphasizes the importance of agencies having the correct evidence before issuing a tolling penalty. Specifically, a "context" image of the violating vehicle is often needed in addition to the license plate image.
3. Toll Enforcement Remedies: Equity of Toll Payment.[7] This award given by IBTTA to the North Texas Tollway Authority in 2014 discusses equity issues in toll payment. It emphasizes the points in establishing toll payment equity:

[5] Kalauskas, R. et al. Motivations Behind Electronic Road Pricing. What is the Driving Force Behind the Worldwide Rise in Tolling? A Review of Innovative Road Pricing from Across the Globe. California Department of Transportation: February, 2009. https://dot.ca.gov/-/media/dot-media/programs/research-innovation-system-information/documents/f0017234-final-report-task-1122.pdf

[6] KPMG International. An Evolution of Tolling. KPMG: 2015 https://assets.kpmg/content/dam/kpmg/pdf/2015/06/kpmg-toll-benchmarking-study-2015-v2.pdf

[7] NTTA. Toll Enforcement Remedies: Equity of Toll Payment. IBTTA: 2014. https://www.ibtta.org/awards/toll-enforcement-remedies-equity-toll-payment

a. *Education* is the most important element in equity—toll facility users need to understand that they owe a toll amount and how to pay that amount
b. *Prior notification times*—the amount of time unregistered users have to pay a toll before a penalty is added—should be adjusted to ensure that all potential users receive a toll notification with sufficient time to pay before a penalty is added
c. There should be *sufficient payment channels* to allow every system user, including cash preferred uses (banked, underbanked, and unbanked) to pay tolls
d. *Accounts*, including tag-based and video accounts, should be easy to sign up for and cheap or free to maintain[8]
e. *Violators* should be given due process by the agency in all respects—including notification, adjudication, and potential escalation to courts.

4. Toll Road Evaders Have a Bad Day and New York Media Cheer.[9] This 2016 blog post by the IBTTA's Bill Cramer discusses the actions that a range of tolling agencies were taking against toll violators. It emphasizes that allowing violators to go unpenalized is not fair for the many people who pay all tolls that they owe, and that media sources generally support enforcement efforts against violators.
5. Registration suspension for failure to pay tolls.[10] This web page by New York's DMV discusses how toll violators with outstanding tolls and penalties of $200 or more can have their vehicle registration suspended until they pay what they owe.

2.3 European highway vignette

Highway vignettes are permits sold for use of specific roads—major highways—for a specific period of time in many European countries. In most European countries, roads are funded through general taxes (income taxes and business taxes). Some European countries would sometimes experience significant roadway usage from foreign vehicles, whose owners paid little if any taxes. To cover this case, highway vignettes were instituted to gain some revenue from such vehicles.

Enforcement of highway vignettes involves external inspection of vehicles—stickers or license plates—without reference to distance traveled. RUC enforcement generally involves some check of distance traveled, and generally does not require any external inspection of the vehicle, so lessons from highway vignette enforcement are of limited relevance to RUC enforcement.

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[8] Tag based tolling accounts are accounts for which the driver has been issued a toll tag to place in the vehicle windshield. Video accounts are accounts where no toll tag is associated, and the vehicle is identified exclusively through license plate recognition—these accounts are typically charged higher rates than tag based accounts as their processing costs are greater.

[9] Cramer, B. Toll Road Evaders Have a Bad Day and New York Media Cheer. IBTTA: February, 2016. https://www.ibtta.org/blog/toll-road-evaders-have-bad-day-and-new-york-media-cheer

[10] New York DMV. Registration suspension for failure to pay tolls. https://dmv.ny.gov/dmv/registration-suspensions-failure-pay-tolls

Assessment of Vignette Systems for Private Vehicles Applied in Member States.[11] This Booz & Company study was completed for the Directorate-General for Mobility and Transport for the European Commission in December 2010. It compares the approaches taken by seven EU member states in applying highway vignettes. It indicates that these member states all generate substantial revenue from enforcement penalties. In one country, Austria, enforcement activities cost the country about 4 million Euros, while enforcement revenues bring in about 9 million Euros. The paper indicates that the member states all aim to make their enforcement approaches so effective that most motorists find a lower risk in compliance with the systems than evasion of the systems.

2.4 International Fuel Tax Agreement (IFTA)

IFTA is the North American program that redistributes revenue from fuel taxes from heavy vehicles (above 26,000 lbs. or having 3 or more axles) that travel in more than one state or Canadian province based on the miles actually driven in those states and provinces. No such program exists for light vehicles, following the general rule that commercial vehicles are subject to more regulation than light vehicles. All heavy vehicles that travel in more than one state or province are required to carry IFTA licenses and maintain records citing dates and locations of their travel. These records may be physical logbooks or electronic logging devices. The burden of the requirement to maintain such logs is substantial, making this approach to mileage recording inappropriate for light vehicles—this approach would be burdensome for non-commercial drivers and could discourage compliance. In the US, IFTA enforcement may be carried out by state police or by dedicated motor carrier service officers. These enforcement officers check the IFTA stickers and licenses of vehicles that stop at weigh stations (and occasionally at other locations). IFTA receives regular reporting of records based on the paper or electronic logs from all vehicles registered—or if they do not receive such records, the vehicles are subject to penalties.

1. IFTA Law Enforcement Committee: A Quick Reference for Roadside Enforcement of IFTA Requirements.[12]
   This is IFTA's brochure for police tasked with enforcing IFTA requirements. It outlines IFTA's approach to enforcement, and how police should observe IFTA stickers and inspect IFTA licenses of vehicles. Drivers are required to maintain the full license in the vehicle, in addition to the vehicle's external IFTA sticker. Enforcement is generally carried out by state police, but other law enforcement may also be tasked with carrying out IFTA enforcement.

[11] Booz and Company. Assessment of Vignette Systems for Private Vehicles Applied in Member States. European Commission: December 2010. https://ec.europa.eu/transport/sites/transport/files/modes/road/studies/doc/2010_12-assessment-vignette-systems-private-vehicles.pdf

[12] IFTA. IFTA Law Enforcement Committee: A Quick Reference for Roadside Enforcement of IFTA Requirements. January, 2016. https://www.iftach.org/committee/lec/LEC%20Brochure%20-%20January%202016.pdf

2. IFTA: Electronic Credentials.[13] This Virginia DMV web page outlines the option for drivers of IFTA vehicles to use electronic credentials, which may be maintained on a smartphone or other mobile device by the driver. Physical stickers remain required on the outside of IFTA vehicles, but licenses can now be maintained on electronic devices instead of on paper. Although this page was written by the Virginia DMV, it holds for all IFTA states.

2.5 Vehicle registration enforcement

Vehicle registration enforcement is carried out by state and local police and in some states special DMV investigative units. The majority of DMV enforcement efforts are intended to prevent the registration of stolen vehicles. Fraudulent or stolen vehicle registration tags are sometimes used to avoid registration fees. One study, conducted in California in the 1990s, indicates that between nine percent and ten percent of vehicles are unregistered at any given time, although many such vehicles may be unintentionally noncompliant, their owners having simply forgotten to renew their vehicle registrations. At the national level, the National Motor Vehicle Title Information System (NMVTIS) helps prevent the registration of stolen vehicles and to detect odometer rollback.

1. AAMVA's DMV Investigative Unit Resource Guide[14] provides guidance to state DMVs on how to establish an investigative unit and on how to investigate a range of types of DMV fraud, including title fraud, registration fraud (or failure to register a vehicle), and other types of fraud. It includes a description of current enforcement practices by state. Detection of these types of fraud generally involves in-person inspection of the given credential (title, registration, etc.) The guide suggests that odometer fraud be detected through comparison of the odometer with historical records, such as those made with title transfers, or sometimes with registration[15].
2. National Odometer and Title Fraud Enforcement Association (NOTFEA)[16]. NOTFEA is an association of state police agencies that enforce vehicle odometer and title regulations. Members share information on title and odometer fraud, including best practices on enforcement. However, such information is available to members only. NOTFEA's primary goal is to reduce fraudulent vehicle sales—either sales of stolen vehicles or sales of vehicle's whose odometers have been rolled back. Potentially, this association could assist in preventing fraud in RUC systems by sharing best practices.
3. Evasion of Property Taxes on Motor Vehicles[17]

[13] Virginia DMV. IFTA: Electronic Credentials. https://www.dmv.virginia.gov/commercial/#mcs/programs/ifta/
[14] AAMVA. DMV Investigative Unit Resource Guide. March, 2017. https://www.aamva.org/DMVInvestigativeUnitResourceGuide-March2017/
[15] Some DMVs do not capture odometer readings, but may simple record owner statement of odometer value, raising concerns about the value of DMV title and registration records as a source.
[16] National Odometer and Title Fraud Enforcement Association (NOTFEA). National Odometer and Title Fraud Enforcement Association. https://notfea.net/
[17] McCarthy, K. Evasion of Property taxes on Motor Vehicles. Connecticut Office of Legislative Research: February 2010. https://cga.ct.gov/2010/rpt/2010-R-0060.htm

Property tax rates on motor vehicles vary widely among the US states, and in some cases, among municipalities within a state. Some states charge no property taxes on motor vehicles, while others may charge as much as 5% of a vehicle's value each year. This variation in vehicular property tax rates leads to a type of evasion distinct from failure to register a vehicle: failure to transfer a vehicle's registration state or municipality where it is primarily located. This form of evasion could become a factor in RUC systems, notably, in which one state mandates RUC and one or more neighboring states do not. This article discusses evasion of vehicular property taxes in Connecticut, where tax rates vary by community. In Connecticut, some communities have hired a third-party firm to patrol neighborhoods, taking pictures of out of state vehicles, and when one is found to have been frequently parked in a given location for 3 months or more, to demand local property taxes from such a vehicle. Evasion rates are unknown, but these communities have been able to collect a substantial amount of money from evaders. Waterbury Connecticut, for example, collected $300,000 in evaded taxes from such individuals in 2009.[18]

4. National Motor Vehicle Title Information System (NMVTIS).[19] NMVTIS is a national database of vehicle title information, including odometer information, which was created by federal law, and is governed by relate NMVTIS regulations. It is populated by state DMVs, leading to the fact that the quality of data from each state is variable, in terms of accuracy and completeness. NMVTIS data is used to prevent registration of stolen vehicles, as well as to observe attempts at odometer rollback. Direct access to NMVTIS is limited to law enforcement agencies and state agencies responsible for registering passenger vehicles, typically DMVs. Consumers cannot access data from NVMTIS directly but can request vehicle history data through a network of approved data providers that includes companies like CARFAX, Experian, and vindatahistory.com.
5. Estimating Uninsured Vehicle & Unregistered Vehicle Rates: Sensitivity to Data and Assumptions.[20] This 1999 article, conducted by and focused on the state of California, is the best research available on estimating the rate of unregistered vehicles. It concludes that in California in the late 1990s, 9-10% of vehicles on California roads were unregistered at any given time, based on six different estimation methods. Many such unregistered vehicles are simply cases of overdue registration payments. If state police pull over such a vehicle, it would generally receive a low-level ticket that could be waived if the owner registers the vehicle promptly. However, some of these vehicles are intentional registration fraud—cases in which the owner applies stolen or fraudulent vehicle tags to the vehicle. While it may not be accurate to assume that other states

[18] Total vehicle property tax collections were not available, but he population of Waterbury, CT, was about 110,000 in 2010, and the tax rate was about 2% of blue-book value.

[19] National Motor Vehicle Title Information System. National Motor Vehicle Title Information System. https://vehiclehistory.bja.ojp.gov/

[20] Hunstad, L. Estimating Uninsured Vehicle & Unregistered Vehicle Rates: Sensitivity to Data and Assumptions. California Department of Insurance: 1999. http://www.insurance.ca.gov/0400-news/0200-studies-reports/0600-research-studies/auto-policy-studies/upload/UninsVehicleRatesSensitivity.pdf

experience similarly high rates of non-registration, it is likely the best assumption that can be made and should be considered in any RUC program.

2.6 Conclusions of Literature Review

The facts contained in this literature review help flesh out the general outline of evasion, prevention, and enforcement of RUC systems, but not the details—the details of RUC differ significantly from tolling and the other forms of charging included here, and necessitate a new, unique enforcement system. The literature definitely indicates that evasion will occur, in fact, at a higher rate than with the gas tax, as the fuel tax is harder to evade in most cases[21]. Thus, prevention and enforcement measures are needed.

Prevention measures include efforts to educate the public about the RUC system, as well as efforts to make the system easier to use. Enforcement includes efforts to detect evasion as well as penalty and adjudication efforts following detected violations. Violation detection will vary by mileage reporting method. However, the external to vehicle methods used for other forms of road charging – including ALPR and vehicle stickers—are not appropriate for RUC, which requires some measure of distance traveled. The vehicle logbooks used in commercial vehicles may be appropriate for RUC measurement, but they are not feasible for private vehicle applications.

Failure to register vehicles—entirely, or at the correct location—may become more widespread under RUC. Thus, registration enforcement efforts by state police DMVs should be improved or increased as RUC enforcement efforts are introduced.

At the national level, the NVMTIS database, accessible through a range of VIN lookup services, provide a reference for odometer records. However, the quality and frequency of data in the NVMTIS is not sufficient for RUC enforcement. Thus, new enforcement procedures for RUC will be needed at the state level.

[21] The fuel tax is harder to evade when it is collected either at the rack or at first distribution, as it is in most states. In Oregon, diesel tax (only) is collected when it goes into the vehicle's fuel tank. Therefore, diesel tax evasion can occur at a number of points in the distribution chain. For example, a dealer may get a load of diesel and cocktail it with other fuel, and only report the amount taken in the original distribution. The dealer can also sell fuel without tax if the vehicle has the right credentials, which the dealer is not required to verify.

3. Discussion of Expert Interviews

This section discusses the interviews conducted for this project, and the primary lessons from those interviews. The project team spoke to organizations directly engaged in providing RUC services and technologies in pilots or operational RUC systems as well as organizations representing analogous or related industries. In all, six types of RUC-related organizations were interviewed:

- OBD-II Device Manufacturers
- Image Processing Vendors
- Tolling agencies
- RUC Commercial Account Managers
- Vehicle Safety Inspection Agencies
- Usage-based Insurance Providers

Questions asked of each interviewee type are included in Appendix A at the end of this documents.

Lessons learned from these organizations, and one cross-cutting lesson, are documented below:

3.1 OBD-II Device manufacturers

After-market telematics devices that plug into vehicles' on-board diagnostic (OBD-II) port are used in both of the operational RUC programs in the US and have been tested in most US RUC pilots. These devices collect data from the vehicles' engine control unit (ECU) via the OBD-II port, and some of the devices contain global positional system (GPS) chipsets. The devices transmit relevant data to back-office operations (e.g., commercial account managers or state RUC managers) so that RUC charges can be calculated.

The project team spoke with two OBD-II device manufacturers, Azuga and IMS (part of TrakGlobal), both of which have supplied OBD-II devices to RUC programs and pilots. The interviews focused on questions of data security and the ease with which bad actors could modify the devices, either physically or by hacking into the device firmware, to evade RUC.

The most important lessons were the following:

- The plug-in devices used for RUC reporting employ a variety of security measures—physical, data, and communications. They employ encryption at rest and in transit, as well as strong authentication measures, and would be nearly impossible for individual drivers to hack. However, security is not inherent in OBD-II devices—less secure OBD-II devices, such as those manufactured for the purpose of vehicle fault diagnostics, are available in the market. It is important that all active RUC programs offering mileage reporting with OBD-II devices make robust security measures a core requirement. The security requirements should

include physical security, such as tamper-evident seals; data and firmware security, such as high-level encryption and data transmissions and firmware updates being initiated by the device rather than an outside agent; and communications security, including using secure data transmission protocols, encrypting all data in transmission, and using strong authentication measures.

- The primary method of RUC evasion with plug-in devices is leaving devices unplugged while the vehicle is in use. Odometer value is not present on the OBD-II dataset for many older vehicles, so OBD-II devices can only detect miles traveled when they are plugged in. Unplugs cannot be prevented, as devices need to be unplugged to allow auto mechanics to check vehicle electronics (in fact, the OBD-II specification explicitly forbids these devices from being permanently affixed to the vehicle). Thus, periodic odometer "true-ups", consisting of odometer photos[22], may still be desired for these older vehicles. Utah is doing exactly this in their RUC program – data from the OBD-II device forms the basis of monthly RUC billing, but an annual odometer verification, by digital photo, is required.
- On some existing vehicles, and all 2021 and newer passenger vehicles manufactured for the US market, the odometer value is available through the OBD-II port. On such vehicles, all miles traveled while a device was unplugged can be captured when the device is plugged back in, though not with location data. A rule can be introduced to charge all such miles, because location data is not available for them due to the owner's actions of having removed the device. This approach means drivers paying RUC for out-of-state and/or for private road travels, but as this results from the owner's having removed the device, that may be a consequence that the owner must be prepared to accept. Potentially, a manual refund method, a form, can be introduced by which vehicles can seek reimbursement for miles driven out of state in this case by completing a form and providing documentation such as fuel receipts from the out of state travel.

3.2 Image processing providers

Some RUC pilots have offered vehicle owners the option of reporting miles driven by periodically submitting a digital image of the odometer. The image is taken with a mobile phone or tablet and submitted through a dedicated app or website. Additionally, at least one operational RUC program in the US is using digital images of odometers to periodically verify mileage reported using OBD-II devices.

The project team spoke to one image processing provider, Vehcon, which has supported several RUC pilots in the US. The most important lessons from that interview include:

- It is important that any image processing provider be able to identify attempts at evasion like submitting a digitally altered odometer photo or printing out an odometer image and then submitting a photo of that print-out later, after additional miles have been driven. Vehcon indicated that its software is effective at detecting anomalies that would indicate

[22] Digital images of odometers taken with mobile phone or tablet cameras and submitted via a dedicated app or website.

attempted evasion, such as digital manipulation of odometer images, or drivers submitting images of old, physically printed out pictures of the odometer when it had a lower odometer value. In addition to detecting digital image manipulation and detecting pictures of pictures, Vehcon's software detects when images are submitted from a vehicle with a different dashboard than the one associated with the vehicle's model, a critical data validation feature. There are some unusual scenarios (e.g., a vehicle owner has two vehicles of the same make, model, and year) in which the software may not be able to detect evasion attempts – such as by submitting a photo of a lower-mileage vehicle and claiming it for the higher-mileage vehicle. Other odometer image processing software solutions may not be as mature as Vehcon's and RUC system requirements should specify minimum capabilities for detecting "anomalies" in images in order for the RUC program to be able to identify possible attempts at evasion; potentially desirable minimum capabilities include the ability to detect digital image manipulation, images of pictures, and to validate a vehicle has a dashboard layout corresponding to the vehicle's VIN.

- Occasionally, unusual conditions such as the dashboard casting a dark shadow over the final digit on an LCD odometer can cause the odometer image processing software to generate an incorrect reading. This can be addressed by having the driver type in the odometer reading in addition to using the image processing software.
- A significant issue with odometer image reporting is the failure of some vehicle owners to report. Vehicle owners should receive a series of reporting reminders via one or more channels of their choice (email, text message, or in-app notification). However, even with many reminders, a possible grace period, and a warning letter, there will eventually need to be a deadline after which there is a financial penalty for failing to submit an odometer image, in order to get high compliance with this mileage reporting method.
- Despite some challenges associated with getting some vehicle owners to submit odometer images regularly, Vehcon offered anecdotal evidence from their MileAuto usage-based insurance product that having the vehicle owner be an active participant in the mileage reporting process – by taking the photo and possibly typing in the odometer reading – leads to a sense of ownership in the process, and fewer contested RUC bills; however, doing so would increase the amount of effort the user needs to expend to complete mileage reporting, potentially leading to less system participation.

3.3 Tolling agencies

Because there is not yet a mature RUC enforcement program in the US, the project team looked to analogous sectors to understand their approaches to identifying evasion and conducting enforcement. One such sector is tolling, and the project team interviewed representatives from Washington Department of Transportation's Toll Division (WSDOT). The most important lessons are the following:

- WSDOT found significantly increased compliance when it changed its definition of "evasion". When WSDOT changed its paradigm from treating everyone who traveled in a toll lane or road without a transponder from an automatic violator (who owed a fine) to a video toll customer (who received a bill in the mail and was charged a higher video toll rate

than transponder customers), the compliance rate increased. To increase compliance and encourage evasion prevention, it is very helpful not to treat minor, passive evaders as "violators" by default. For RUC, this could simply mean automatically enrolling vehicles that are not registered with a CAM or SAM in a flat fee program until they do register. This rule applies to minor, passive forms of evasion—for major intentional forms of evasion (say, masking license plates in tolling, or odometer rollback in RUC), it is still appropriate to treat offenders as violators.

- WSDOT's goal is to collect the toll, not to collect fines and penalties. At WSDOT, minor evaders who are charged a late fee or penalty due to non-payment of tolls have up to two opportunities to have the fee or penalty dismissed, provided they pay the original toll. WSDOT refers to this as "amnesty". After the third evasion, the civil penalties are no longer forgiven but WSDOT may agree to a payment plan. Errors that are not the fault of the DOT, such as the wrong address being on file at the DOL, do not count towards late payment violations, and thus do not count towards amnesties. In the context of RUC, late fees or other penalties will have a place in the overall enforcement program. However, the organization administering RUC accounts—the states or account managers—may wish to implement a similar amnesty program. Doing so could reduce the disproportionate weight of the fines on lower income drivers. Further, overly aggressive application of fines could shift attention away from the primary purpose of the RUC – to generate revenue equitably based on roadway use – and should be avoided if possible.
- The most important tool for increasing compliance is to make it easy both to get an account and to pay, and to make maintaining an account simple and inexpensive (ideally, free). It should be simple to create an account online, but in-person venues to create an account should also be offered. There should be many payment options. Credit cards are convenient for those who have them, but there should be options for the underbanked and the unbanked. Payment services such as the PayNearMe[23] network support this. In the context of RUC there are options for providing easy access to account creation, including at vehicle dealerships and during registration renewals.
- The New York Thruway said that they begin any violation adjudication process by triaging violators into victims, standard violators, and scofflaws. Victims are those who are innocent and were incorrectly sent violation notices. Standard violators are individuals who neglect to pay or respond to warnings or penalty notices promptly, but who are not knowingly acting to avoid paying what they owe. Scofflaws are those who are clearly intentional violators, knowingly acting to avoid paying what they owe. They remove all penalties from victims as fast as possible. They work with standard violators, waiving initial penalties, and if necessary, taking actions like developing payment plans, to help them become compliant. They allow the strongest measures to be applied to scofflaws.
- At the New York Thruway, adjudication of penalties for minor violations is handled by their tolling services contractor, and thus not by the agency directly. However, the agency

[23] PayNearMe is a service that allows users to pay cash or other payment methods for purchases from retailers who may not accept cash, such as online retailers. Users go to a local PayNearMe affiliate, including 7-Eleven and other convenience stores and grocery stores, to make the cash payment for any retailer that accepts PayNearMe. It is fully described at https://home.paynearme.com/

directly employs a toll payer advocate, to whom toll payers may appeal in cases in which they were not satisfied with the results provided by the tolling services contractor, and who will advocate for them with the tolling services contractor.

- At the New York Thruway, the strongest measure taken against toll violators is registration suspension. The Thruway would have preferred to have the option of a violation hold (which would block registration renewal, but not immediately invalidate a vehicle's registration), instead of a suspension (which immediately invalidates a vehicle's registration and makes driving a vehicle illegal), but the legislature only granted them the legal authority to perform suspensions. Not having access to a vehicle can make it difficult for some evaders to earn money to pay off violation penalties.

3.4 Vehicle Registration Administration Agencies (DMVs and similar)

Vehicle registration administration agencies, most commonly called Department of Motor Vehicles (DMV), but in some states called Departments of Licensing (DOL) or Bureau of Motor Vehicles (BMV), are currently the primary point of contact between vehicle owners with the state, because they already administer vehicle registration and titles. Further, given their experience with consumer-facing operations, these agencies are well-situated administer some of the public-facing aspects of RUC. Finally, their experience operating the motor vehicle registry database gives them unique insights into the challenges of vehicle-based evasion and enforcement. The project team spoke with Washington State DOL and California DMV, who shared the following lessons:

- The address records in DMV databases are generally only as accurate as vehicle owners make them, because vehicle owners are required to provide address updates when they move, but many do not. However, both Washington DOL and California DMV, and likely most other DMVs, use the National Change of Address (NCOA) service whenever they receive a returned registration renewal letter, which means most incorrect addresses are updated once a year.
- Both states provide updated data to the National Motor Vehicle Title Information System (NMVTIS), and both states refer to NMVTIS when a vehicle is newly titled. NMVTIS is a good source of information but for vehicle title information. Currently, 48 states participate in NMVTIS—Kansas, Hawaii, and the District of Columbia do not, but are eventually going to support it. NMVTIS indicates title liens but does not include information on vehicle registration such as vehicle registration holds. In general vehicles are allowed to be titled in other states even if they have a registration suspension or hold.
- Both states generally only initiate odometer investigations if they find inconsistencies in the data directly reported to the agency.
- Vehicle registration holds may result from a range of non-moving violations, such as lack of auto insurance, or excessive toll or parking fines. RUC would thus easily fit in the category of leading to vehicle registration holds.
- Vehicle registration in the wrong (non-domiciled) location is a common type of vehicle registration fraud. Such fraud is mostly enforced through citizen reporting (tips from

neighbors who see such a vehicle). In Washington, police in border counties may do extra reporting.

- Changes needed for DMV systems for RUC enforcement support could be significant but will vary greatly by state. For example, Washington State would need to add the functionality to assess late payment penalty fees.

3.5 RUC Commercial Account Manager (CAM)

A limited number of companies have provided RUC account management services in the US. These CAM vendors have first-hand experience with detecting attempts at evasion by their customers, as well as the details of back-office operations. The project team spoke to two CAM vendors, Azuga and IMS. The interviews were wide ranging, exploring methods that individual vehicle owners might employ to evade RUC, as well as ways a CAM might attempt to defraud the government. Highlights of these interviews include:

- CAMs could attempt to defraud the government through a range of methods, including:
    - Keeping two sets of books: one reflecting the distance and RUC values charged to customers, the other with lower values reported to the state. Discussions with both CAM representatives suggest this would be very difficult to do, given the nature of RUC data reporting, and spot audits of a limited number of customer invoices would uncover this. Periodic financial audits of CAMs will also be necessary.
    - Enrolling "ghost vehicles": vehicles that are not registered in the state. This would be immediately detected by reconciling RUC accounts with motor vehicle registration records, unless an employee of the motor vehicle registering agency (DMV or equivalent) was a participant in the fraud. A safeguard against this method of fraud is verify that each RUC-enrolled vehicle is also registered with the state agency, and for the state agency to keep internal controls preventing fake vehicles from being enrolled.
    - Inconsistent rounding—rounding charges to customers up, but values reported to the state down. This approach results in differences of only pennies per customer per month, but the amount adds up over time and as the number of RUC-liable vehicles increases. In a state with thirty million RUC-liable vehicles, a one cent-per-month difference is $3.6 million over the course of a year. To prevent this fraud, the state needs to provide a complete, consistent set of rules for rounding values and ensure the rules are being following during regular audits.

3.6 Vehicle Safety Inspection

Some states with required annual vehicle safety inspections have studied using that process to support implementing RUC. It is a way of leveraging existing processes to support an alternative revenue source. To gain an understanding of the role that annual vehicle safety inspections might play in detecting RUC evasion, the project team spoke to Hawaii DOT (HDOT) staff

responsible for overseeing the Periodic Motor Vehicle Inspection (PMVI) program. The key points are Hawaii-specific, but some of the information can form the basis of recommendations to other states considering adapting their vehicle safety inspection programs for RUC. Relevant information from the Hawaii PMVI program include:

- In Hawaii (and probably in most states with vehicle safety inspection), vehicle safety inspectors do not inspect for odometer rollback. They record odometer values, but no procedures exist to check for odometer rollback.
- In Hawaii, vehicle safety inspectors do not currently photograph the odometer. However, they could easily do so, because they already enter the vehicle to inspect the vehicle and use a tablet to photograph other vehicle elements, including the VIN. Combined with odometer image processing, such photos could increase accuracy of odometer records, which are currently not fully accurate. Some inspectors even leave the field blank.
- Vehicle inspectors are unlikely to accept bribes to falsify vehicle inspection reports. Inspectors are audited frequently by HDOT, and these reviews are not conducted in secret—agency observers openly enter inspection stations and staff are generally known to vehicle inspectors. These checks are mostly to ensure that inspectors are performing up to standard. It is worth noting that there is currently little financial motivation for either vehicle owners or vehicle inspectors to give or take bribes; under a RUC system there could be more incentive to commit fraud. Thus, requiring odometer image records if RUC is implemented through safety inspections is a wise evasion prevention measure. Alternatively, or in addition, penalties for safety inspectors who fail to record the correct odometer value could be introduced.

3.7 Usage-based Insurance (UBI)

UBI bases auto insurance rates, in part, on the distance traveled by the covered vehicle. In this way, it is similar to RUC. Further, the technologies used to establish distance traveled for UBI purposes are among those used to measure distance for RUC – OBD-II plug-in devices and odometer image processing.

The project team spoke to UBI providers IMS and MileAuto to understand how these insurers protect against fraudulent distance reporting – analogous to evasion in the context of RUC. The primary lessons learned were the following:

- Fraud attempts by UBI customers are very rare, based on statements by both firms. For context, MileAuto currently supports thousands of customers using odometer image submission, while IMS supports tens of thousands of customers with a combination of OBD devices, other devices, odometer submissions, and smartphone apps. The methods employed in those rare attempts are essentially the same methods as for RUC fraud: for devices, unplugging the device, for odometer image processing, image fraud (submitting pictures of pictures or submitting an image from the wrong vehicle).
- Insurance companies are heavily regulated (the insurance regulation office of each state in which they are active) and audited (at least once a year), and consequently providers of UBI

services are heavily regulated and audited. Those audits are primarily financial, but also include business process audits. Such audits would be appropriate for CAMs providing RUC services.

3.8 Cross-cutting Lessons

Both the CAM interviews and the UBI interviews included the following lesson learned:

- Agencies regulating CAMs should establish audit criteria. These criteria should outline the various ways that the CAMs can be audited, and data that should be available. This should proceed in a manner similar to how insurance regulators have audit criteria for insurance companies and their supporting services. Providing this information to CAMs allows them to design systems that are audit-friendly, ensuring the required information is readily available without undue cost to the CAM. There are three basic audit types that may apply to CAMs, each of which have distinct content and criteria, as described below:
    - Financial audits—standard accounting audits, to ensure all relevant financial regulations are being complied with. Although limited to financial statements, such audits may reveal improprieties in any part of a company's operations, as such improprieties typically have financial implications. Typical data provided for financial audits include bank statements and internal accounting records such as balance sheets, cash flows, capital statements etc. Criteria include compliance with the relevant accounting rules such as GAAP. Insurance audits provide a good example of such a financial audit: detailed criteria for insurance audits are compiled by the National Association of Insurance Commissioners.[24]
    - Process audits—an audit of a specific work process or workflow, to ensure that it is efficient and no or minimal losses can occur from the process. Example processes for RUC could be enrollment, updating accounts with new travel data, generating a monthly statement, providing customer service. Typical data provided for the process audit include documentation of the process; auditors also typically interview employees involved in the process. Criteria include verifying the process has no gaps (does not lose or incorrectly use data in any circumstance).
    - Technical Audits—detailed technical audits of systems, which may include examination of code and/or direct testing of the software by the auditor. These are expensive and time intensive audits, and essentially the initial system certification that CAMs undergo qualifies as a technical audit. Typical data provided for technical audits include software documentation and software test results. Criteria are that the software is designed to achieve its goal and tests produce expected results.

[24] https://www.naic.org/documents/prod_serv_fin_receivership_cpa_zu.pdf

4. Scan of Relevant Laws

This section presents the RUC West Evasion, Prevention, and Enforcement project team's scan of relevant laws, in the following subsections:

- **4.1 Legal scan background** explains the reasons for conducting the legal scan, and the scope limitations of the legal scan
- **4.2 Overarching Legal Issue: is RUC a tax or a fee** describes the background and implications of RUC being legally considered a tax or a fee
- **4.3 Access to driving data to detect or prove tax evasion** describes legal considerations related to the collection of data needed to detect and prove RUC evasion
- **4.4 Issues related to the consequences for RUC evasion** describes legal considerations on potential legal consequences of RUC evasion, such as fees, fines, and registration holds

4.1 Legal Scan Background

Why Conduct a Legal Scan?
Before developing a RUC compliance and enforcement program it is critical to understand laws that might affect the range of permissible (or advisable) enforcement activities by government or its agents. This section of the report examines some of the laws and regulations that are related to road usage charging enforcement by states. As background, the project team scanned other transportation programs that are analogous to RUC (such as tolling) or that have similar characteristics or elements of an enforcement program that could be applicable to a RUC enforcement program (vehicle inspection programs, for instance). Relevant legal issues and possible constraints are highlighted below to provide insights into how best to structure a future RUC enforcement program.

Scope (and limitations) of the Legal Scan
The scope of this legal scan included U.S. constitutional law, manifested through federal court cases; select state constitutional laws; and select state statutes (including any court decisions interpreting them).

Another layer of legal constraints may be found in state regulations. Regulations can be promulgated by state and federal agencies either with or without specific direction from Congress or state legislatures. Regulations are adopted through formal rule-making procedures under the federal Administrative Procedures Act (APA), or the state-level equivalent of the APA for state regulations.

Although regulations carry the same force-and-effect as legislatively enacted statutes, regulations are more easily and more frequently enacted, amended, or repealed. The project team's legal scan included only state-level regulations that are directly on-point to road usage charging.

Given the resource limitations of this project, the relevant legal issues and potential constraints presented in this report should be considered as *useful starting guidelines* – but not an exhaustive treatise – of the laws, rules and policies related to tax payment enforcement in RUC West member states. Legislatures in all fifty states are considering new measures that could affect motorists and taxpayers; state motor vehicle licensing agencies, revenue agencies, and departments of transportation are constantly promulgating new rules or amending existing ones; and courts at all levels are hearing cases every day that could change the rights, obligations and relationship between motorists and roadway tax authorities.

The information in this report is best used as a beginning checklist of common legal issues to consider as RUC West member states weigh options for creating an enforceable RUC system. Beyond this general guidance, each state should consult their own attorneys general/legal counsel when developing state-specific RUC enforcement provisions. These lawyers are most knowledgeable about the unique laws in each jurisdiction and will be most qualified to help agencies craft specific RUC provisions.

Prioritizing the Research

The research priorities for this legal scan were RUC West member states. Where non-RUC West states have unique programs analogous to RUC, the project team considered relevant provisions from those states as well.

To date, only Oregon and Utah have implemented RUC programs that are actively collecting mileage-based payments from drivers. In both states, vehicle enrollment in the RUC program is voluntary rather than compulsory. Given the current nascent-stage development of RUC in the U.S., the project team briefly reviewed laws affecting compliance and enforcement activities to find useful legal guidance (or guardrails) for future RUC programs. Beyond RUC, we considered laws in the following areas:

- Weight-mile taxes (for heavy trucking)
- Vehicle inspection programs
- Tolling
- Vehicle registration programs

First, however, at the request of RUC West member states, the project team examined the specific question of whether RUC constitutes a “tax” or a “fee” – and some potential implications of such a legal determination. Although this question is not strictly an enforcement issue, the answer impacts the approval requirements state government must meet to enact and collect a tax or fee.

4.2 Overarching Legal Issue: is RUC a tax or a fee?

Whether RUC is judged to be a tax, fee or charge is not just semantics or marketing spin – the legal characterization can have practical consequences for the authorization, implementation and enforcement of RUC.

Why does this issue matter?

In many states, taxes require a different approval process than fees. For example, if a proposed governmental charge is deemed to be a tax, then the measure may require super-majority approval by the legislature and/or voter approval at a special or general election[25]. In some states, if the revenue raised by the charge is considered "general tax revenue," total expenditures may be subject to the state's legal spending cap[26]. On the other hand, if the governmental charge is deemed a "fee" then a state legislature may be able to impose the fee without these stricter approval requirements[27]. State legislatures can delegate fee-setting (or adjustments) authority to state agencies[28]. A third consequence of whether RUC constitutes a tax or a fee is that some states have spending restrictions based on the legal characterization of the revenue mechanism. For example, in many states fuel taxes may be spent on "highway purposes" but not on other transportation purposes (such as transit). Each jurisdiction has its own unique language and court treatment of these provisions, making generalizations regarding revenue restrictions difficult.

Who decides?

While the bill language used in describing the revenue mechanism as a tax or a fee provides initial insight into legislative intent, such descriptions are not dispositive; in fact, tax watchdog organizations have taken on the legislative practice of attempting to skirt higher approval requirements by such labeling revenue measures as "fees"[29]. In some states, courts will defer to the legislature in deciding whether a revenue measure constitutes a tax or fee. This is especially true when the determination is needed strictly for legislative procedural purposes. However, when the revenue measure would otherwise trigger additional approval thresholds or processes beyond the legislature, courts have taken up the question when petitioned.

The General Rule (in Three Parts)

In determining whether a revenue measure constitutes a tax or a fee, parliamentarians and courts consider several factors. In *San Juan Cellular Telephone Co. v. Public Service Commission of Puerto Rico*, 967 F.2d 685 (1992), the U.S. First Circuit Court of Appeals applied a three-part test. The first element is to determine whether the charge itself is governmental (that is, imposed by government) or proprietary in nature (not imposed by government). Note the word "imposed," which refers to the party who can legally compel payment of a particular sum. This is very different than who collects payment. A charge imposed by government but collected by its agents or private parties can still be a tax. A clear example of this is the retail sales tax, which is imposed (i.e., a specific sum legally compelled) by government but collected by third parties (generally, retailers). A contrasting example of a charge not imposed by government is

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[25] As of 2017, 13 states require supermajority approval to raise revenue (taxes), including RUC West members WA, OR, CA, NV, AZ, HI, and OK. *Supermajority Budget and Tax Rules*, The Urban Institute, November 2017.

[26] Ibid.

[27] *C.f.*, State of Washington (add citation)

[28] *J.W. Hampton v. United States*, 276 U.S. 394 (1928), holding that Congress can delegate their authority to agencies provided they provide "intelligible principles" to guide agencies' actions.

[29] *How is the Money Used*? Joseph Henchman, The Tax Foundation, Background Paper No. 63, March 2013.

mandatory drivers' insurance. Although government may legally require that drivers maintain minimum insurance in order to operate a motor vehicle on public roadways, government does not impose or set the actual charge (in this example, insurance premiums).

In the case of RUC, even where states allow private businesses to collect the charges, these charges are nonetheless imposed by government and therefore must undergo further scrutiny for proper legal classification.

The second factor from the *San Juan Cellular* case calls for determining whether the charge is imposed for the purpose of raising general state revenue. General revenue refers to collections that are spent on general government services. Examples include police, fire and other public safety expenditures; environmental protection; operations of most state and local government agencies; and dozens of other examples. Charges imposed by government for the purpose of raising revenue for general government services are taxes, regardless of whether all or only some groups of people are required to pay the charges.

The third factor delineated in *San Juan Cellular* was to examine which persons are liable for the charges, and whether they are direct beneficiaries of the expenditures. Fees are government charges imposed for the distinct purpose of covering the cost of a specific service, and where those persons paying the fee are direct beneficiaries of that service. Charges for fishing licenses that raise revenue for regulation and stocking of the fisheries are fees because they are paid only by persons who want to catch fish, and those fee-payors receive a direct benefit (unlike the fish). In the transportation sector, a clear example of a "fee, not a tax" are bridge tolls[30]. The fee is paid directly by motorists (beneficiaries of the bridge facility), and the proceeds are dedicated to improvements on the same facility or within the same transportation corridor[31].

An even stronger argument can be made that government charges are not "taxes" when the proceeds of the charge are not only used (de facto) for specific governmental goods or services, but where statutory restrictions on expenditures exist to ensure that tax revenue must always be spent on *only* those narrow purposes and not subject to the shifting spending priorities of legislators.

Another possible factor not part of the 3-prong test in *San Juan Cellular*, but relevant in some states (while specifically rejected in others) is whether the governmental charge is "voluntary" in nature, so that persons may opt out of paying the charge. If the charge is viewed as a voluntary payment, it might be construed a fee; if the charge is involuntary with no feasible way for people to legally avoid payment, then it is considered a "tax." However, the Tax Foundation

[30] We note the less-clear situation where a toll is imposed on a public roadway and the proceeds used for general government purposes. Although the payers of the toll receive a direct benefit (i.e., use of that roadway segment), if the toll proceeds are not used for improvements within that transportation corridor and instead diverted to other government spending, the toll might be characterized as a general tax.

[31] *C.f.,* RCW 47.56.875, which allows expenditure of collected revenues within the same highway corridor served by the toll bridge – that is, not restricted to the bridge facility itself.

reports that this rationale for distinguishing a tax from a fee has fallen out of favor among the courts so that very few states use this criterion to help determine whether a charge is a tax or a fee.

To summarize the general rule: in nearly all states[32], a charge will be considered a "tax" if it is legally imposed by government to raise revenue for general government services. If the charge is imposed by government but only on a subset of direct beneficiaries of a specific public service, it is more likely to be considered a "fee," particularly where the revenues are legally protected from diversion to other uses.

Applicability to Fuel Taxes and RUC

Use taxes (or user fees) can have characteristics of both taxes and fees under the *San Juan Cellular* test. State motor fuel taxes are a perfect illustration. Fuel taxes are collected from drivers[33] who are direct beneficiaries of the public roadways funded with that revenue. In fact, in most states, drivers who pay fuel taxes for using fuel off public roadways – on private farming roads, recreational trails, or for boating – are entitled to a refund of fuel taxes attributable to their off-road use, on the grounds that these taxpayers did not receive a direct benefit because they did not "use" the public roadways.

Further strengthening the argument that fuel taxes constitute user fees is where the revenues are segregated in a special trust fund, not comingled with general government revenues, and expenditures from the fund are restricted to highway (i.e., public roadway) uses[34]. With these additional features, fuel taxes appear to meet the *San Juan Cellular* three-prong test.

However, this classification of fuel taxes as a type of fee (and therefore not subject to supermajority legislative approval and/or voter approval required for taxes) runs into problems when even a small portion of the revenue is used for non-roadway purposes, or when the revenue is not segregated into a special dedicated account and is instead mixed with other general government revenues. In these instances, the state fuel tax is less likely to be considered a roadway use "fee." Other arguments weakening the case that fuel taxes are fees include (a) in most states, the fuel tax is actually imposed upon fuel wholesalers and therefore not paid directly by the beneficiaries of the charge; and (b) a much wider range of people and businesses benefit from a public roadway network, whether they actually drive on it or not, as

[32] Oregon does not subscribe to this general rule. Rather, Oregon applies a slightly different three-prong legal test. See *Automobile Club v. State of Oregon*, 314 Or. 479 (1992). The rule applied in Oregon examines whether the charge is (a) a government fee (b) imposed to fund specific services, and (c) whether the financial burden (or charge) is closely related to the benefit provided.

[33] Note that in most states, the taxes are collected at the rack and therefore technically paid by fuel wholesalers. However, legislatures and also some courts have found this distinction to be artificial as the intended operation of the fuel tax is for the cost to be passed down from wholesale fuel distributors to retailers (gas stations), who in turn set their prices to cover the cost of the fuel tax.

[34] Note: some states make distributions of gross motor fuel tax collections prior to those funds being deposited into a special trust fund where expenditures are restricted.

roads facilitate commerce, emergency services, public transit, biking and walking, shared ride services, etc.

Courts in many states have made clear that the label applied to the governmental charge is of little persuasive value in determining whether the revenue mechanism is a tax or a fee. Whether called road usage charges, or mileage taxes, or vehicle miles traveled fees – the courts will look beyond the name and examine how the charge is actually structured and used.

If a state places all of the same provisions and restrictions on RUC as it does on the state fuel tax, it is reasonable to assume legislative parliamentarians and courts will treat RUC similarly (as either a tax or a fee, depending on the jurisdiction). RUC does have the advantage of being a direct charge on motorists for each mile of roadway "consumption," thereby operating more directly as a fee for a service paid by drivers in direct proportion to the benefit received. In contrast, with increasingly divergent MPG (or MPGe)[35] ratings among vehicles, this 1:1 correlation between fuel taxes paid and direct benefit received in the form of actual roadway use has been deteriorating. In this respect, a stronger case might be made that RUC is a direct fee and not a tax than can be argued for the fuel taxes.

4.3 Access to driving data to detect or prove tax evasion

Several of the RUC enforcement methods require the state (or its authorized agents) to access the driving data of the vehicle owner in order to detect, audit or prove RUC evasion. This raises questions about who owns RUC driving data, who is entitled to view it, and what procedures must be followed to use the data for investigative purposes.

The federal Drivers' Privacy Protection Act of 1994[36] (DPPA) governs the disclosure of personal information gathered by state departments of motor vehicles (DMV) or whichever state agency is responsible for managing the state's vehicle registry. The law prohibits DMVs from disclosing personal information without the express consent of the driver. The statute contains numerous exceptions to this general rule, including allowing government agencies to use such information "to carry out its official functions." These permissible uses are so expansive[37] that they do not, in any meaningful way, restrain states from using driving data for RUC enforcement purposes. The DPPA might be viewed as simply regulating the release of personal information maintained by the DMV for private purposes (although the federal statute allows even some private uses).

[35] MPGe is the official designation adopted by the U.S. Environmental Protection Agency for Miles Per Gallon Equivalent. It is the measure of the average distance traveled per unit of energy consumed. Where MPG (Miles Per Gallon) is the standard measure for liquid motor fuels, MPGe is used to compare average "fuel" economy of electric-powered vehicles, versus more conventionally powered gasoline or diesel vehicles.

[36] 18 U.S.C. 2721 et. seq.

[37] C.f., 18 U.S.C. 2721 for a complete listing, but notable are the sweeping authorizations allowing release of data "for response to requests from motor vehicle departments" and "for other uses specifically authorized by state laws."

Lacking any meaningful federal constraints on a state's use of driving data, legal restrictions on the use of driving data will depend on individual state laws.

Government access and use of taxpayer data was common for compliance, audit and enforcement across all states reviewed in the areas of state income taxes (where applicable), tolling, and vehicle registrations. For RUC programs, Oregon and Utah are the only states actively collecting road usage charges from drivers. In Oregon, state law protects the confidentiality of personally identifiable information (PII) collected under their RUC program[38]. The statute expressly allows PII to be used by a financial institution for purposes of collecting per-mile road usage charges owed; by the department or its authorized service providers; by law enforcement upon obtaining a lawful court order for purposes of a criminal investigation; or any party authorized by the vehicle owner to receive such PII[39]. Furthermore, absent a driver providing specific consent to different treatment of their data (such as sharing with third parties, or longer retention periods), a driver's PII may only be released to these parties to the extent that the specific information sought is necessary to carry out a proper governmental function.

Although Oregon provides for the destruction of driving data, the state may retain this information during a dispute resolution process or as part of a "noncompliance investigation." What is unclear from the statute is whether conducting periodic audits rises to the level of a "noncompliance investigation." If not, within 30 days of payment processing, the state would no longer have access to the necessary data needed to perform routine audits due to the statute's data destruction requirements. While this issue is not critical during an early-adoption phase of RUC, this relatively short (30-day) data retention period could prove problematic in a greatly expanded program where periodic, random audits are an important compliance tool.

Utah's RUC program also contains provisions related to driver data[40]. Unlike Oregon's program, Utah may condition a driver's participation in their RUC program upon that driver consenting to the collection and use of location data[41],[42]. And although the driving data is not subject to public disclosure, there does not appear to be any requirement in state law or the resulting administrative rules specifying a retention period before destruction of the driving data. Retention of driving data would allow for easier periodic audits. The data retention policies must be disclosed to drivers as part of the User Agreement between drivers and the account

[38] ORS 319.915, which defines PII as "any information that identifies or describes a person, including, but not limited to, the person's travel pattern data, per-mile road usage charge account number, address, telephone number, electronic mail address, driver license or identification card number, registration plate number, photograph, recorded images, bank account information and credit card number."
[39] ORS 319.915(3)(a).
[40] Utah Administrative Rules, R926-17-6.
[41] R926-17-6 provides, in pertinent part: "User agreements between account managers and RUC participants must be approved by the Department prior to use and *must require explicit consent for collection and storage of RUC participants' location data*." [italics added]
[42] It should be noted that if Utah drivers do not wish to enroll in UDOT's RUC program, they will be subject to a flat rate annual vehicle fee as an alternative to paying for roadway use.

manager, and UDOT must approve such provisions in its service contract with the account manager[43].

States' prohibitions or severe restrictions related to the collection and use of location data by government could present new complications if a state also allows deductions or exemptions for mileage driven out of state. Such prohibitions or restrictions could make proof of non-taxable mileage harder to scrutinize—especially if the data from such driving is not collected, or is insufficiently detailed, or has been destroyed too quickly.

General rule (or approach):
Government's right to access taxpayer data for purposes of compliance audits and related enforcement activities is common across the states and various tax programs. Specific to RUC, both Oregon and Utah greatly restrict personally identifying information (including driving and location data) from being disclosed to third parties. There is some divergence in the degree to which each state regulates the use and retention of data by the state and its authorized agents. Oregon state law mandates that driving data be purged within 30 days of RUC payment unless there is an ongoing dispute or investigation of non-compliance. Utah law only requires contracts between the state and its authorized third-party account managers to detail how data will be retained, destroyed and shared.

Although a detailed compliance and enforcement program may not be warranted in early-stage RUC systems, as states look ahead to expanding the number of vehicles in their RUC programs, they might consider the legitimate need for state auditors to periodically and randomly review past driving data as part of a more comprehensive compliance program. Data retention and destruction policies that are too short may hinder the ability to conduct these periodic audits. On the other hand, indeterminate retention periods and lack of data destruction policies could raise concerns from privacy advocates and pose a risk that historical data could be unlawfully accessed by third parties. Agency program managers and policymakers will have to weigh these factors in crafting a legal, effective compliance program as RUC scales up.

Legal limitations on vehicle access and roadside enforcement
In a simple RUC program where vehicle owners self-report odometer mileage, a compliance and enforcement program may require periodic odometer verification by authorized third parties. There are numerous ways third-party verification can be done. One method is by odometer checks by law enforcement or other authorized personnel, either on a random basis or while performing other investigative functions.

One approach suggested is occasional roadside checkpoints by law enforcement. Roadside checkpoints involve law enforcement officials selecting a pre-determined number of vehicles (say, every 10th vehicle) on a public roadway and investigating the possibility the driver might

[43] See R926-17-9(f), requiring that the service contract contain mutually approved guidelines for "privacy and security protection processes, including parameters for data collection, retention, destruction, anonymization, aggregation, and sharing."

be doing something unlawful – typically, driving while impaired. This use of roadside checkpoints is commonly known as "sobriety checkpoints."

The U.S. Constitution's Fourth Amendment protects against unreasonable search and seizure of self or property by government officials unless there is probably cause and a warrant stating the basis for the suspicion and the person and/or items to be searched. However, In *Michigan Dept. of State Police v. Sitz*[44], the U.S. Supreme Court upheld the practice under certain circumstances. A majority of the court held that government's interest in preventing the public danger presented by drunk drivers relative to the degree of intrusion on a motorist who is briefly stopped weighs in favor of the state's action.

Although checkpoints are used in some states, at least 11 states have found the practice unconstitutional under individual state constitutions. Among the states that have ruled roadside checkpoints to be an unconstitutional invasion of privacy are RUC West members Idaho, Oregon, Texas, and Washington.

It is doubtful that federal or state courts would find roadside checkpoints to be a valid practice if the intended purpose is simply to check for tax payment compliance or gather information for audits – i.e., an odometer reading. The governmental interest in RUC compliance is unlikely to outweigh and individual's Fourth Amendment right against warrantless search and seizure[45].

A related issue is whether law enforcement can "search" the vehicle (or more specifically, the odometer mileage) coincident with a lawful stop for a traffic or safety violation. Even when pulled over for an alleged traffic infraction, law enforcement must have a reasonable and articulable suspicion of a crime to enter and search the vehicle. The situations where this usually occurs is when an officer believes the driver may be armed and dangerous or is carrying contraband. Being pulled over for failure to signal or a broken taillight does not give law enforcement unfettered access to the person or the vehicle.

Roadside enforcement of RUC, either as a stationary checkpoint or conducted when pulling over an individual vehicle for probable cause of a traffic infraction or criminal behavior, is not legal in several RUC West states and might be illegal in all states.

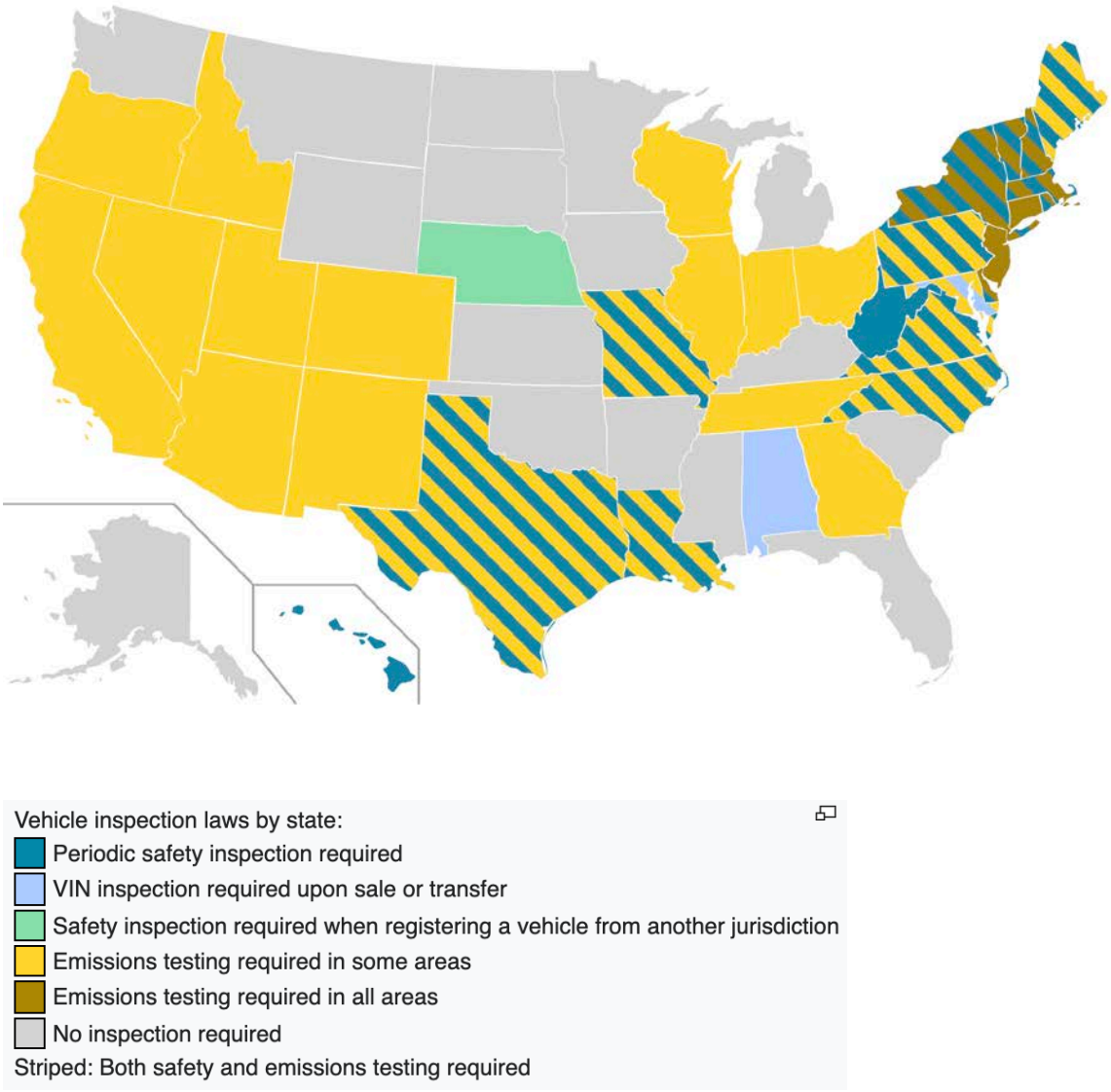
A better, legal alternative exists for conducting physical inspections of odometer readings by government officials or their agents. The best example of a lawful inspection of a vehicle odometer are official vehicle inspection programs that are carried out in several states, and several other states (or regions within states) also conduct vehicle inspections as part of emissions testing. Hawaii and Pennsylvania each require periodic vehicle safety inspections for all vehicles (not just when the vehicle title is transferred). The Hawaii Periodic Motor Vehicle

[44] Michigan Dept. of State Police v. Sitz, 496 U.S. 44 (1990).

[45] City of Indianapolis v. Edmond 531 U.S. 32 (2000) held that a vehicle check point set up for the primary purpose of detecting evidence of ordinary criminal wrongdoing (in that case, searching for drugs) did not fall within the highway safety (DUI) or border patrol exceptions that have permitted roadside checkpoints.

Inspection form contains a field for the vehicle inspector to record the vehicle's odometer reading. However, this information is currently not mandatory and often not recorded by the inspection station. At least thirteen other states or regions within states have vehicle inspection programs for other purposes, such as emissions, VIN verification at the time of title transfer, etc. These programs may already collect odometer information or could easily do so if required. This is illustrated in the map below.

Figure 1 Vehicle inspections required by state[46]



Another source of odometer verification could be through private, third-party service providers who already have customer relationships with drivers. For example, automotive repair shops could serve as a third-party verification service where the vehicle odometer mileage is

[46] Map taken from Wikipedia. Vehicle Inspection in the United States. https://en.wikipedia.org/wiki/Vehicle_inspection_in_the_United_States

periodically reported to the state. A simple check of past odometer mileage reporting could help flag irregularities that might merit further inquiry (or investigation) by the state.

4.4 Issues related to the consequences for RUC evasion

Civil penalties

Civil penalties are monetary fines imposed by government on persons found to have committed a violation of law. Civil penalties are imposed to compensate the government for the person's wrongdoing, whereas criminal penalties are intended to mete out punishment. Both civil and criminal penalties may be imposed for the same wrongdoing, depending on the specific law violated. For example, if a vehicle owner underreports mileage to a state RUC program by committing fraud (say, submitting a fake odometer reading), that person may be subject to civil penalties for underreporting mileage and late payment (regardless of how the underreporting happened), as well as subject to criminal penalties for committing fraud, which is a felony under federal law.

In this report we only examine possible legal issues and constraints on the use of civil penalties as a RUC enforcement mechanism.

Civil penalties have several advantages as an enforcement tool for RUC programs. First, monetary fines can be administratively imposed prior to any adjudication on the facts and applicable law (but still subject to appeal). Second, if the accused person disputes the imposition of the fine and decides to adjudicate the issue, a state hearings officer or administrative law judge will likely hear the case in a less costly, less formal venue than cases that must come before a district or superior court judge. Third, the standard of proof required is for "clear and convincing" evidence to be presented to find a person liable for the wrongdoing. In a criminal proceeding, the government must prove "beyond a reasonable doubt" that the person committed the offense.

The amount of a civil penalty is often specified in law[47]. Generally speaking, courts will only intervene to amend the penalty if they find the amount of the fine "excessive" and therefore in violation of the U.S. Constitution's Eight Amendment, which provides that "Excessive bail shall not be required, *nor excessive fines imposed*, nor cruel and unusual punishments inflicted." This Eighth Amendment protection applies to civil fines[48] as well as to forfeitures of property[49].

What is considered an "excessive fine"?

[47] C.f., 49 U.S.C ss 33115, which establishes a maximum penalty for a violation of federal VIN notification requirements by automotive repair shops and allows the Secretary of Transportation to impose a more specific amount underneath the maximum allowable fine.

[48] Hudson v. United States, 552 U.S. 93 (1997)

[49] Austin v. United States, 509 U.S. 602 (1993).

The First Circuit U.S. Court of Appeals enumerated three factors to be considered to determine whether a fine is excessive[50]. First, whether the intended purpose of the fine established in statute was to "punish" a defendant; second, how the amount of the fine compares to other fines and penalties established in statute; and third, the amount of harm caused by the defendant. A simply put restatement of this test: is the penalty grossly disproportionate to the crime or violation[51]?

Who can impose a civil penalty?

While it's clear that government (or more specifically the legislative branch) can delegate the ability to set fines and fees to administrative agencies, a question often arises whether private entities acting on behalf of government can establish and impose fines. This question is often raised in the context of private operators of public parking and toll facilities. Prospectively, it could be raised in the context of RUC where a private vendor is authorized to set or impose "civil penalties" for improper compliance with policies and procedures related to mileage reporting and RUC payment.

At the broadest level, the "non-delegation doctrine" holds that Congress (or the legislative branch) cannot delegate powers that are strictly legislative. The classic examples used are the powers of appropriation and taxation, which are "exclusively legislative"[52]. In addition to legal issues related to the constitutional separation of powers, delegating legislative powers to other entities raises due process questions, as individuals' rights (including their property rights to their wallet) may be impacted by decisions and actions of third parties that may not be legally authorized to impose penalties.

Courts have been surprisingly lenient in allowing government to delegate regulatory powers (including imposition of penalties) to private entities[53]. However, allowable delegations must include certain safeguards. First, adequate standards and procedural protections must be provided in the delegation that private entities must follow[54]; and second, the private entity should not have interests that are adverse to the interests of those regulated, thereby denying the latter due process[55]. The private entity should be able to act with impartiality.

Although allowing private RUC service providers to set and impose fines for non-compliance with RUC program requirements is permissible (assuming the delegation from government met the standards set forth above), more severe consequences that cascade from a drivers' non-compliance should probably be administered by government itself. This brings us to the issue of holds, suspensions and revocations of vehicle registrations and drivers licenses.

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[50] United States v. Jose, 499 F.3rd 105 (2007).

[51] This gross disproportionality reasoning was applied in United States v. Bajakajian, 524 U.S. 321 (1998).

[52] United States v. Shreveport Grain & Elevator Co., 287 U.S. 77 (1932).

[53] See generally, *Delegation of Legislative Power*, Annotations, Justia: accessed at: https://law.justia.com/constitution/us/article-1/04-delegation-legislative-power.html

[54] A.L.A. Schechter Poultry Corp. v. United States, 295 U.S. 495 (1935)

[55] "One person may not be entrusted with the power to regulate the business of another, and especially of a competitor." Carter v. Carter Coal Co, 298 U.S. 238 (1936), at 311.

Drivers' License and vehicle registration holds and revocations
In the absence of fines, or as an escalation in enforcement techniques after fines have been assessed, states often use temporary suspensions of vehicle registrations or drivers' licenses as a strong incentive for a vehicle owner to become compliant with state laws. If people don't become compliant, temporary suspensions can further escalate to revocations of licenses and registrations for an indeterminate period of time.

These enforcement measures have been used to compel compliance with a wide array of laws, ranging from failure to pay a fine, a toll, a court judgment, or child support; to failure to attend or complete court-ordered educational classes; to failure to purchase or maintain adequate vehicle insurance, and beyond. Because vehicle registration revocation only affects a specific vehicle (whereas drivers' license revocations affect a person's ability to lawfully drive *any* vehicle), we will discuss registrations and licenses separately.

Vehicle registration suspensions and revocations.
Driving a vehicle is not an absolute right, legally speaking; it is a privilege that is granted based on fulfillment of a multitude of legal obligations. Focusing first on the vehicle: all vehicles must be properly registered by the state's regulatory agency (typically, a department of motor vehicles, or DMV). Some of the obligations required before a person can register a vehicle are managed and monitored by the DMV itself: payment of registration fees, payment of excise taxes, proof of emissions testing or safety inspections, etc. These all must be satisfied before the DMV will issue or renew a vehicle's registration.

Not all obligations are actively managed or monitored by the DMV. For instance, in many states, proof of auto insurance is required but DMV is not responsible for managing compliance (in some states, DMV does have that responsibility). A third scenario is where vehicle owners have unfulfilled obligations that are reported to the DMV, which then may place a "hold" on a vehicle registration until those obligations are met by the vehicle owner. An example of this is unpaid tolls. If the tolling authority determines that a vehicle owner has not paid his or her tolls, after an opportunity to correct the situation passes without resolution, the toll authority may notify the DMV of the unpaid tolls (and any penalties for non-payment), whereupon the DMV may place a "hold" (or "stop") on renewal of the vehicle's registration. When the owner attempts to renew the vehicle's license, the DMV will not process the registration until the underlying obligations have been satisfied.

Vehicle registration holds and suspensions are powerful tools that state agencies can use to compel compliance with laws and settlement of taxes, fees, tolls, charges and associated

penalties[56]. All of the RUC West states scanned have laws that allow for vehicle registration holds or suspensions. States that place holds for unpaid tolls include Utah, California, Colorado, and Washington. The state of Hawaii will not allow vehicle registration renewal until a vehicle has completed the annual motor vehicle inspection required in law.

In short: vehicle registration holds are legal, well-established and effective in compelling a vehicle owner to become compliant with laws. Because this enforcement measure only affects a specific vehicle and not the rights of a person to drive other vehicles, registration holds are considered less onerous and punitive than drivers' license suspensions or revocations. Once a RUC program moves from voluntary participants (the early-stage implementations in Oregon and Utah) to compulsory for at least some subset of vehicles, state RUC administrators can be expected to follow the lead of tolling authorities, municipal courts and parking authorities in using vehicle registration holds to ensure compliance with RUC laws.

Drivers' license suspensions and revocations

Similar to vehicle registrations, a person's right to a drivers' license is not absolute but conditional upon fulfilling other legal obligations – including some that are wholly unrelated to vehicles or driving[57].

In today's society, a valid drivers' license is required not only to legally operate a motor vehicle, but also serves as an official government-issued identity document, enabling everyday retail commerce (stores require a drivers' license to accept payment by check), access to venues (proof of age), authorization to pick up goods and, in some cases, people (childcare centers that require a drivers' license), and even travel by air between states. Unlike suspension of a vehicle registration (which affects only lawful use of that particular vehicle), a drivers' license suspension can have the effect of curtailing other important activities beyond just driving a car.

The implications for personal liberty posed by drivers' license suspensions have resulted in both increased scrutiny of this form of enforcement[58] and higher standards to ensure individuals' right to due process before a license can be suspended or revoked. "License-for-payment" systems – terminology used by critics to describe the practice of withholding issuance of drivers' licenses until the debtor pays off all fines, fees and accumulated interest charges – have

[56] Registration holds and suspensions may be ineffective in instances where the subject vehicle is permanently registered – that is, no further registration renewal is required. Montana allows for permanent registration of vehicles once they reach certain criteria (value and age of vehicle). Older vehicles more typically fall into this situation. In addition, these vehicles may not have the ability for use OBD devices for mileage reporting and therefore may be more likely to forego payment of RUC.

[57] According to the National Conference of State Legislatures, all 50 states now have statutes or administrative rules that call for the suspension or revocation of drivers' licenses for failure to pay child support, among other license privileges that may be revoked. See *License Restrictions for Failure to Pay Child Support*, as of October 14, 2020. Accessed at: https://www.ncsl.org/research/human-services/license-restrictions-for-failure-to-pay-child-support.aspx

[58] For example, the Fines and Fees Justice Center tracks the practice of drivers' license suspensions, as does The National Legal Aid Justice Center.

been found to disproportionately impact historically vulnerable groups, including low-income people, persons of color or communities of color, and more. For example, recent data from California shows a strong positive correlation by zip code between black populations and drivers' license suspension for nonpayment of court fees[59].

The legal scan showed that several RUC West states have provisions for drivers' license suspensions or revocations. However, recently the Oregon legislature passed HB 4210 that repealed a court's ability to suspend driver's licenses because of unpaid fines, fees and processing costs. Other states are now considering similar measures[60].

Given the gravity of this enforcement measure and the additional costs to drivers, state DMVs, and the court system generally[61], RUC administrators and policymakers may decline the use of drivers' license suspensions as a penalty for non-compliance with RUC laws.

[59] *Driven by Dollars: A State-by-State Analysis of Driver's License Suspension Laws for Failure to Pay Court Debt*, Legal Aid Justice Center, (Fall 2017), at page 17.

[60] Twelve states (including Oregon and California) have enacted driver's license revocation reform laws in the U.S. and others (including Washington) have legislation pending. U.S. News and World Report, "Washington Law Would End License Suspension for Unpaid Fines" February 16, 2021.

[61] Washington State Prosecutors Association testified that about 33% of the entire prosecutorial caseload in the state is related to driver's license suspensions.

5. RUC Reporting Evasion, Prevention, and Detection

This section discusses potential methods of RUC evasion, and methods that can be employed to prevent and detect evasion. It first discusses four general evasion methods that apply to all mileage reporting methods, as well as their detection methods. It then discusses evasion measures that are specific to each of the five mileage reporting methods, as well as their detection methods. That discussion includes a compliance waterfall for each method. General suggestions for preventing RUC evasion are discussed in detail in Section 8. Consequences are discussed in more detail in Section 9.

5.1 General evasion

There are five general types of evasion that can occur regardless of mileage reporting method:

1. Failure to register a vehicle with the state DMV (or equivalent agency)
2. Failure to enroll vehicle in the RUC
3. Failure to make payments (this can include both late payment and complete nonpayment)
4. Moving out-of-state without making a final odometer report and payment
5. Vehicle scrapped/abandoned without making final RUC report

A final general category of RUC-related fraud includes directly hacking into a CAM's computer system to alter either mileage or payment records. However, such efforts would require sophisticated, large-scale hacking efforts, and go well beyond the capabilities of most system users. They are well beyond evasion, rising to at least the level of organized crime, and are not considered here.

5.1.1 Failure to register vehicle

Failure to register a vehicle means a vehicle owner's failure to register a vehicle with the state vehicle registry (DMV or Department of Licensing) in the state in which the vehicle is domiciled. In all states, operating an unregistered vehicle is a non-moving violation, and detection and enforcement against this violation already are carried out by law enforcement. Generally, law enforcement officers can pull over moving vehicles with expired license plate tags and can ticket parked vehicles with such tags. In the past, registration evaders in some states stole tags from other vehicles. However, many states now use vehicle-specific tags that include the vehicle's VIN, making theft of tags easy for police officers to detect. Bad actors have also created fraudulent tags. However, law enforcement officers have the ability to verify vehicle registrations in real time during traffic stops, and the penalties for having fraudulent tags are significant, so this is uncommon.

It is unlikely that the introduction of a RUC will increase the frequency of vehicles remaining completely unregistered. RUC does give vehicles another incentive to remain unregistered, as the state may not have a way of detecting whether an unregistered vehicle is paying RUC, but it seems unlikely that the risk of this evasion is significant. However, the threats of detection and

penalty of driving an unregistered vehicle (up to $500 or more in some places) should be sufficient to discourage RUC evasion in this manner. Some drivers will still allow their registrations to inadvertently lapse, and in this case, the RUC system should be prepared to charge RUC owed for the period that the vehicle was unregistered. To do this, it is vital that the state store, in some manner, a record of each registered vehicle's odometer that is updated at least annually.

By contrast, the introduction of RUC may increase the likelihood of leaving a vehicle registered in a state where that vehicle is not currently domiciled (i.e., a state without a RUC). It is much more difficult for law enforcement to identify vehicles that are not registered in the correct state than to identify vehicles that are not registered at all. Some areas, such as the District of Columbia, actively enforce this by requiring all vehicles that are parked overnight on more than two nights to prove that they are not resident in the district. This enforcement is typically carried out by parking enforcement officers, though police officers are likely empowered to do so as well.

However, many jurisdictions do not actively enforce against locally domiciled vehicles being registered in other states. Such jurisdictions may offer a phone line on which vehicles suspected of being locally domiciled with out-of-state plates can be reported anonymously, and investigate suspicious cases found when vehicles are pulled over for other reasons but may not otherwise enforce in this case. These jurisdictions may need to begin more active enforcement efforts when they initiate a RUC program. They can do so by having parking or law enforcement officers record observations of of out-of-state vehicles parked in residential areas on multiple days. After a maximum number of days is exceeded, owners of such vehicles would be required to prove that they are in fact residents of the states in which the vehicles are registered (through a utility bill or other record).[62]

5.1.2 Failure to enroll vehicle in the RUC

This method of general evasion means that a vehicle owner could leave a RUC-liable vehicle un-enrolled in the RUC. This can be avoided by designing the RUC program in such a manner as to render this situation impossible. For instance, a state could require RUC enrollment as a prerequisite to registering a vehicle title or renewing registration or could automatically register vehicles into a flat-fee program if the vehicle owner has not enrolled with a CAM within a particular period of time, and the flat fee should be high to make this option unappealing.

[62] This approach will not capture vehicles parked off-street, such as in parking garages. Laws exist today to discourage leaving vehicles registered out of state, including significant penalties if a vehicle is not promptly registered in state. Further, failure to register a vehicle in the state where it is domiciled could render its insurance void. The RUC program will need to rely on these laws and the thread of void insurance to ensure vehicles are registered in state. A tip hotline could be created by which tipsters could inform the state of out of state vehicles that are housed there for long periods of time.

However, a poorly designed RUC program could allow such evasion to occur, and such evasion must be prevented.

5.1.3 Failure to pay (Late or no payment)

The third type of general RUC noncompliance, late or no payment, occurs whenever vehicle owners fail to pay the RUC owed in the required timeframe. The law, regulation, or contracts enabling RUC will provide vehicle owners a timeframe to pay the RUC after they have received the statement of charges owed. Such a timeframe may be a period of 30, 45, or 60 days. If vehicle owners fail to pay in the specified timeframe, their payments are late, and incur some sort of penalty—typically a warning or late fee.

The detection of the late payment is straightforward. Software can check, for each vehicle, whether payment has been received on time. It is the responsibility of the body overseeing the manner of collection to perform this check. It may be the state agency tasked with overseeing RUC, in the case of safety-inspection based reporting, or it may be the CAM, in the case of other reporting methods.

5.1.4 Moving out of state without making a final odometer report

Regardless of reporting method, it is possible to move out of state without making a final odometer report (for some mileage methods, this actively requires disabling the mileage reporting method, for example, unplugging the mileage reporting device). Whether intentional or unintentional, doing this leads to part of the RUC owed being evaded. There may be no way to fully eliminate this type of evasion, but several steps can be taken to reduce such evasion.

To reduce this type of evasion states should check RUC owed before issuing refunds of any taxes or fees paid. In particular, many states offer partial refunds of vehicle registration costs for vehicles that are registered in other states before the registration in the first state is expired. Other such refunds of fees or taxes for vehicle owners that move out of state may also exist. Any such refunds should only be given if a final RUC odometer report to the state is made.

As a further prevention measure, RUC payments could either be pre-payment for a given period, if allowed by law, or made from an electronic wallet that has a minimum balance and top-up amount, or, if post-payment is supported, a deposit should be required of some amount. This deposit can then be reclaimed when the vehicle is sold or moved or deregistered from RUC[63]. These measures ensure that the vehicle owner will have paid for at least part of the RUC owed. In a pure post-payment paradigm, if no deposit is required, a vehicle owner can abscond without paying for RUC owed. The ability to require pre-payment may be limited if RUC is enacted as a tax rather than a fee.

[63] In many parts of the US and world, utility companies require a deposit in order to activate the utility for a property, and the deposit is only repaid when the utility is shut off. This deposit is similar for RUC.

Potentially, as an even stronger prevention measure, state agencies could place a vehicle title lien on vehicles with large amounts of outstanding RUC, to prevent them from being registered in another state. Vehicle registration holds, while an important enforcement measure, will likely not be sufficient to prevent vehicles being registered out of state, as many states do not check whether out of state vehicles have registration holds on them before allowing them to register). Vehicle title liens are currently issued only issued to auto lenders, and to mechanic's or vehicle storage facilities ("mechanics' liens"), so this would require a new category of vehicle lien be created in RUC enabling legislation. Penalty measures are discussed in more detail in Section 8 but are mentioned here as they could theoretically be used to prevent vehicles with large amounts of outstanding RUC from escaping the state's jurisdiction. As discussed in Section 8, adding outstanding RUC as reason for a vehicle registration hold and/or title hold will require new regulation and likely new legislation—it could be included a law that would create a RUC program. Details of such legislation or regulation would be state-specific but would allow the state to place a registration hold on vehicles with large amounts of unpaid RUC. Registration holds and title holds are not currently used in cases of small amounts of outstanding payments, and thus are unlikely to be appropriate (or feasible or legal) in cases of small amounts of RUC owed.

Finally, states with RUC programs will need to create some form of interoperability to support state-to-state payments. This should also support the exchange of final odometer readings, when a vehicle moves from one RUC state to another. This can be extended to a specific enforcement agreement between states. Offering this form of interoperability may require explicit language on the vehicle owner's terms and conditions.

5.1.5 Vehicle scrapped/abandoned without making final RUC report

A vehicle owner scrapping or abandoning the vehicle without making a final RUC report could also lead to part of the RUC being evaded.

An important prevention measure would be to require in regulation that all vehicle scrapyards only accept vehicles that are up to date on RUC owed, or even to have a means of charging for RUC owed at the time of vehicle scrappage (i.e., having the scrap yard collect the RUC owed). Unlicensed vehicle scrapyards, which do not comply with state regulations may exist, but these are likely already illegal, as they are often associated with car theft activities. Insurance companies could also be involved in such activities.

In case of abandoned vehicles, regulation should say RUC owed is added on top of any existing fine or fee for vehicle abandonment, and regulation should indicate that the state has a lien on any value left in an abandoned vehicle, if it does not do so already. Of course, if the vehicle owner leaves the state after abandoning the vehicle, there may be no way for the state to

collect the RUC owed, if there is not a specific enforcement agreement with that state. This is another compelling reason to make RUC a pre-payment or electronic wallet-based payment.[64]

5.1.6 Compliance waterfall for general evasion

The project team developed compliance waterfalls for general evasion activities, and for each specific Mileage Reporting Method (MRM). The purpose of the compliance waterfall is to describe steps that move vehicle owners from non-action (non-compliance/negligence) to compliance. The compliance waterfalls are not intended to cover all possible noncompliance scenarios, but to cover typical non-criminal noncompliance events. Note that consequences described in the pink and red boxes are notional and should be customized to each state's RUC system, legal framework, and enforcement capabilities.

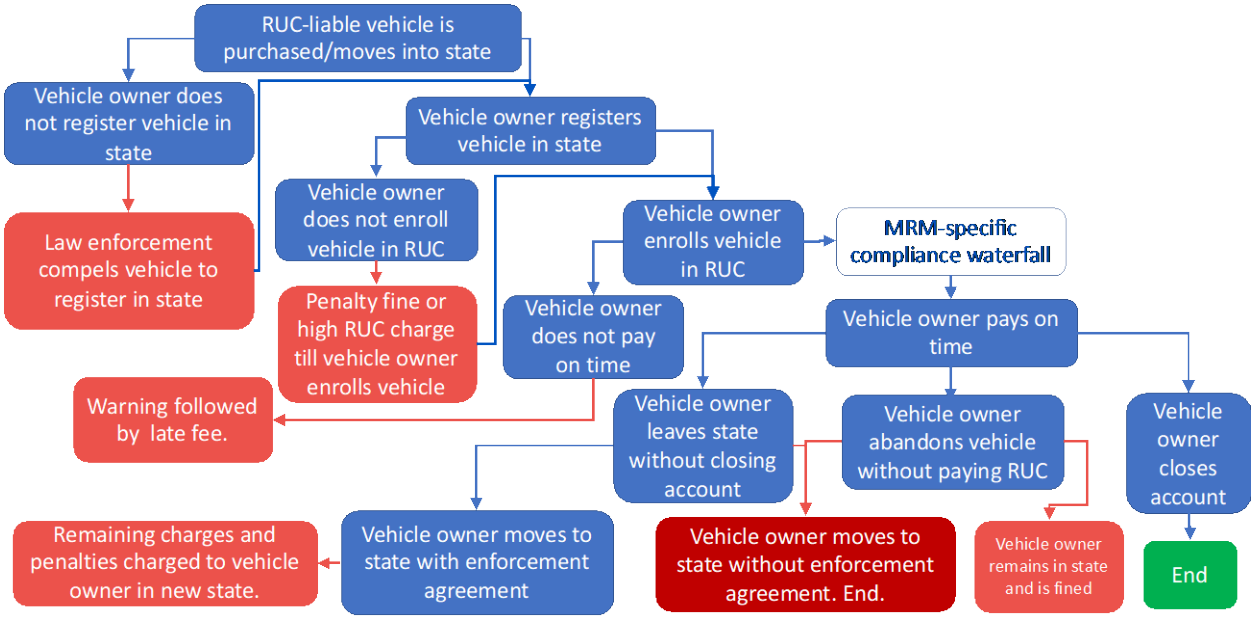
The project team developed the following compliance waterfall for general evasion. Compliance waterfalls are color-coded as shown in the key in Figure 2.

Figure 2. Key to compliance waterfalls

The following General Compliance waterfall captures the general means of RUC evasion. It indicates where the Mileage Reporting Method-specific compliance waterfalls fit in.

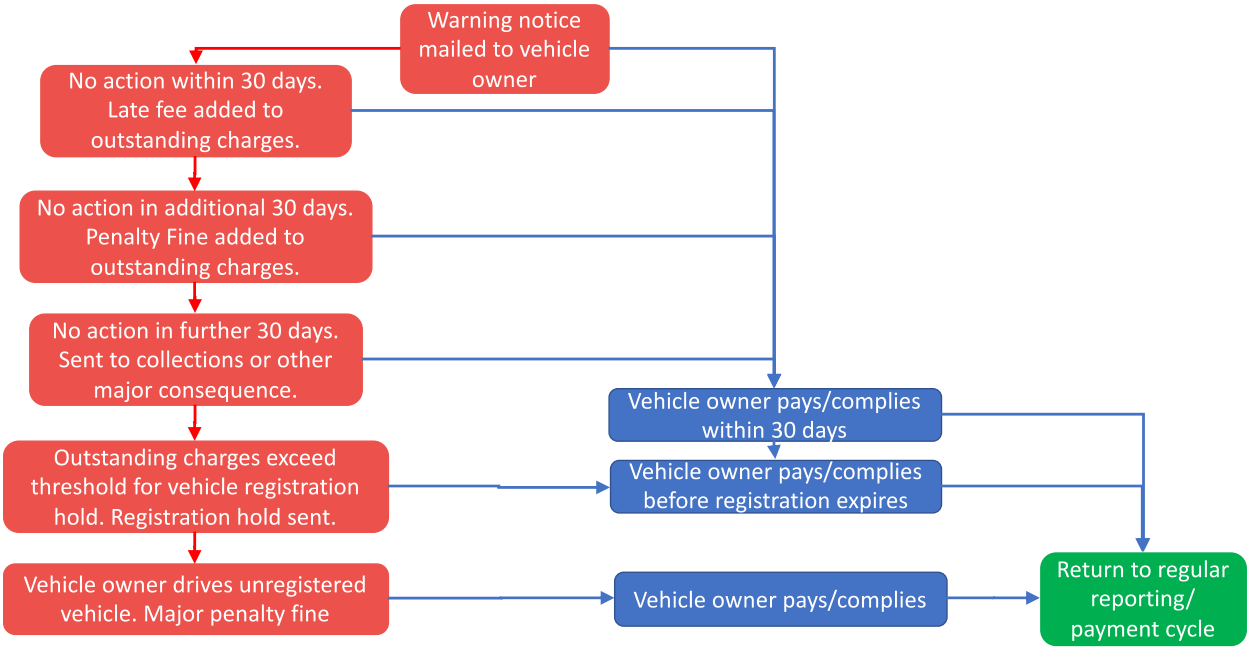
[64] In both cases, small payment amounts should be possible—prepayment could be done in quarterly or monthly increments, and electronic wallet top-ups should be possible for $10-$20, to ensure lower income individuals do not struggle to pay RUC.

Figure 3 General Evasion Compliance Waterfall



When any violation is detected, a series of elevating consequences is triggered. This series of elevating consequences will be specific to the state developing the enforcement plan, in terms of how many notifications a vehicle owner receives, and how the consequences escalate in each case. Consequences for major, intentional violations will be very state-specific, and cannot be illustrated in a generic way, that applies to all states, but consequences for more minor violations should be similar in many states. The following violation compliance waterfall gives a general format for the escalation of a minor violation such as “Vehicle Owner does not pay on time,” or “Vehicle owner does not report on time”. In the general evasion waterfall above, it could replace the box that reads “Warning followed by late fee.” This waterfall begins assuming that some minor violation (late payment or report) has occurred. It can be substituted into any of the MRM-specific waterfalls below where minor violations occur.

Figure 4 Example Violation Compliance Waterfall



5.2 Background: Odometer rollback

One of the primary means of intentionally evading RUC is odometer rollback. Odometer rollback means manipulating a vehicle odometer to display a lower value than the number of actual miles (or kilometers) traveled by the vehicle. Odometer rollback could be used in conjunction with any mileage reporting method and is thus explained before the mileage report methods.

Odometer rollback occurs today outside of RUC programs. Bad actors may roll back vehicle odometers to sell used vehicles for greater value than they would have if their actual value were displayed to the buyer, or to keep leased vehicles below mileage limitations. For these reasons, odometer rollback is a federal crime. However, implementation of a RUC creates a new incentive for odometer rollback.

Mechanical odometer rollback means physically rolling back an odometer. Automakers phased out mechanical odometers in the 1990s. By 2001, nearly all new vehicles sold in the United States had a digital odometer, though a few relatively rare models had a mechanical odometer through 2004. By 1990, automakers had developed mechanical odometers that were tamper-resistant and tamper evident—it was very difficult to roll back such odometers, and even if someone could, it was likely to leave a visible mark on the odometer's exterior. Few people today have the skills to roll back these odometers.

Digital odometer rollback means using software to adjust the odometer field in a vehicle's engine control unit, the computer that operates the engine of cars built since the 1990s. Digital odometer rollback is made possible by automakers, who create a software means to change the odometer field. Automakers include this software feature so that when an engine control unit (the computer that operates a vehicle's engine and also contains the vehicle odometer) is broken or damaged, it can be replaced such that the vehicle keeps the same odometer reading. Automakers attempt to keep this software secure and allow its use only by authorized mechanics, but in previous years, automakers have not used absolutely secure electronic security measures. Sometimes, criminals obtain official automaker diagnostic tools, and official credentials that allow them to use such tools, to modify the odometer. In other cases, criminals have managed to hack these diagnostic tools and create software to modify vehicle odometers that they may sell on online marketplaces.

In recent years, automakers have begun using stronger digital security measures, reducing the likelihood and feasibility of odometer rollback. For vehicles from automakers that have implemented fleetwide telematics systems, such as Tesla, digital odometer rollback is virtually impossible (only a Tesla employee could roll back a Tesla odometer). For vehicles with an active telematics systems from other automakers, odometer rollback may also be impossible, though it cannot be said with certainty which vehicles are virtually immune to digital odometer rollback, as automakers do not publicize incidence of fraud. Even on vehicles without active telematics systems, digital odometer rollback is becoming more difficult, as automakers employ more sophisticated security measures. However, it cannot be ruled out for these vehicles, and is certainly possible on many vehicles manufactured over the past 20 years, so it should definitely be considered in RUC evasion detection efforts.

Digital odometer rollback generally cannot be detected by analysis of an engine control unit, because engine control units traditionally have not recorded a history of odometer values. Detection of digital odometer rollback can generally only be done by having a validated odometer reading for a given vehicle that is higher than the current value of the vehicle's odometer. The state should retain a record of odometer reading for each vehicle that is updated at least once per year. Further, in cases of suspected fraud, or for random vehicles the state chooses to audit, the state can look up odometer records for a vehicle from a vehicle data consolidator such as CARFAX or AutoCheck. These services compile vehicle data from auto mechanics, oil change, and other auto service facilities, who are required by law to record this data for all vehicles that they service.

Most vehicles have data that appears in these services, however, vehicles that are exclusively serviced by vehicle owners or unofficial mechanics may not have data that appears in these services. For such vehicles, there is no general means of detecting digital odometer rollback.

5.3 Mileage reporting method-specific evasion

This section contains evasion methods, evasion detection methods, and a compliance waterfall for each of five mileage reporting methods considered in this study.

5.3.1 Distance Permit

A distance permit or mileage permit means prepaying for a block of miles, based on odometer self-declaration. This form of RUC is used in New Zealand for all diesel-powered vehicles. The distance permit is stored in the RUC system, which police can access to determine if a given vehicle has a valid distance permit.

The means of evading distance permit-based RUC is simply to fail to purchase a new mileage permit. In some cases, this may be accompanied by rolling back the vehicle odometer, but in many cases it is not.

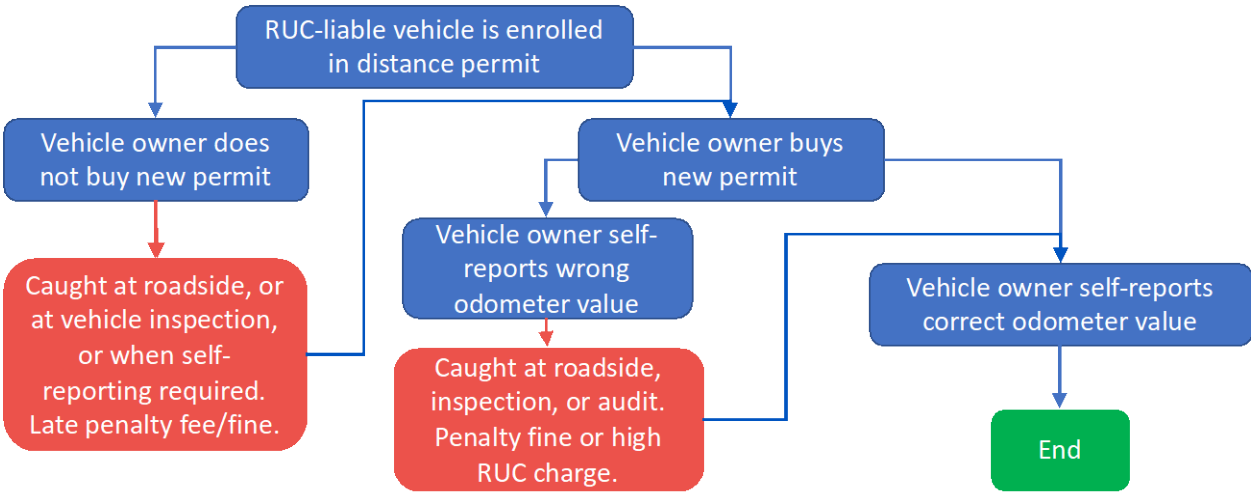
In New Zealand, this evasion can be detected through spot enforcement when a police officer pulls over a vehicle for another cause and asks to check that the RUC permit is still valid, and by reading the odometer and comparing it to the current permit during annual vehicle safety inspections. Spot enforcement is likely not be feasible in the US, because police will not ask drivers to exit the vehicle for odometer verification due to safety concerns.

If safety inspections are not required in a given state, the state can ask vehicle owners to self-declare their odometers on an app, web portal, or verbally at a given frequency (at least once per year) to validate or "true-up" mileage consumed on distance permits. Data validation activities such as requiring vehicle owners to enter their odometer values twice will help to reduce the number of accidental errors in reporting. Requiring self-declaration of odometer readings will ensure that vehicle owners who fail to purchase new permits are detected, though it will not catch individuals who declare a false odometer reading or who roll back their odometer – further, it is doubtful that someone who fails to purchase permits when required will comply with the self-declaration, unless significant penalties are in place for failing to do so. To catch dishonest individuals, a sample of individuals using the distance permit can be selected for audit—comparing their most recently submitted odometer reading to a reading from a VIN Lookup service such as CARFAX or AutoCheck, which contain data on most, but not all, vehicles.

Instead of asking for self-declared odometer values, the state could require odometer images be submitted, as described in the next section.

Figure 5 illustrates a notional compliance waterfall for Distance Permit evasion.

Figure 5 Distance Permit Compliance Waterfall



5.3.2 Odometer image reporting

Odometer image reporting means having RUC program users submit an image of their RUC-liable vehicle's odometer and charging them for miles based on the submitted odometer image. The image is processed into a digital odometer value through optical character recognition (OCR) software. Odometer image reporting can be implemented as a post-pay method or an electronic wallet-based prepay mileage reporting method.

Odometer rollback is one method of evasion possible with odometer image reporting. In this case, a evader would roll back a vehicle's odometer before submitting an odometer image. The organization administering the odometer image reporting service should store each odometer value submitted, and check that new values submitted are not lower than previous values submitted. However, this check will not catch cases where an evader consistently changes the odometer to just higher than the previous odometer report. To catch such cases, some vehicles may be subject to audit through a vehicle history service such as CARFAX. Some number of vehicles in any program that relies on odometer values should be audited each year in this manner. These audits can be random or can be targeted at vehicles which may have suspicious characteristics.[65] It should be noted that digital odometer rollback requires nontrivial effort, and that, combined with the relatively low return on effort and substantial penalties if caught, should keep its occurrence for RUC relatively rate.

[65] Organizations can detect develop algorithms that recognize/detect anomalies in the data reporting vs the average perceived use/driving habits, such as very high mileage followed by very low mileage, or instances such as a 4-year-old vehicle, 20-something owner residing in a suburban/rural community and reports less than 5k miles per year. Many times, such instances will prove to be nonfraudulent. Nonetheless, this allows the audits to be targeted at cases where fraud is more likely to be found.

In addition to odometer rollback, another feasible method of evasion is odometer image fraud—submitting a false or manipulated odometer image. There are two main ways in which this may be accomplished:

1. The vehicle owner could submit a picture of something other than a given vehicle's current odometer—images of another vehicle, or old, historical images of the car's odometer, taken specifically to submit at a later date.

2. The vehicle owner could submit an odometer image that had been manipulated with software, such as Adobe Photoshop.

Odometer image fraud can be minimized, if not completely prevented, through a variety of software measures:

1. To prevent old images from being submitted, images should be submitted "live" through an app on mobile device (i.e., the user has to take a new picture at the time it is submitted—submitting an older picture is not possible). Historical images should not be accepted via email or other means.

2. To ensure that the image is valid, the image should be compared to known vehicle characteristics, including dashboard layout.

3. Algorithms that detect digital manipulation of images should be employed to detect attempts to change the image, or to submit otherwise suspect images, such as taking pictures of pictures. Such software rates the confidence of images on a scale from zero to 100%. Images with low confidence can be automatically rejected, and vehicle owners can be requested to submit the image again. Alternatively, or in addition, or in cases of repeated submission of suspect images, a human review of an image can take place, to evaluate if evasion is being attempted.

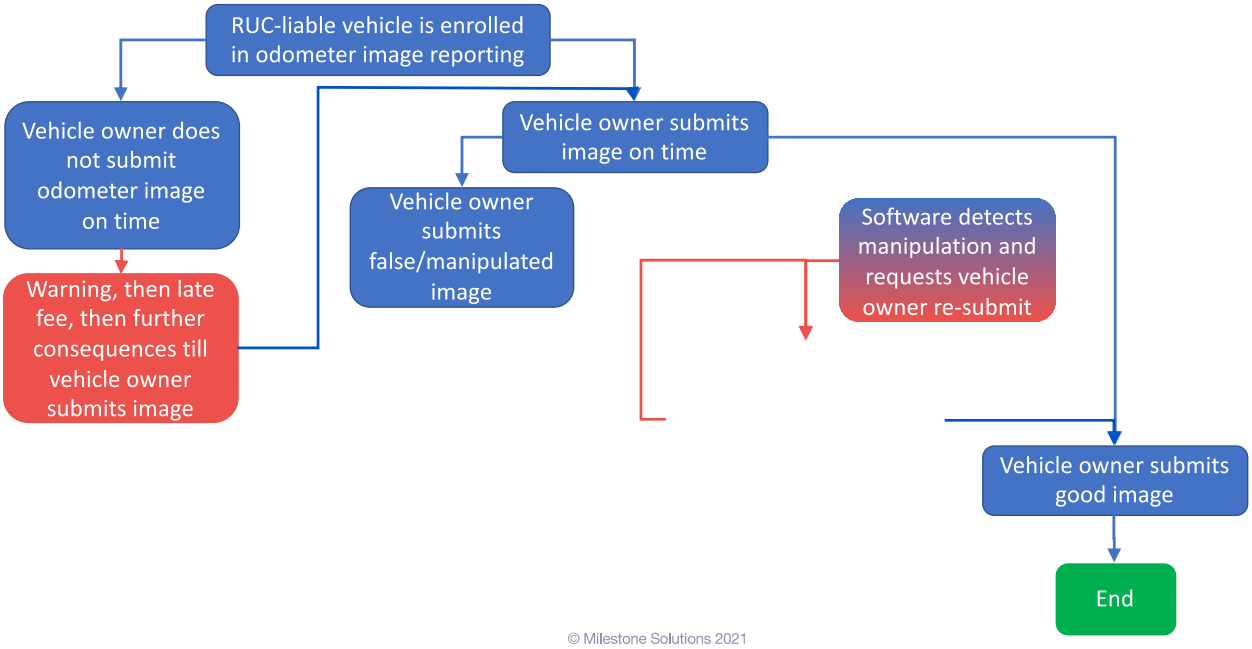
4. Further, as described above under odometer rollback, a very small percentage of vehicles may be subject to audit through a vehicle history service such as CARFAX. Such audits can be targeted to suspicious vehicles.[66]

With these prevention measures in place, evasion should be very difficult. It would only be possible if some form of image manipulation emerges that the software cannot detect. It is thus important for any provider of odometer image reporting services to stay current on image validation technology and relevant software trends.

Figure 5 illustrates a notional Odometer Image Reporting Compliance Waterfall.

[66] See footnote 61 above.

Figure 6 Odometer Image Reporting Compliance Waterfall



5.3.3 Safety Inspection-based reporting

Safety inspection-based reporting means manual reading of odometers by safety or emissions inspectors, as was included in both the California and Hawaii RUC pilots.

Odometer rollback is possible with this form of mileage reporting. As in other cases, random audits of vehicles should be employed to detect odometer rollback. In the case of older vehicles with mechanical odometers, safety inspectors could theoretically inspect odometers for signs of rollback. However, this is a long, complicated activity that requires removing the dashboard, and as evasion through rolling back mechanical odometers is expected to be very rare, such investigations are unlikely to be worth the effort.

The main form of evasion that could be possible with safety inspection-based reporting would be the vehicle owner bribing the safety inspector to falsely report a lower odometer value than is actually on the odometer. This could be detected through random audits of safety inspected vehicles, or through criminal investigations. Odometer readings should also be validated (checked that they are not declining but increasing at least minimally). If odometer readings are recorded on official vehicle-mounted stickers, such as registration tags, another form of evasion could involve black market activities—creating fake stickers or tags or stealing stickers or tags. However. Use of such stickers for RUC enforcement is not currently contemplated in states with safety inspections exploring RUC. Moreover, many states that issue official stickers, such as Hawaii now include vehicle-specific information such as VIN or license plate number on the stickers, making tag theft pointless and sticker fraud very difficult.

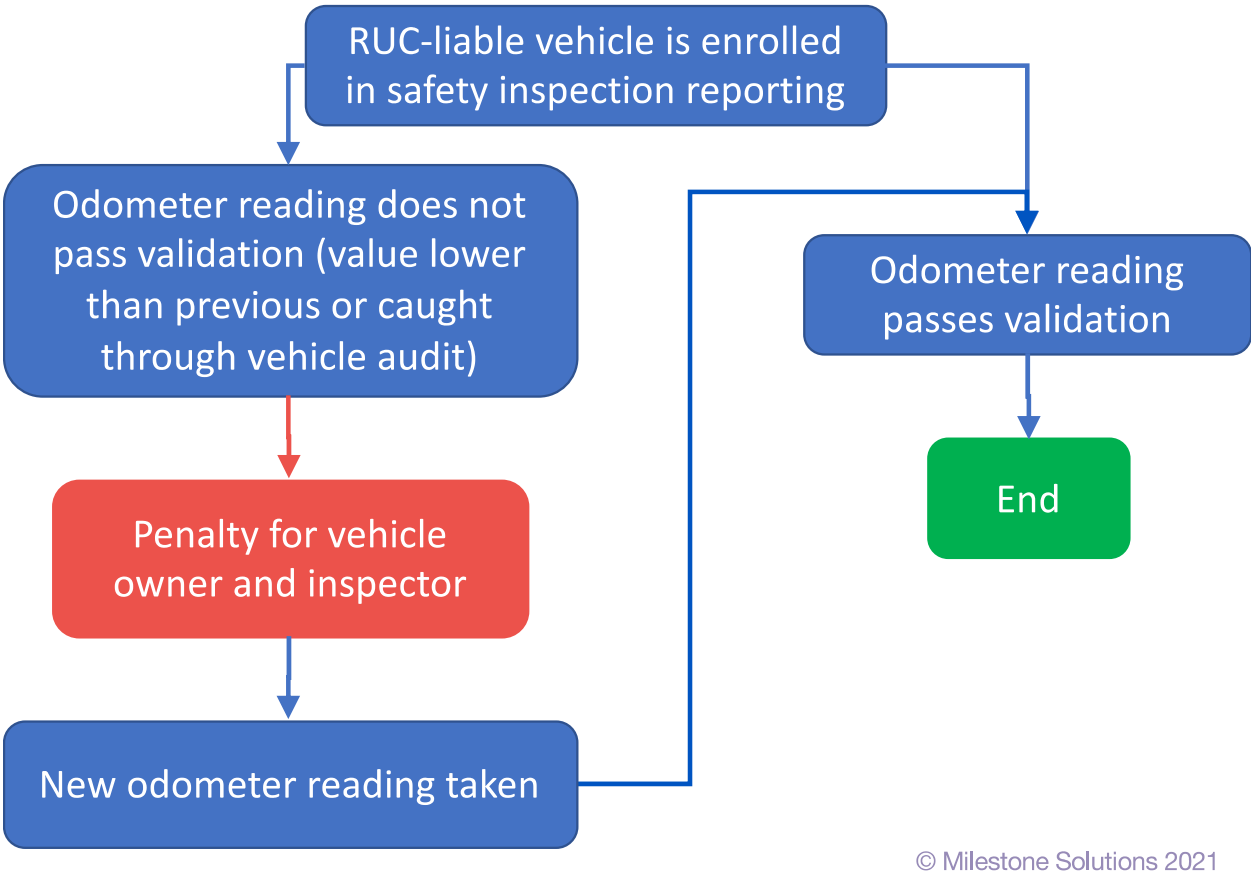
However, instead of trying to detect such fraud, it is much easier to simply prevent this possibility from occurring by requiring that safety inspectors submit odometer images for all vehicles that they inspect. Image capture software can be included in the mobile devices provided to safety inspectors, and safety inspectors can be required to capture odometer images as part of their vehicle inspections. Those odometer images should be subject to the same image validation measures mentioned above. Ideally, those image validations would take place in near real time (say, within 5 minutes) so the inspector could have the opportunity to take another image if the first image proved to be of a low confidence level.

Requiring images of inspected vehicles' odometers to be submitted should virtually eliminate the possibility of evasion through vehicle safety inspectors.

Figure 7 illustrates a notional safety inspection reporting compliance waterfall:

Figure 7 Safety Inspection Reporting Compliance Waterfall

This illustration assumes that odometer image photos are not required at the time of inspection. If they are required, fraud potential is virtually eliminated



5.3.4 Plug-in Device

Plug-in devices are after-market telematics devices that are plugged in to vehicle OBD-II ports. Plug-in devices are accurate and secure, and capture miles traveled by vehicles when they are plugged in. However, in general, for vehicles built before 2021, they may not have the capability to read actual odometer value from the ECU.

In 2019, 30% of new vehicles were required by the California Air Resources Board (CARB) to provide odometer value to the data port. In 2020, CARB required 60% of new vehicles to do so. In 2021, all new vehicles are required to provide odometer value to the data port. On some older vehicle models without CARB required odometer, plug-in device service providers are

able to obtain odometer values from automaker-specific messages that are accessible from the OBD-II port.

When devices are unplugged from vehicles that do not have the odometer value available in the OBD-II dataset, miles driven are not recorded until the devices are plugged in again. Thus, frequent or lengthy device unplugs could indicate attempts to underreport miles traveled. However, devices must be unplugged for regular car service, when a mechanic plugs in a vehicle testing device. Plug-in devices may also need to be unplugged in cases of leaving a vehicle in storage (say, for a month or longer).

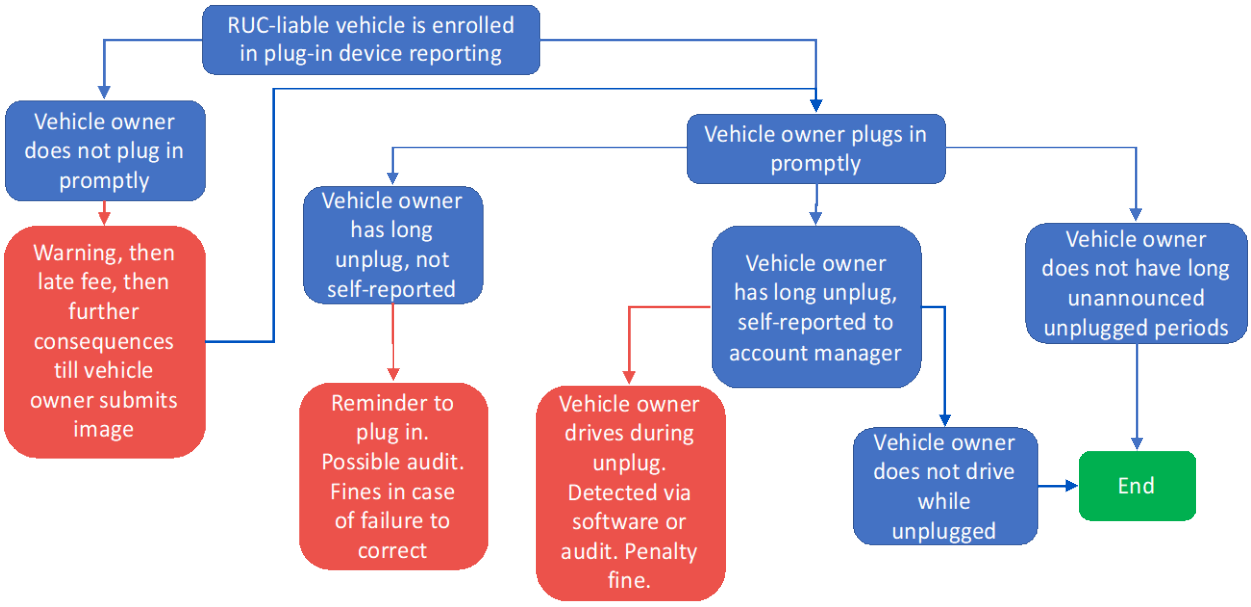
To minimize fraud, CAMs offering plug-in devices should be required to record odometer information, if available for a given vehicle, and if a device is ever unplugged for such a vehicle, to count all miles driven while the device was unplugged as chargeable miles, at the highest rate possible. CAMs should also be required to notify users promptly when devices are unplugged. In order to capture miles for vehicles for which odometer readings are not available, it may also be desirable to require vehicles to submit annual odometer images or readings, to ensure no miles are lost through a long period of device unplugging. Utah is employing this approach in its current RUC program. This is an additional burden on the RUC payer, but it is the only way to ensure all miles are captured.

Alternatively or in addition, if a device is left out of a vehicle for too long, the RUC payer could simply be charged a flat rate per day. That flat rate could either be the same for everyone or could vary based on the driver's historical patterns (e.g., just charge the RUC payer the average number of miles traveled for each day that the device is unplugged. This approach could be applied to all vehicles, or only to vehicles for which distance driven information cannot be recovered. The state would need to choose a length of time that is considered too long, likely three or more days, because period of being unplugged for one or two days are common in vehicle repair scenarios.

CAMs offering plug-in devices will generally want to allow vehicle owners the option to pro-actively report a device being unplugged for a long period of time while the vehicle is not being used. Plug-in devices typically cause a very light drain on vehicle batteries. This light drain may become noticeable when a vehicle is unused for a long period of time (say, a month or more). Thus, vehicles put in storage should have their devices removed, and vehicle owners can notify CAMs to indicate that this is the case so as not to be constantly reminded of the need to plug in a device. This option creates the opportunity for fraudsters to unplug a device, report a vehicle in storage, but then actively use the vehicle. The only way to detect this fraud is to require some sort of actual odometer report. This could be done through annual true-up odometer image. If such an image is not required, then an odometer image could be required at the start and end of periods when the device is unplugged.

The following is a plug-in device compliance waterfall:

Figure 8 Plug-in Device Compliance Waterfall



5.3.5 Native Automaker Telematics

Native automaker telematics is likely the most secure form of mileage reporting and is virtually impossible to evade. When mileage data is provided directly by the automaker, there is no way known to manipulate that data. However, no automakers are currently directly providing data to RUC systems, and it is unclear when they will do so.

Currently, use of native automaker telematics for RUC is supported by third party API providers. This service was provided by Smartcar in the California Road Charge Pilot Program, and Smartcar is currently supporting Utah's Road Usage Charge Program for Tesla 3 and Y vehicles (which have no OBD-II port). Other firms that may provide this service include Otonomo and Sheeva.ai. However, only Smartcar has direct RUC experience. In general, the API providers send current odometer and possibly current vehicle location. They generally cannot send historical location information, and depending on vehicle manufacturer, they will only be able to send updated vehicle information at a given frequency, possibly as infrequently as once per hour. So detailed location information cannot yet be supported for native automaker telematics.

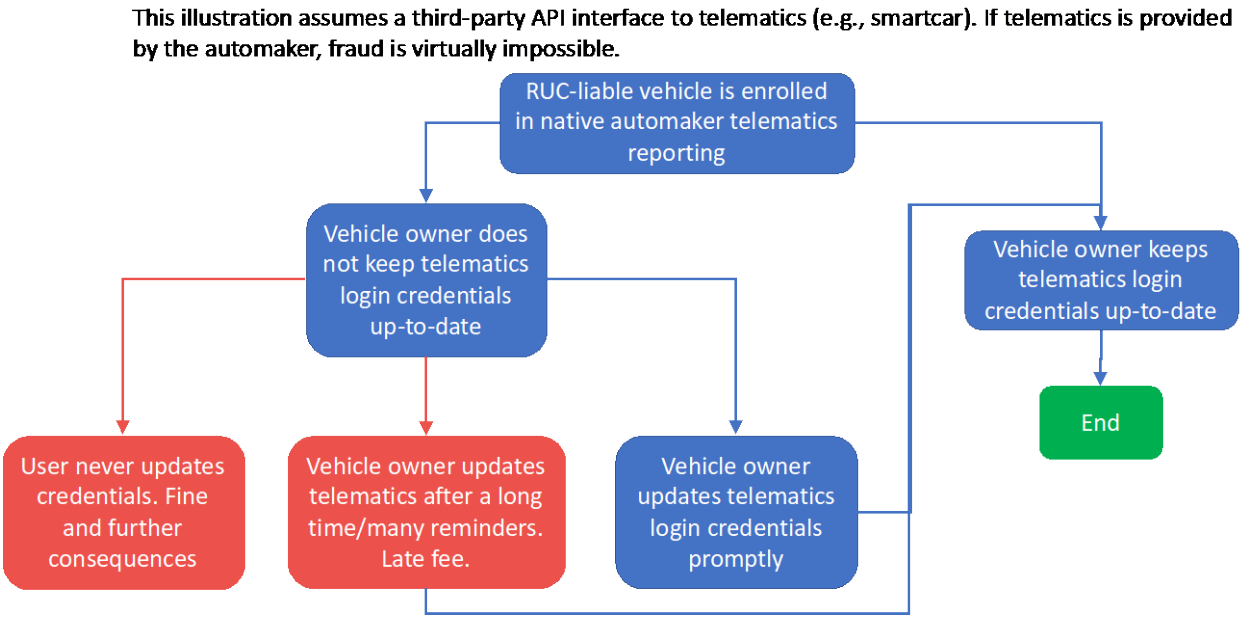
These firms provide vehicle data by using a vehicle owner's telematics login credentials—username and password—to gain access to the vehicle's data available on the automaker's telematics web portal. It is thus the responsibility of the vehicle owner to provide their current login credentials to the Account Manager. If the vehicle owner changes his/her password without providing the updated password to the Account Manager, the Account Manager will not be able to get updated data from the vehicle. This is the only known opportunity for evasion using native automaker telematics: a vehicle owner could stop reporting vehicle data.

CAMs will detect the lack of current credentials as soon as they use the login credentials to try to get new information on the vehicle. CAMs should be required to immediately notify users by several channels (email and text at a minimum) to update their login credentials. Distance driven while there is no valid login information will be recorded by the vehicle odometer, but location information will be lost, so vehicles should be responsible for paying for all miles driven while they have not provided current credentials, ideally at the highest rate if multiple rates are possible.

If a vehicle owner never provides updated login credentials, then the CAM will never get updated odometer information. The CAM can close the user's account and pass the last known odometer information to the state. The state can then assign a penalty to the vehicle until the vehicle pays the RUC. However, if the vehicle moves out of state at this time, the vehicle may have no legal recourse by which to reclaim the RUC.[67]

The following is a native automaker telematics compliance waterfall:

Figure 9 Native Automaker Telematics Compliance Waterfall



[67] As discussed above under general evasion, in cases of vehicles with substantial amounts of unpaid RUC, the vehicle can be issued a registration hold. However, for vehicles with small amounts of unpaid RUC, such as measure is likely extreme.

6. Account Manager Evasion, Prevention, and Detection

This section discusses Account Manager Evasion—intentional evasion by the Account Managers themselves. Although unlikely to occur in early years of RUC programs, eventually unethical Account Management vendors may emerge. This section should help states structure their programs to prevent this from happening.

As a basis, this section assumes that the states collect data regularly from Account Managers, and checks that the data is consistent with any odometer records that the state already has, such as those obtained on safety inspections or through titles.

Based on research and interviews with account management vendors, the project team found three possibilities for Account Managers to evade the RUC system:

- Keeping two sets of books
- Enrolling "ghost vehicles"
- Inconsistent rounding

These actions are difficult and unlikely. Account Manager Evasion is not expected to be common. Each of these methods, and their means of prevention, is explained below:

Keeping two sets of books—one "clean" set of records for the state, the other reflecting the reality, is a standard practice in organized crime. In the case of RUC, it would mean invoicing vehicle owners for more value than is passed on to the state, for example, charging a vehicle owner for 1,000 miles, while reporting to the state that the vehicle owner had only driven 900 miles.

Prevention: This approach should be prevented through Account Manager certification and audit. Certification means the initial functional testing and financial screening of account managers, to ensure that they have the technology and processes in place, and financial stability, to serve the state for a sufficient period of time as an Account Manager. During the certification, the funds charged to individual participants should be tracked through to their transfer to the state. While this ensures that the Account Manager is compliant at the start of the RUC program, an Account Manager could theoretically always change—begin siphoning off funds sometime after program start. To prevent this, periodic audit or recertification is necessary.

In the insurance space, financial and process audits of providers are common, and such audits make sense for RUC Account Managers as well. However, some number of direct participant audits will also be necessary. If each vehicle's RUC charges are reported to the state by the Account Manager, the auditor simply needs to contact individual vehicle owners to verify that the charges reported to the state are the same as the values charged to the individual vehicle owner. If the selection of vehicle owners is random and unknown to the state, the number of owners audited in this way need not be especially large.

While auditing account managers is necessary, it should not be so frequent or onerous as to discourage vendors from offering their services. Relatively standard audits, such as financial audits, may need to be required once a year once revenue exceeds a substantial level—such audits are needed not only to verify that the CAM is not committing intentional fraud, but also being a good financial steward of the state's money. Higher effort audits, such as process or technical audits, may only be needed every 3 to 5 years, or in cases of major system upgrades.

Auditing can also take place through comparing vehicles held by the CAM with any records

Further, CAMs could be required to hold surety bonds, similar to the fuel tax surety bonds that fuel tax dealers are required to hold, to ensure that they pay all fees owed. This would likely only be necessary when the program would exceed a certain revenue threshold, and if there is found to be significant danger of the CAMs being fly-by-night companies that could disappear or go bankrupt rapidly. If CAMs meet stringent financial requirements, then such surety bonds may not be needed.

Enrolling ghost vehicles means an Account Manager registering vehicles that are not registered with the state, and possibly do not exist at all. The CAM then charges the state for managing the nonexistent vehicles' RUC accounts.

Prevention: This method of Account Manager evasion can be prevented by requiring that the state validate all enrollments with their Motor Vehicle Registry (DMV database). If the state validates each vehicle being enrolled by an account manager and keeps a record of which vehicles are registered with which Account Managers, enrollment of unregistered vehicles or double registration of vehicles with multiple account managers is not possible. If an employee of the DMV were a participant in a scheme to defraud the state, he or she could potentially register ghost vehicles, and then the Account Manager could control them. But the need to pay vehicle registration fees and DMV internal controls should prevent this from happening.

Inconsistent rounding means that Account Managers round decimal values up when charged to vehicle owners, but down when reported to the state. Rounding is necessary in RUC programs—with per mile charges generally set to a tenth of a cent, and distance reported to tenth or hundredth of a mile, miles traveled, and the amount of RUC owed will be a long decimal value. Theoretically, Account Managers could apply two sets of rounding rules—one for when charges are applied to vehicle owners, and another when charges are sent to the state. In this manner, the Account Manager could keep one set of books, but still capture funds that should go to the state. Although the margins of such rounding would be small (perhaps a penny per vehicle per month), when a RUC program covers millions of vehicles, this could result in significant amounts.

Prevention: the state should set consistent rounding rules for Account Managers. In general, rounding of RUC charges for vehicle owners should occur for the greatest possible time or

monetary value. Further, the state should specify that all RUC charges collected from vehicle owners be passed on to the state, with no rounding.

7. Aggregated Evasion Detection: Internal Controls

Internal controls are measures of overall system performance that can be used to improve system performance. Internal controls can serve as indicators of evasion at the aggregate level. Although they do not provide a definite indicator of evasion, they can be used to observe topics that deserve scrutiny, which can lead to the discovery of evasion.

The primary internal controls for a RUC system are measures of vehicle performance on the aggregate, such as average miles driven per vehicle. While these values may fluctuate after system start, they will eventually achieve a steady state that will fluctuate within a given tolerance and change seasonally. After such changes are accounted for, major deviations from the steady state averages (either increases or drops) should be investigated.

States should receive data periodically from all account managers offering RUC services in their jurisdictions. They should compute internal control values on a periodic basis, for example, monthly basis, and those values should be illustrated on a dashboard, including historical values dating back for at least a year. Major deviations in internal control values should be investigated either when they are large or repeated.

7.1 Road usage charge component values

The primary components of the charge are miles driven, fuel gallons used (or some proxy for it) or fuel tax credits, and RUC. Each of these values should be computed, for each reporting Account Manager, both:

- in aggregate (i.e., total value)
- per participant (i.e., dividing the total value by number of participants)

If multiple RUC rates are possible, then the average RUC rate paid should also be computed, both in aggregate and per participant. The month-on-month trends (deltas) should be computed for each value.

Further, for the reporting period (month), the minimum, mean, and maximum values of each of these components (miles, fuel gallons or fuel tax credits, and RUC) for each vehicle in the system should be observed. The minimum values should generally be zero, because there will be some active vehicles that are not driven, but they should never be negative. The maximum values should be feasible (for instance, less than 1,500 miles per vehicle per day). The mean values should be followed for deviations. If possible, the min/mean/max values should be computed by vehicle type (at a minimum, private versus commercial vehicles, and possibly breaking these down into various subcategories).

When a substantial portion of vehicles in the state are paying RUC, fuel consumed as measured by RUC can be compared with the total fuel sales in the state, acknowledging that state fuel

sales also include sales to out-of-state vehicles, and that in-state vehicles may buy fuel out-of-state.

7.2 Fleet Fuel Economy (MPG)

Aggregate fleet fuel economy (mpg) should be computed for vehicles using liquid fuel based on RUC data available. RUC data will ideally include fuel consumed by each vehicle, as either reported by plug-in devices or telematics or computed based on miles traveled times EPA estimated city-highway fuel economy. However, if actual fuel consumed is not available, but if only fuel tax credits are available, they can be divided by average gasoline costs for a given reporting period). The computation should exclude EVs and PHEVs, because they either never use liquid fuel or have a fuel economy that depends on how they are driven/charged. In general, fuel economy should improve slowly over time. In 2019, the average fleet fuel economy in the US was 22.2 mpg.[68] Major deviations in fuel economy should be investigated.

7.3 Errors and Events

Any errors and events reported by Account Managers should be recorded as internal controls, both as a total number and as a per vehicle value.

The most important error and event to measure is plugs and unplugs of plug-in devices. If length of device unplug is available, that should be recorded. Other system errors and events should also be recorded as internal controls, both aggregate and per participant, most importantly:

- Non-reports by odometer photo reporting vehicle owners
- Lack of current login credentials by telematics reporting vehicle owners.

7.4 Enrollment trends

Enrollment trends per account manager should be recorded as an internal control for each account manager, including vehicles added and vehicles dropped, by vehicle type, and possibly by mileage reporting method. Such values may not reveal evasion activity, but major unexpected deviations are worth investigating.

7.5 Payment trends

Data on vehicle owner payment—are most vehicle owners on time, or are a number late, and if so, do they pay late fees? – may be a useful internal control. It may not be necessary if AMs are required to pay the state for RUC measured regardless of payment status but could still be a useful value to monitor.

[68] Bureau of Transportation Statistics, https://www.bts.gov/content/average-fuel-efficiency-us-light-duty-vehicles

8. General RUC Evasion Prevention

Section 5 provided mileage-reporting method-specific evasion prevention methods. This section provides some overall principles for preventing RUC evasion:

- Design RUC system for easy compliance
- Design RUC system to support all expected RUC use cases
- Educate the public about the RUC system
- Only treat vehicle owners as violators in cases of serious non-compliance
- Actively engage in detection of non-compliance and program enforcement

8.1 Design system for easy compliance

RUC systems should be designed to be easy for vehicle owners to comply with. Doing so will reduce unintentional noncompliance, but it will also discourage evasion, because some casual evaders do so because systems are so inconvenient. Means of designing the system for easy compliance include the following:

- Offer multiple reporting options—many users will find it easiest to plug in a device into a vehicle. Some may find it easiest to take an odometer image, perhaps because they do not have an available OBDII port in their vehicle. Some may prefer to use telematics, even if it means paying for a telematics subscription. Offering multiple reporting options—and even multiple Account Managers—will make the system easier to comply with.
- Offer multiple payment methods and payment frequencies—for most people with credit cards, using credit cards will be the easiest way to pay. But the system should also be easy to comply with for the unbanked and underbanked. Underbanked individuals—who may have a limited bank account, but no credit card—may be able to be supported through mobile payment options such as Venmo. Although some truly unbanked individuals may use mobile payment options, there will need to be some way for unbanked vehicle owners to pay cash. This could be done through offering a walk-in center, contracting with a network of convenience stores, or using a service such as PayNearMe. Just as importantly, the system should support incremental payments—not require that vehicle owners pay all RUC charges for a given year at once (annually), but allow them to be charged biannually, quarterly, and/or monthly.
- Design each reporting option to have a good user experience—ensure that the messaging for each reporting option, both from the state and Account Manager level, is clear and complete; that there are clear and complete FAQs on the state account manager levels; and that user interfaces for apps, web portals, and other technology is intuitive and easy to use. Designing good user interfaces takes specific effort. It means ensuring that instructions are clear, that users know exactly what is required of them, that they do not have to enter information twice, that customer support is available by several channels (email and phone, at a minimum), etc. While Account Managers may

have ultimate responsibility for the user experience, they should be strongly encouraged to provide good user experiences.

- Design the RUC system with redundancy to be fail proof (or nearly failproof). If the system has significant operational downtime, people may start to undermine it.

8.2 Design system that support all expected RUC use cases

Evasion will also be prevented by designing the RUC system to support all expected RUC use cases. Some primary use cases are buying/selling vehicles, covering abandoned vehicles, and moving in and out of state. If these use cases aren't designed to be handled conveniently, vehicle owners may prefer to risk evading the RUC than to try to be compliant.

- Buying/selling vehicles—when buying a vehicle from a dealership (new or used), it should be possible to gain information about multiple account managers and enroll at dealerships. An odometer record of vehicle transfer should be made whenever vehicles are sold, either from dealerships or at private sales. An app or web portal and a private record of sale should feed odometer value at time of sale should be sent to the state.

  Regarding private vehicle sales, in a mature RUC system—one in which most drivers in the state are aware of RUC—it would be ideal for all RUC owed to transfer with the vehicle to the new vehicle owner, and the buyer can check that a vehicle has no outstanding RUC fees prior to or when it is sold. Having RUC stay with the vehicle is a desirable approach because the state has a way of contacting the new vehicle owner—through that vehicle's registered address. By contrast, the previous owner could leave the state no means of contacting him/her. This approach mirrors the approach taken on money owed through a vehicle title lien. If a person buys a vehicle with a title lien, the new owner must repay the lien or give up the vehicle—in all states, it is the buyer's responsibility to check that there are no outstanding title liens on the vehicle. To support buyers, most state DMV's offer a lien check feature online. Similarly, states and/or account managers will need to offer a means for vehicle sellers to pay RUC up to the current odometer and a means by which vehicle buyers can check that a given vehicle has its RUC paid.

  Until the mechanics of a RUC system are widely understood, and thus is mature enough for the state to allow RUC to transfer with the vehicle, RUC owed will presumably remain with the vehicle owner, and the state assumes responsibility for pursing unpaid RUC after a vehicle is sold. In this case, the state should develop a simple means of private vehicle sales—a means by which a vehicle buyer and seller can report the odometer value at the sale to the state's RUC accounting database. The first indication the state may receive of a private sale is a vehicle title/registration change request from the new owner. The odometer value reported could become the value on the new vehicle title.

In the case that the RUC does not stay with the vehicle, it may be beneficial to state in law or regulation that an individual's RUC owed remains the obligation of the vehicle owner incurring the RUC. However, a change in the law or regulation will be needed in case the state wishes the RUC to transfer with the vehicle.

- Abandoned vehicles—vehicle owners are generally the ones required to pay RUC, so when they abandon their vehicles, they should remain the ones required to pay any outstanding RUC debts. However, if the vehicle owner leaves the state permanently, it may be impossible for the state to enforce any penalties against the vehicle owner. For this reason, states should adopt pre-payment or wallet-based payment for RUC systems.[69] By contrast, pure post-payment systems may allow RUC to be avoided by individuals who abandon vehicles and move out of state.

- Moving into/out of state—vehicle owner should be able to enroll in RUC at the moment that they register a vehicle in a state (providing the odometer value through an odometer image or inspection). Vehicle owners should have an easy way of stopping paying RUC when they register the vehicle in another state, or of transferring their vehicle if both the states require RUC be paid for the vehicle. Account Managers should support movement of vehicles from one RUC state to another, when they are active in both states.

- Vehicle Dealers—vehicle dealers are special class of vehicle owners. During the period that they possess the vehicle, they should be required to pay the RUC. Vehicle dealers are required to record odometers for vehicles when they are sold on vehicle titles, so adding a requirement to pay RUC for such vehicles should not be exceptionally complicated. An odometer charge, with or without image requirement, should be sufficient to cover most vehicles on dealer lots. Such dealer payments for RUC could be made directly to the state.

- Vehicle Fleets—vehicle fleets are another special class of vehicle owners. To the extent that fleets use the same mileage reporting methods as individual owners, the methods described here should capture any evasion attempts. The only exception is odometer image capture, as fleets may comprise many vehicles of the same make and model, and a dishonest owner could submit images of the same (lowest mileage) vehicle multiple times. For that reason, and because it is very inconvenient for fleets to use odometer image capture, that mileage reporting method should not be offered to fleets. If vehicle fleets are allowed to use other methods of mileage reporting, such as self-reporting from their own telematics system or having a dedicated vehicle inspector to read odometers in person, they may require additional checks in order to prevent evasion. Such additional checks may simply involve submitting odometer images of a small number of select vehicles.

[69] The organization could offer refunds of any remaining RUC prepayment on a given vehicle.

- Vehicle Salvage/Scrapyard/Insurance Claims. Odometer reports should be required when vehicles are involved in reported collisions (or other reportable incidents), as well as when vehicles are totaled out and scrapped (salvaged). These activities could require insurance companies, or the salvage or scrapyard, to subtract the vehicle's outstanding RUC obligation from any payment and remit it to the state.

8.3 Educate the public about the system

RUC evasion will also be prevented by educating the public well about the system. RUC education will of course discourage unintentional noncompliance, but it will also discourage evasion, as some vehicle owners may choose to evade rather than try to learn about a system that is complicated and hard to learn about.

The main things that states need to educate vehicle owners about are:

- Why is RUC needed?
- Which vehicles are liable for the RUC, and when?
- How does RUC protect user privacy and security?
- How do vehicle owners sign up to pay the RUC, both for existing and new vehicles?
- What choices of mileage reporting and account managers do vehicle owners have?
- How does RUC impact buying/selling a vehicle, and moving in/out of state?
- How can vehicle owners learn more details about the RUC?

One of the main channels for educating the public about RUC is online, through a well-designed website. Paper pamphlets available at motor vehicle registration agency locations will also help educate the public about RUC. RUC should further be announced through vehicle registration renewal reminder letters, possibly also including the RUC pamphlet mentioned above, as well as on the vehicle registration renewal website. Either directly on the website or following a link from that website to an account manager, a simple form should allow vehicle owners to register for the RUC. If users have the choice of multiple account managers, a state level customer service email and call center should be available to respond to user questions. Finally, it may help to include some basic RUC information in the driver's license handbook, so people become familiar with RUC when learning to get their license.

8.4 Only treat vehicle owners as violators in cases of serious non-compliance

This lesson was learned from the tolling industry: when noncompliance occurs, only treat vehicle owners as violators in cases of serious evasion. In other cases, penalties and surcharges may be waived to encourage payment of RUC owed – the goal of the enforcement program should be for people to pay their RUC, not to collect fines or penalties.

After the transition to electronic tolling, some toll roads began charging any vehicles that did not have tolling accounts as vehicles in violation, and their owners as violators, after a single trip on the toll facility, and subject to a penalty. While they did get some penalty revenue this

way, there was a relatively high incidence of evasion. To reduce the evasion rate, many such toll roads changed their enforcement paradigm to charging vehicles without an account only a somewhat higher rate than vehicles with an account (a non-account rate) and sending those vehicles their charges in the mail (as non-account customers). That higher rate might even be waived in cases where the vehicle owner signs up for an account. When vehicles do incur late payment penalties, they may be offered amnesties (eliminating the penalty, though not the toll charge) when they pay promptly.

This general philosophy—charging the RUC, but not immediately labeling vehicle owners as violators or demanding payment of significant penalties in case of noncompliance—will help to encourage compliance and prevent evasion. That said, cases of unambiguous noncompliance (e.g., extended failure to enroll a vehicle or extended failure to pay the RUC due) still merit treating the vehicle owner as a violator.

8.4 Actively engage in detection and enforcement

Actively engaging in noncompliance detection and enforcement will prevent RUC evasion. The visible knowledge that evasion efforts will be caught, and penalties charged for such efforts, will discourage vehicle owners from attempting to evade.

9. RUC Enforcement

This section considers consequences for detected RUC evasion, follow-up actions, and related topics. A range of actions are described below, and not all may be desired – or even allowed – under a specific RUC implementation.

9.1 Who carries out RUC Enforcement

In general, RUC enforcement will be carried out primarily by the state of vehicle registration. That is because that state has knowledge of a vehicle's VIN and can thus verify that a given vehicle is enrolled and paying RUC, and because it alone can legally execute some of the major secondary consequences for significant RUC evasion, such as a vehicle registration hold or suspension.

At some point in the future, states may require that out-of-state vehicles pay RUC. However, for reasons described in the introduction, the fuel tax is likely to remain in place, in parallel with RUC for a number of years to come, and during that time, out-of-state vehicles are likely to remain on the fuel tax. When states start charging RUC on out-of-state vehicles, they may simply do so as a secondary violation only (only investigating when vehicles are pulled over for other reasons). Alternatively, states may require that out-of-state vehicles register their license plates in order to travel in a given state and create a RUC account or purchase a time permit along with their license plate registration. In that case, RUC enforcement could also be carried out through automatic license place recognition cameras. Further details of such out-of-state enforcement will only be able to be determined when policies for charging RUC to out-of-state vehicles are fleshed out.

Today, vehicles that are paying RUC and travel out of state are required to pay for miles traveled out of state unless they choose a location-based method and remain compliant. If a state wants to offer manual refunds for miles driven out of state, it can do so, but administering such manual refunds may be expensive. In this case, again RUC enforcement is carried out by the state of vehicle registration.

9.2 Initial Consequences of Evasion

This section describes potential initial consequences that the state can make for detected minor evasion efforts. When developing a RUC program, such consequences will need to be provided for in RUC-enabling legislation, and the specific consequences will need to be determined in regulation.

Initial consequences for RUC evasion include:

- Warning letter—for minor evasion instances, such as late payment, vehicle owners may be given the consequence of a warning letter.

- Fee or Surcharge—for slightly more significant evasion efforts, such as leaving a device unplugged for a substantial length of time while the vehicle is in use, or for an ignored warning letter, vehicle owners may be treated with a minor fee or surcharge. Alternatively, the vehicle owner can be charged at the highest mileage rate due to lack of compliance. In this case, the vehicle owner is still not being clearly assessed a penalty.
- Penalty notice—for significant evasion efforts such as long-term nonpayment, long term unexplained unplugs, or failure to send in an odometer image for an extended period, vehicle owners can be sent an explicit penalty notice, which depending on the legal framework could include a fine, late fee, or surcharge.

Note that actions that may be construed as very minor evasion attempts, such as sending an unreadable image may simply be treated as mistakes and handled by the Account Manager requesting a replacement image. Vehicle owners may even send the image from an incorrect vehicle unintentionally, so the Account Manager may simply request a replacement image. Multiple such attempts may eventually escalate to receiving one of the initial consequences indicated above.

Setting the exact fee or surcharge, and penalty fines will vary by state. They will likely need to be set in regulation, not law, so levels can be changed by the overseeing agency. In general, the economics of fraud must also be considered. RUC penalty fees and further consequences should be at such a rate that they disincentivize evasion.

9.3 Secondary Consequences of Evasion

If the initial enforcement attempts are not successful, or the violation discovered is more severe than the instances described above, the state will wish to enact more severe consequences. The exact nature of these consequences will vary depending on whether the RUC is enacted as a tax or a fee, and on the state's specific legal framework. Specifically, tax liens and levies are only possible if the RUC is a tax, and lawsuits followed by wage garnishment will only be desirable if the RUC is a fee. As with initial consequences, when developing a RUC program, secondary consequences will need to be provided for in RUC-enabling legislation, and the specific consequences will need to be determined in regulation.

- Collections—it may be possible to sell outstanding RUC debt to a third-party collections agency, or to empower a third party collections agency to recoup the value of RUC owed. Such agencies can be more aggressive at recouping amounts owed but will take a fee for their actions—the state may be able to claim 60% of the amount, while the collections agency retains 40%, for example. This is appropriate for a significant but not huge amount of unpaid RUC. If the amount is over, say, $500-$1000, further steps may be merited, described below.
- Vehicle registration hold: sometimes called vehicle registration block or stopper, a vehicle registration hold is an order that prohibits a vehicle owner from renewing registration for a given vehicle, until a certain task is completed, e.g., paying both RUC

charges and penalties. Many states will not allow out-of-state vehicles with a vehicle registration hold to register, preventing unpaid RUC when such vehicles are moved out of state. Vehicle registration holds generally allow the violators several months to pay, as they only impact a vehicle's operation when the current registration expires, which may be months away. A stronger measure is a vehicle registration suspension, which invalidates the registration immediately. If a vehicle owner cannot pay to lift the registration hold, the vehicle owner will no longer be able to drive the vehicle legally, which will limit his/her mobility. Some states, such as Montana, allow some older vehicles to be permanently registered, with no need of registration renewal, and a registration hold would have no impact on such vehicles; such states may need to consider a registration suspension or other major penalty in case when such vehicles would have significant RUC violations.

- Vehicle Title Liens could be added in addition to registration holds to keep vehicles with large amounts of outstanding RUC from being registered in other states. Vehicle title liens are currently issued only issued to auto lenders, and to mechanic's or vehicle storage facilities ("mechanics' liens"), so this would require a new category of vehicle lien be created in RUC enabling legislation.
- Legal attempts to claim funds: states may wish to recoup funds owed to it from a given noncompliant vehicle owner by a variety of legal means. Unlike a vehicle registration hold, this will allow the individual to retain use of the vehicle indefinitely. However, they may be more bureaucratically work intensive than a registration hold and will not prevent a vehicle from being moved out of state. Each of these legal means will need to be specifically enabled for RUC in the RUC-creating legislation, and details of each means will need to be specifically designed to comply with other relevant state laws.
    - If the RUC is a fee, a step beyond collections will be for the state to **file a lawsuit** a vehicle owner for unpaid RUC. If established in legislation/regulation, such a suit will be straightforward for the agency to win. Then, if a vehicle owner does cannot immediately pay, the state can garnish his/her wages until the amount of RUC paid is recouped. Unlike a registration hold, this will never prevent a vehicle owner from being able to use his/her vehicle. However, it may deprive the vehicle owner of a significant amount of his/her income.
    - If the RUC is a tax, the state can take out **tax liens**—claims against property owned by the vehicle owner. This can include claims against real estate, securities, or a vehicle itself. With a lien, the vehicle owner will not be able to sell these items until the lien is removed (or the buyer would assume responsibility for repaying the state. This has the advantage of not immediately taking funds from an individual undergoing financial hardship. However, it is only feasible if the vehicle owner owns property of significant value. If the vehicle owner owns no real estate or securities, and the vehicle's own value is low, this approach is infeasible.
    - If the RUC is a tax, the state can take out a **tax levy** against the vehicle owner. The tax levy gives the state the ability to immediately seize individual assets. In cases in which the individual does not possess such assets, this becomes wage garnishment. Unlike a registration hold, this will never prevent a vehicle owner from being able to

use his/her vehicle. However, it may deprive the vehicle owner of a significant amount of his/her income.

- Vehicle disabling or impoundment: in case of extended, large outstanding RUC fees, vehicles could be disabled (booted or windshield obstructed) or impounded.
- Asset seizure: If unpaid RUC accrues to very high values (thousands of dollars), it is conceivable states would move to seize assets. This would likely only follow impoundment of the vehicle.
- Jail time: jail time could theoretically be required but would likely only be relevant in cases where an individual conspired to have many vehicles evade the RUC system for a significant amount of money.

9.4 Social Equity of RUC Penalties

RUC enforcement approaches may have social equity implications, compared with payment of the fuel tax. Fuel taxes today are paid incrementally, with each gallon of gas purchased, and fuel tax violations involve very clearly intentional acts, whereas RUC may be charged in larger single amounts, and RUC violations may involve less directly intentional acts. In general, states should offer installment payment options, to ensure that RUC fees are not burdensome. However, low-income individuals may also find RUC penalties onerous. The following measures will help states achieve equity in RUC enforcement.

- As described above in Section 8 on RUC Evasion Prevention, the state should make the system easy to comply with and understand and offer multiple and incremental payment options. This step is the most important towards achieving system equity.
- The state should offer amnesties or waivers for first and potentially second minor offenses, potentially only in cases of good cause shown. Amnesties or waivers mean cancelling penalty fees or fines—but not the base RUC owed. Amnesties should not necessarily be granted automatically—vehicle owners should be informed of their option to request amnesty, but they must still request them. However, after utilizing one or two amnesties, vehicle owners should no longer be offered amnesties—at some point, there must be consequences.
- Offer payment plans or build installment payment options into the system. For large amounts of RUC and penalties owed, the state should allow individuals who have difficulty paying large amounts at once (low-income individuals) to repay the amounts owed though a predefined installment payment plan, or potentially in limited cases over a custom payment plan, over an agreed period of time. The entire amount owed may not be feasible for low-income individuals to pay at once. However, payment plans should include consequences when debts are not repaid on schedule. The state will need to develop official rules for payment plans.
- Driver's license suspension or other consequences impacting an individual's right to drive should **not** be legislatively authorized. Doing so could eliminate an individual's ability to travel to work, further reducing their ability to meet their responsibility to pay

RUC and could limit the individual's ability to participate in other aspects of public life unrelated to transportation.

- Vehicle registration holds should be used with caution, and in particular, should only be used if vehicle owners fail to repay through payment plans or if the vehicle owner cannot be contacted despite extensive research into change of address databases and skip-trace activities. In such cases, when vehicle owners are finally contacted, they may still deserve the option to a payment plan. Vehicle registration holds may limit the mobility of individuals, and thus limit their ability to earn money to repay funds owed; and they may have significant secondary impacts on vulnerable groups, because if unresolved, vehicle registration holds may automatically lead to additional consequences such as jail time in some states. Nonetheless, vehicle registration holds provide an important backstop against those engaged in extensive evasion.
- Vehicle impoundment or various forms of vehicle disabling, if used at all, should be used only in extreme cases, when payment plans and tax liens/wage garnishment have failed. Such measures will limit the mobility of the vehicle owner and thus may limit the vehicle owner's ability to earn money to repay the RUC owed.

9.5 Adjudication and legal appeal

Adjudication means an out-of-court appeals process for vehicle owners who think that they have been unfairly charged with noncompliance and penalized. It would be carried out by the state, but by an office separate from the office tasked with overseeing the RUC. Adjudication could be carried out online, or in a simple in-person proceeding. Vehicle owners would present evidence or arguments as to why their penalty was incorrectly assigned. The adjudicator could uphold the penalty, lessen the penalty, or vacate the penalty completely, based on the evidence and arguments provided. In general, adjudication procedures for RUC can be modeled on those offered by tolling agencies or city parking ticket adjudication procedures.

It is vital to include adjudication procedures as part of any RUC system with enforcement procedures, because some RUC violations will inevitably be incorrectly assigned, and if vehicle owners do not have a means of appeal, they may pursue legal recourse by suing the state office that oversees RUC. Once the system reaches a certain size, such cases could overwhelm the court system. Indeed, some vehicle owners will be unhappy with the outcome of adjudication, and still wish to execute a legal case. Offering a good adjudication system should minimize the extra burden on the state's court system.

10. Recommendations

This section describes the recommendations of the project team for states implementing a RUC. It includes three sections:

- General evasion/enforcement policy recommendations, which include recommendations for system design and operational procedures for a RUC system with low evasion and strong enforcement.
- RUC Program Development approach recommendations, which are steps recommended for states to take as they implement a RUC program.
- Legal/regulatory recommendations, recommendations for law and regulations to enable RUC enforcement.

10.1 General evasion/enforcement policy recommendations

- **The state should maintain an odometer record for each vehicle**, that is updated at least once per year, and every time a vehicle enters or leaves the state, is bought or sold, or switches account managers. This list should be maintained by the state, independent of any Account Managers (though it can certainly be populated by data from the Account Managers). The first odometer reading should be recorded when the vehicle enrolls in RUC. This overall approach ensures that miles do not remain uncharged when vehicles are in between Account Managers or owners.
- **The state should record which Account Manager each vehicle is enrolled with.** This ensures that the state is always aware of how each RUC-liable vehicle is paying RUC.
- **Vehicle dealers should be included in the RUC process**. Both new and used vehicle dealers should be able to track and report vehicle purchases and sales easily to the state's RUC Accounting system and provide information to vehicle buyers on the RUC program, or perhaps even enroll them automatically.
- **When RUC systems are open and are scaling up, to facilitate private sales the state should provide a means (app, web portal, and/or paper form) to record the odometer value and purchaser, to allow the seller to confirm the odometer of the vehicle at sale and ensure any outstanding RUC has been paid prior to sale.** This will allow the vehicle to be closed out of RUC and de-enroll the seller, while notifying the state RUC system of the new vehicle owner.
- **Once the RUC system has scaled up and is widely known and understood, RUC owed should remain with vehicle.** In this case, when a vehicle is purchased, if there is outstanding RUC owed, it now is the responsibility of the new vehicle owner to pay for it. This mirrors the situation with vehicle title liens today. It will be necessary to educate the public about this situation, and it should be included on websites and in all information related to the RUC. Moreover, states and/or account managers should make an easy way to check that RUC is paid in full on a given vehicle, or at a minimum to determine how much outstanding RUC is owed on the vehicle. The law creating the RUC program should establish that the RUC owed, as recorded by the state or Account

Manager, stays with the vehicle, without creating an additional need for a formal title hold on the vehicle.

- **The state should audit some number of vehicles through a vehicle history service such as CARFAX or Autocheck each year**. Doing this ensures that vehicles for which odometer rollback is performed have a threat of being caught. Eventually, these audits may want to exclude vehicles for which odometer fraud is virtually impossible (e.g., Teslas).
- **The state should require that vendors keep software and hardware secure and keep up to date on technology trends**. New threats emerge constantly, and systems must be kept secure to prevent new means of evasion emerging.
- **The state should employ a prepay and/or electronic wallet payment approach, or if a post-pay approach is used, require a deposit**. These prevent vehicle owners from absconding without paying for last bit of RUC, which a pure post-pay approach without a deposit would allow. For approaches based on annual odometer readings, the vehicle owners may prepay for a whole year, or a number of periodic (e.g., quarterly) payments. For approaches that include regular invoicing, an electronic wallet or post-pay with deposit is appropriate. The minimum wallet value or deposit amount should be set to cover losses when a vehicle owner leaves the state. One way to do this is to have a registration surcharge in place (flat value charged at the time of registration) and use that as the base payment for RUC so the surcharge is essentially a prepayment that is drawn down as taxable miles are driven.
- **Interoperability hubs (between any jurisdictions with differing RUC rates) should also allow transfers of RUC owed in an enforceable way.** In this way, when vehicle owners move from one RUC state to another, their RUC debts can be transferred through the interoperability hub.
- **Occasionally audit account managers** in a non-onerous way. Occasional audits (every 1, 3, or 5 years depending on the type of audit) are the only way to fully ensure that account managers are compliant with RUC rules. Audits can involve just a handful of participants.
- **Provide rounding rules to Account Managers** to ensure that account managers round all fractional amounts owed consistently.

10.2 RUC Program development approach recommendations

- **Prior to starting a RUC program, develop an enforcement plan** based on the recommendations in this document. The enforcement plan should include prevention approaches, detection approaches, penalties, adjudication, and internal controls. It should outline enforcement responsibilities of Account Managers. Where needed, the enforcement plan should suggest changes to state law and regulation to allow enforcement. See full legal recommendations below.
- **Implement enforcement during RUC program ramp up, but in a limited way that grows**. Enforcement policies and procedures can adapt and grow with the RUC program.

During ramp up, not all aspects need to be carried out. During ramp up, extra leniency and amnesties can be employed.

- **By the time the fuel tax is ready to be removed, the enforcement program should be mature.** As indicated at the start of this document, as long as fuel tax and electric vehicle fees provide a backstop for RUC enforcement, the motivation to evade will be very low. This will provide years during which the enforcement program can mature. When the fuel tax is ready to be removed, the state should evaluate the RUC enforcement program, verify that it is mature, and address any issues discovered.

10.3 Legal/regulatory recommendations

Our teams' legal and regulatory recommendations are divided into actions and considerations that states should make at the outset of a RUC program, during program design, and those that apply during live operations.

10.3.1 Legal actions during RUC Program Design

The state should take the following actions at the outset of a RUC Program.
First, if a state will be treating RUC as a roadway use *fee* rather than a tax, the state should draft its RUC authorizing legislation and design its program with the following features:

- Clearly express the legislative intent that RUC be treated as a fee in the intent section of the authorizing legislation (typically a preamble of legislative findings and declarations). For example, in Oregon, clearly labeling RUC as a "proprietary charge" or a "fee for the privilege of public road access, in direct proportion to the benefit received" would align with state court decisions. In many other states, simply calling RUC a "tax" or a "fee" will not have much effect.
- The amount of the fee should not raise revenue in excess of the cost to provide and maintain the public roadways. Practically speaking, no state generates highway-related revenue in excess of the cost to provide upkeep of the system; RUC is unlikely to change that.
- Use the revenue generated only for "services directly related to the fee exaction" (i.e., driving). From a policy perspective, this may be problematic in many states as RUC and its predecessor, state gas taxes, may intentionally fund programs and projects beyond public roadways. If this is the situation in a RUC West member state, the case for RUC to be treated as fee will be significantly weaker. If revenues are used beyond surface transportation for other general government purposes, then RUC surely will be ruled a tax.

- Depositing RUC revenue in a special protected fund (e.g., a highway trust fund) to be expended only on maintaining and improving the services provided will reinforce the argument that RUC is a fee and not a tax.

Second, regardless of whether RUC is determined to be a tax or a fee, in the RUC enabling legislation or the program's initial administrative rules, consider the following driver data provisions:

- Include specific language allowing for driving data retention for a period of time sufficient to carry out an audit program. A requirement that all driving data be destroyed within 30 days of payment processing may be too short to enable an audit to be conducted as part of a taxpayer compliance program. A period of 15 calendar months would align with the time period that drivers in Oregon are allowed to claim refunds for out-of-state miles driven. Consider aligning these policies to ensure that the data retention period matches the need to conduct post-driving audits.
- Be mindful of data collection tradeoffs: a statute that prohibits or severely restricts state collection or retention of driving location data may bolster drivers' confidence that they are not being "tracked," but it could prove problematic if RUC administrators wish to audit claims for out-of-state mileage deductions.

Third, in designing a compliance and enforcement program that requires visual odometer inspections:

- Avoid designs that call for law enforcement to conduct physical inspections of odometer readings. Stationary roadside checkpoints for the purpose of odometer inspections are very likely unconstitutional.
- Similarly, requiring (or expecting) law enforcement to visually inspect odometer readings of a person's vehicle while an officer has pulled over a vehicle for a different violation is likely an illegal (warrantless) search.
- Completely legal options for visual inspection of odometers already exist through periodic motor vehicle safety inspections, emissions testing, or VIN inspections at title transfer (each of these depend on the jurisdiction). Other methods of in-person odometer readings have been successfully tested in other states and more are planned in forthcoming pilot projects (such as odometer readings by independent businesses such as AAA of America chapters, oil change services, etc.). If these third-party odometer readings are to be used for purposes of reporting RUC mileage or for compliance and enforcement activities, specific authorization will likely be needed in statute, or upon permission granted by the vehicle owner.

10.3.2 Legal/regulatory actions to take after the start of RUC Program operations

The remainder of legal and regulatory recommendations apply to live operational programs collecting revenue. Once a RUC program is beyond the early start-up phase and enhanced compliance and enforcement is warranted, structure civil penalties that:

- Avoid “excessive fines,” which violate the U.S. Constitution’s Eighth Amendment. Penalties for non-compliance must be roughly proportionate to the harm caused to the state from the wrongdoing.
- Provide procedural safeguards and adequate standards if a third party has the delegated authority to set, impose and collect civil penalties.
- Avoid penalty schemes that delegate the power to impose civil penalties to private parties’ interests whose interests may be adverse to the accused. A private entity that has been delegated the power to impose penalties must be able to act with impartiality.

For very significant RUC evasion, the primary legal penalty should be vehicle registration holds until RUC is paid (or until a RUC payment plan, tax lien, or wage garnishment agreement is finalized). As an enhanced compliance and enforcement measure, vehicle registration holds:

- are ubiquitous among all states;
- are legal; and
- are an effective tool to compel a vehicle owner to comply with RUC laws.

Drivers' license revocations are among the most severe consequences for non-compliance with RUC laws or policies. The project team does not recommend drivers’ license revocations be considered as a RUC penalty for the following reasons:

- Compounding penalties, fees, and costs related to civil fines, as high balances owed may make it impossible for certain drivers to pay, thus thrusting them into more serious consequences for non-payment.
- Escalating penalties resulting in drivers’ license revocations may be viewed as de facto “debtors’ prisons” as more liberties are lost through drivers’ license revocations than all other potential enforcement measures short of criminal penalties. The public policy trend in the last 3 years is to repeal drivers’ license revocations as an enforcement method.
- Be aware of the disparate impacts that drivers’ license revocations tend to have on historically disadvantaged communities (low-income, minority, etc.).
- Be aware that drivers’ license revocations are costly not only to the affected driver but to the public as well, given that about 1/3 of all prosecutorial cases involve license revocations.

Appendix A: Expert Interview Questions

Tolling interview questions

Background: Our investigation involves potential future RUC enforcement. Thus, we are more interested in processes and less interested in details of ALPR technology or video enforcement, which are tolling-specific technologies.

1. Approximately what is the payment compliance rate of toll road users? How do you define / determine compliance rate?
2. Can you describe your enforcement strategy? If possible, can you share documentation that describes your enforcement strategy/approach?
3. Please describe the actions (or inactions) that trigger the enforcement process.
    a. What leads to a penalty notification being sent? Are there any notices that precede a penalty notice?
    b. Are these notifications only sent to in-state residents?
    c. Is there a threshold that must be met before a penalty notification is sent (e.g., $5, $10)? Is it the same for in-state and out-of-state residents?
4. Once a penalty notification is sent, what are the following steps when a given individual does not respond to the notice? Does
    a. Does this response vary by state of road user's vehicle registration?
5. Do you ever have in-person toll payment enforcement (by law enforcement officers), If so, can you describe how?
6. Does your toll system have a legal definition of "habitual violator"?
    a. What legal remedies are available to you under state law? (can violators be charged with criminal offences (e.g., trespass, theft), civil only?)
7. Do you have an adjudication process, by which suspected violators can object to what they believe to be an unjust penalty notice?
    a. If so, can you describe it?
    b. How often is the process used?
    c. How often are cases appealed to court?
8. What is the overall quality of registration addresses in the motor vehicle registry database?
    a. Do you take any measures to ensure that the addresses listed in the database are accurate?
    b. Will the agency waive late fees, interest, or other additional charges for individuals who claim that the penalty was sent to the wrong address?
    c. Has the agency encountered any individuals who believe that they shouldn't owe any fees at all because notifications were sent to the wrong address, and if so, how has the agency responded?
9. Does your enforcement program include the ability for violators to establish payment plans?
    a. If so, how are the plans structured and administered?

10. Do you report uncollectable accounts to credit reporting agencies?
11. Do you ever sell uncollectable accounts to collections agencies?
    a. If so, at what point – is there a time-based trigger, a dollar-amount based trigger?
12. How do you view the tradeoff between economic efficiency (or ROI) of aggressive compliance and enforcement program, against citizen/driver/politician expectations for "fairness" and "full compliance"?
13. Are there any improvements you would like to see in the enforcement process, either in enabling legislation or in your own operations, especially to improve cost-effectiveness?
14. Are there any lessons learned you think may apply to RUC enforcement?
15. What level of concern their drivers show about data privacy, and what challenges does that pose for you?

Vehicle inspection interview questions

1. Do inspectors look for odometer fraud (odometer rollback) on mechanical odometer vehicles?
2. Are there any cases of odometer rollback in Hawaii?
3. Do you have any cases of inspection fraud (fraud by vehicle inspectors, potentially based on bribes by customers)?
4. Do any such cases involve odometer readings (e.g., odometer rollback)? Note that we know that there are erroneous odometer readings that are not intentional fraud (eg, typos, lazy).
5. Do you have any measures in place to prevent vehicle inspection fraud, in general?
6. Do you think requiring vehicle inspectors take an odometer image would prevent inspection fraud?
7. What level of concern drivers show about vehicle inspection data privacy, and what challenges does that pose for you?
8. Have you seen any counterfeiting of registration stickers? Are there any measures taken to detect, prevent, or penalize this?

DMV interview questions

1. Motor vehicle registry database questions
    a. Do you have an estimate of the overall accuracy of vehicle title or registration data in the database?
        i. In general, and specifically for mailing addresses, ie, when people move without informing DMV?
    b. Have you recently, or are you currently taking steps to improve overall accuracy?
2. Interstate registration/title data exchange:
    a. Please describe any efforts you are aware of to share information about vehicle titling or vehicle registration among multiple states—either with neighboring states or across the country (NVMTIS covered specifically below).
    b. Does DMV upload data to NVMTIS? If so, what data, and how frequently?
    c. Does DMV use data from NVMTIS? If so:

i. How would you describe the overall data quality? What is the current quality of NVMTIS data? How complete/up-to-date is it? Is it getting better?
ii. How complete is it? – both in terms of how many states report, and whether the data they report is complete
iii. How current is the data?

3. Do you have any ideas about the incidence of:
    a. Incorrectly titled vehicles?
    b. Unregistered vehicles?
    c. How long to vehicles typically stay unregistered?
4. Do you have any data on vehicle registration fraud rates?
    a. What are typical measures made to perpetrate such fraud—fake tags, stolen tags, etc?
    b. What measures are taken to combat such fraud, i.e., what detection measures are taken, and what penalties are imposed?
    c. Are there measures taken to ensure vehicles are registered in the state when they are domiciled here for a certain period of time? If so, what measures, and who carries them out?
    d. Do you have any data or thoughts on the enforcement of the requirement to register a vehicle?
5. Do you have data or thoughts on odometer fraud?
    a. Are you aware of any major activities to investigate digital odometer fraud? What detection measures are taken, and what penalties are imposed?
    b. We know there's a federal law against odometer rollback. Is there a state law as well?
6. Are vehicle registration suspensions imposed for non-moving violations (e.g., excess toll charges, lack of insurance, unpaid child support)? If so, how often does this occur?
7. Are there any improvements you would like to see in any DMV enforcement processes (even those carried out by law enforcement outside of DMV)?
8. Are there any lessons learned that you think may apply to RUC enforcement?

CAM interview questions

1. Fraud *by* a CAM, against a state, is possible (e.g., intentional under reporting of miles so you could pay less than you collect). How would you do it? How should it be prevented?
2. How easy would it be to audit your systems, down to the device level? How would you suggest a state or RUC West going about such audits?
3. Do you design your systems with auditability in mind? Would you consider doing so going forward?

UBI Service Provider interview questions

1. Have you noticed any fraud attempts by UBI end-users? If so, what are they?
2. Are there any additional security measures you have in place for your UBI customers (insurance companies)?
3. Do insurance companies audit your data/systems in any way?

4. Do you think there's any way that UBI data can be used to detect, prevent, or enforce against fraud?

Plug-in Device Supplier interview questions

1. Can you describe security and tamper-resistance measures at a high level (anti-spoofing, etc.)?
2. Do your devices accept inputs, or are they output-only?
3. Do/can you report the length of time to device unplugs, in order to prevent significant losses while devices are unplugged?
4. Of course, unplugs can be reasonable—vehicle taken to the shop. Do you have any ideas about how to prevent or minimize fraud in cases users claim to take the vehicle to the shop but in fact go on long trips, and plug the device back in when they return home?
5. Does lack of cell coverage in the area of a vehicle allow any additional types of fraud?
6. Are you obtaining actual odometer readings where available, including on 2021 and newer vehicles? Will this virtually eliminate the potential for fraud (digital odometer rollback and extended unplugs)?
7. Do you have any additional thoughts on evasion, fraud prevention, and enforcement activities from the perspective of a plug-in device?